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Inside the Book

Introduction to Campus Recruitment Procedure.....	i
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QUANTITATIVE APTITUDE	LOGICAL REASONING
Number System..... 1.1	Coding–Decoding..... 2.1
Averages..... 1.13	Seating Arrangement..... 2.7
Ratio – Proportion..... 1.19	Day Sequence/ Calender..... 2.12
Chain Rule / Variation..... 1.27	Direction Sense Test..... 2.20
Percentages..... 1.33	Blood Relations..... 2.27
Mixtures and Allegations..... 1.39	Syllogisms..... 2.33
Time and Work..... 1.43	Series..... 2.43
Pipes and Cisterns..... 1.47	Analogy – Classification 2.47
Time Speed and Distance..... 1.52	Alphabet Test..... 2.50
Clocks..... 1.63	Character Puzzle..... 2.54
Profit and Loss..... 1.67	Symbol Based Operations..... 2.59
Interests and Discounts..... 1.72	Arithmetic Reasoning..... 2.63
Partnerships..... 1.81	Statements and Arguments..... 2.68
Problem Solving..... 1.85	Non Verbal Reasoning..... 2.73
Basic Geometry..... 1.88	Cubes and Dices..... 2.79
Solid Mensuration..... 1.97	
Co-ordinate Geometry..... 1.104	
Permutations and Combinations..... 1.110	
Probability..... 1.119	
Data Sufficiency..... 1.130	
Data Interpretation..... 1.136	
• Tabular Data Interpretation..... 1.136	
• Bar Graphs..... 1.144	
• Line Graphs or Cartesian Graphs..... 1.148	
• Pie Chart..... 1.153	
• Venn Diagrams..... 1.156	
• Net Diagram..... 1.158	
• Mixed Diagrams..... 1.159	
• Missed Data Tables..... 1.162	
Inequalities..... 1.166	
Surds..... 1.169	
Functions..... 1.172	
Logarithms..... 1.177	
Set Theory..... 1.180	
Progressions..... 1.184	
Quadratic Equations..... 1.188	
	VERBAL ABILITY
	Grammar
	Sentence..... 3.1
	Parts of Speech..... 3.2
	• Noun..... 3.3
	• Pronoun..... 3.5
	▪ Articles..... 3.7
	• Verb..... 3.9
	▪ Tenses..... 3.10
	▪ Subject–Verb Agreement..... 3.13
	▪ Active and Passive Voice..... 3.14
	• Adverb..... 3.16
	• Adjective..... 3.18
	• Preposition..... 3.20
	• Conjunction..... 3.22
	▪ Reported Speech..... 3.23
	Sentence Correction/ Spotting Errors..... 3.24
	Vocabulary..... 3.34
	Antonyms..... 3.40
	Synonyms..... 3.50
	Analogy..... 3.53
	Phrasal Verbs..... 3.58
	Idiomatic Expressions..... 3.59

Reading Comprehension.....	3.61
Closet – Fill in the blanks.....	3.77
Sentence Rearrangement.....	3.84
Theme Detection.....	3.100

PLACEMENT PAPERS

Placement Paper-1.....	4.1
Placement Paper-2.....	4.11
Placement Paper-3.....	4.22
Placement Paper-4.....	4.33
Placement Paper-5.....	4.43
Placement Paper-6 to 40 visit www.CampusRecruitment.co.in	

TECHNICAL INTERVIEW

Civil Engineering.....	5.1
Electronics and Communication Engineering....	5.6
Electrical and Electronics Engineering.....	5.11
Mechanical Engineering.....	5.18
Computer Science/ Information Technology.....	5.22

HR INTERVIEW

What qualities does an Interviewer observe?.....	6.1
Tips for Interview.....	6.2
Do's and Dont's of Interview.....	6.2
Do's and Dont's of Body Language.....	6.3
Answering Interview Questions.....	6.4
Mock Interview with Body Language.....	6.6
Reasons for failure in Interviews.....	6.17

TIPS FOR SEARCHING/ APPLYING JOBS

Different ways to apply for jobs.....	6.18
Applying jobs through companies website.....	6.19
Jobs at Government/PSUs.....	6.21
Apply Govt/PSU jobs in Naukri/Monster.....	6.22
Selection Procedure in PSUs.....	6.23
List of PSUs.....	6.23
Tips to use Naukri.com.....	6.26
Tips to use Monster.com.....	6.31
Career Path based on Academic Percentage.....	6.35

RESUME PREPARATION

Tips to build an effective Resume.....	6.37
Things to avoid when writing Resume.....	6.37
Contents of a Good Resume.....	6.37
Sample Resume Format.....	6.39

GROUP DISCUSSION

Introduction.....	6.41
Skills required for Group Discussion.....	6.42
Steps to approach a Group Discussion.....	6.43
Reasons for failure in Group Discussion.....	6.44
Summary.....	6.44
How to know a company is genuine.....	6.45

Introduction to Campus Recruitment Procedure

Every student chooses an educational institute on the basis of three important factors-

- A. What would be the quality of education imparted?
- B. How would the education benefit the student academically or otherwise?
- C. The potential jobs that would be offered on the campus to the students who pass out of the institute.

The last factor is apparently the most important criteria that would be evaluated by the students in choosing a particular academic institution. The campus recruitment procedure has become one of the most popular avenues to recruit people into companies.

Companies hire engineering graduates into roles that range from software application development, delivery roles, software/ hardware testing, research and development, application maintenance network security and support etc. Management graduates are hired for roles in business development, IT consulting, business analysis, customer relationship management, HR roles, sales, marketing, finance etc.

Before a student braces himself to face the arduous task of appearing for the campus selection procedure, there are a few points that he has to bear in mind –

1. Interact with senior students who have been hired into different organizations. Taking a cue from the seniors would effectively help a student to know the areas that would require extensive preparation and the ones that wouldn't.
2. Interact with the faculty and understand how the technical interviews could be facilitated.
3. Map your strengths to the profile of the job. This is extremely important because there may be scenarios in which a student may have more than one offer at hand. Understanding the profile of the job and the opportunities for growth within the organization, besides the CTC offered would benefit the students to narrow down their choices.
4. Study and understand the philosophy, culture and values of the companies that recruit college graduates.

Campus Recruitment Procedure:

Most colleges that offer campus recruitment facilitate the recruitment through a special department known as the placement department. The placement department is steered by a placement officer who oversees the entire recruitment process.

The various stages that are involved in a typical campus recruitment program are as follows-

- Pre-placement talk
- Aptitude tests
- Group discussion
- Technical Interview
- HR Interview.

1. Pre Placement Talk:

The pre-placement talk is a presentation that is given by the recruiting company's HR and recruiting team. Various aspects of the company such as its profile, history, milestone achievements, organizational goals, its vision, mission, the job profile, products, services, product lines, customers, locations, branches, organizational chart, senior management etc. The role of the job offered as well as its description along with the selection criteria, CTC, designation etc. are also explained in detail. Generally the pre-placement talk is presented by a senior member of the delivery or the HR team.

The general format of the selection process remains the same across companies that hire campus graduates. Minor variation may be present. Selection happens in the following stages.

2. Aptitude Test:

Aptitude test is conducted to evaluate how effectively a student could respond to a task or a situation and their communication skills. In short, this area tests a candidate's problem solving ability. The areas that are normally tested are numerical or quantitative ability, logical reasoning, verbal ability and data sufficiency.

a. Quantitative Aptitude:

Numerical ability entails multiple choice questions that are from the topics mostly covered in high school along with some advanced topics. The various topics from which questions may be asked are Number theory, Averages, Ratio and proportion, Time and Distance, Percentages, mixtures and allegation, permutations, combinations, probability etc. The purpose of this test is to assess the problem solving ability of a candidate under constraints in time. This area can be effectively countered if a student prepares sufficiently beforehand.

b. Verbal Ability:

This area tests the communication skills, reading ability and also the grammatical knowledge of a candidate. The type of questions that may be asked in verbal ability include grammar based questions (sentence correction/ error identification), vocabulary based questions (para jumbles, synonyms, antonyms, fill in the blanks, cloze passages), idioms and phrases, reading comprehension and occasionally descriptive writing (essays, formal/informal letters, analytical/ issue writing section). It is mandatory for a candidate to have basic rules of English in place before he or she appears for the campus placement process.

c. Analytical and Logical Reasoning:

This section tests the logical reasoning and the analytical ability of a candidate. The questions are generally given in the form of puzzles and a set of questions follow the puzzle. It is required by a candidate to rationally approach the puzzle by interpreting the logic. Verbal based reasoning questions such as cause and effect, assertion and reasons may also be asked.

d. Data Interpretation and Data Sufficiency:

Data is presented in various forms such as bar graphs, pie charts and data should be interpreted accordingly. In data sufficiency, a problem is presented with some data and a candidate has to determine if the given amount of data is sufficient for problem solving.

The aptitude round cannot be underestimated because it is a process of eliminating candidates who do not have enough problem solving abilities, reasoning skills or acceptable levels of communication. While a few companies may lay more emphasis on communication and numerical abilities, a few others may stress upon analytical abilities. Regardless of how well a candidate fares academically, he or she should prepare sufficiently for the aptitude test as this stage is an inevitable phase of any campus selection process.

3. Group Discussion:

Those selected in the aptitude test will be called for group discussion. Group discussion is a process of selection rather than a process of elimination. The recruiting team will evaluate certain personality traits like confidence, communicating with the team, participation, ability to present one's views in a clear and concise manner, interpersonal skills, leadership skills etc. These are the traits that the employers would want to see in their potential employees. The main intention of group discussion is to assess the behavior of a candidate in a group. In the GD round, there are usually a minimum of 5 and a maximum of 10 candidates. The topic of the discussion is normally related current topics, hypothetical situations, problematic situations, abstract topics etc. Students who are confident, have a clear thought process and are able to articulate their thoughts lead the group discussion. Hence, students need to be positive, confident and dynamic in their attitude in this round. They should also develop effective listening skills that would enable them to listen and understand others perspective. Students are advised to keep abreast of current affairs and are expected to familiarize themselves with the popular topics in news. They are advised to form small groups and discuss various topics which would bolster their efforts to successively participate in the group discussions.

4. Technical Interview:

The pre final round of the selection process is the technical interview. A student appearing for the technical round should be thorough with the fundamental aspects of his subject. While a student may not be expected to know the entire subject inside out, he or she is expected to be proficient in the basic aspects of the subject and able to present the subject in a well formatted manner to his interviewers. It would greatly benefit the students if they would have completed their projects on their own rather than plagiarizing (copying) from other sources. This would exhibit the ingenuity of a student and increase his chances of clearing the technical round. Students who have interned in good organizations have an edge above the others in the technical round as company internships are greatly valued by the recruiters.

5. HR Interview:

The HR interview is more of a two way process. A student is assessed for his communication, attitude, confidence, flexibility, enthusiasm, behavioral skills etc. The company HR will market their company through the HR round. A student should be confident, but not over confident in the HR round. He or she should be honest and polite in answering the questions and also ask questions to the company HR regarding basic policies, procedures and of course, the CTC. Many a time it is quite common for technically strong candidates to fail to get through the HR round. This may happen if the candidate has poor presentation skills, is overconfident or is rude or extremely timid in his or her attitude. Self-grooming is very important for a candidate to clear this round of the campus selection.

The recruitment process weighs heavily on the attitude of a candidate. A candidate should exhibit positive thinking, learnability, proper body language, confidence, clarity of thought, interpersonal skills, future goals etc. This segment has about 75% weightage.

Academic knowledge has a weightage of about 10%. This test the student's fundamental knowledge of the core subjects in his or her branch and also its practical use.

Communication skills carry a weightage of about 10%.

Preparing a good resume is equally important while bracing for the campus selection process. The resume is the first impression a recruiter has of the candidate. The resume should be prepared in such a way that it reflects a candidate's capabilities, his strengths, achievements and areas of interests. Hence sufficient efforts should go into preparing a good resume. For further reading, refer to 'Resume' section of this book.

Knowledge about current affairs and extra-curricular activities carry about 5% weightage. These areas should also be concentrated upon to increase the chances of making it through the campus interviews.

Thus, a thorough and systematic preparation in each of the areas mentioned above would go a long way in ensuring that a candidate gets through the right company.

QUANTITATIVE APTITUDE

NUMBER SYSTEM

CONCEPTS

In Hindu–Arabic system we use ten symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 called digits to represent any number. This is the decimal system where we use the digits 0 to 9. Here 0 is called *insignificant digit* where as 1, , 9 are called *significant digits*.

• Classification of Numbers:

Natural Numbers: The numbers 1, 2, 3, 4, 5, 6, which we use in counting are known as *natural numbers*. The set of all *natural numbers* can be represented by $N = \{1, 2, 3, 4, 5,\}$

Whole Numbers: If we include 0 among the natural numbers then the numbers 0, 1, 2, 3, 4, 5, . . . are called *whole numbers*. Hence, every natural number is a whole number. The set of *whole numbers* is represented by W .

Integers: All counting numbers and their negatives including zero are known as *integers*.

The set of integers can be represented by Z or I .

$Z = \{. -4, -3, -2, -1, 0, 1, 2, 3, 4,\}$

Every *natural number* is an *integer* but every *integer* is not *natural number*.

Positive Integers: The set $I^+ = \{1, 2, 3, 4,\}$ is the set of all positive integers. Positive integers and Natural numbers are synonyms.

Negative Integers: The set $I^- = \{. . . , -3, -2, -1\}$ is the set of all negative integers.

0 (zero) is neither positive nor negative.

Non Negative Integers: The set $\{0, 1, 2, 3, . . .\}$ is the set of all non negative integers.

Rational Numbers: The numbers of the form $\frac{p}{q}$, where p and q are integers, p is not divisible by q and $q \neq 0$, are known as *rational numbers*.

(or) Any number that can be written in fraction form is a *rational number*. This includes *integers*, *terminating decimals*, and *repeating decimals* as well as *fractions*.

e.g.: $\frac{3}{7}, \frac{5}{2}, -\frac{5}{9}, \frac{1}{2}, -\frac{3}{5}$ etc

The set of rational numbers is denoted by Q .

Irrational Numbers: Any real number that cannot be written in fraction form is an *irrational number*. Numbers which are both *non-terminating as well as non-repeating decimals* are called irrational numbers.

e.g.: Absolute value of $\frac{10}{3}, \frac{22}{7}, \sqrt{2}, \sqrt{3}, \sqrt{10} \dots$

Note: A *terminating decimal* will have a finite number of digits after the decimal point.

e.g.: $\frac{3}{4} = 0.75, \frac{5}{4} = 1.25, \frac{25}{16} = 1.5625$.

Repeating Decimals: A decimal number that has digits that repeat forever.

e.g.: $\frac{1}{3} = 0.333 \dots$ (here, 3 repeats forever.)

Non-Repeating Decimal: A decimal that neither *terminates* nor *repeats*.

e.g.: $\sqrt{2} = 1.4142135623 \dots$

Real Numbers: The rational and irrational numbers together are called *real numbers*.

e.g.: $\frac{13}{21}, \frac{2}{5}, \frac{-3}{7}, \frac{+4}{2}$ etc are real numbers.

The set of real numbers is denoted by R .

Even Numbers: Any integer that can be divided exactly by 2.

e.g.: 2, 6, 0, -8, -10, . . . are even numbers.

Odd Numbers: An integer that cannot be divided exactly by 2 is an Odd number.

e.g.: 1, 3, -5, -7, . . . are odd numbers.

Prime Numbers: A Prime Number can be divided evenly only by 1, or itself. And it must be a whole number greater than 1.

e.g.: Numbers 2, 3, 5, 7, 11, 13, 17, . . . are prime.

All primes which are greater than 3 are of the form $(6n+1)$ or $(6n-1)$.

Note:

- 1 is not a prime number.
- 2 is the least and only even prime number.
- 3 is the least odd prime number.
- Prime numbers up to 100 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.

There are 25 prime numbers up to 100.

Composite Number: Natural numbers greater than 1 which are not prime, are known as *composite numbers*. The number 1 is neither *prime* nor *composite*.

Two numbers which have only 1 as the common factor are called co–primes (or) relatively prime to each other.

e.g.: 3 and 5 are co primes.

Note:

Natural Numbers = 1 + Prime + Composite Numbers.

Whole Numbers = 0 (Zero) + Natural Numbers.

Integers = Negative Integers + 0 + Positive Integers.

Real Numbers = Rational + Irrational Numbers.

• Test of Divisibility:

Divisibility by 2: A number is divisible by 2 if the unit's digit is either zero or divisible by 2.

e.g.: Units digit of 76 is 6 which is divisible by 2 hence 76 is divisible by 2.

Units digit of 330 is 0 so it is divisible by 2.

Divisibility by 3: A number is divisible by 3 if sum of all digits in it is divisible by 3.

e.g.: The number 273 is divisible by 3 since $2 + 7 + 3 = 12$ which is divisible by 3.

Divisibility by 4: A number is divisible by 4, if the number formed by the last two digits in it is divisible by 4, or last two digits are zeros.

e.g.: The number 5004 is divisible by 4 since last two digits 04 is divisible by 4.

Divisibility by 5: A number is divisible by 5 if the units digit in the number is either 0 or 5.

e.g.: 375 is divisible by 5 as 5 is in the units place.

Divisibility by 6: A number is divisible by 6 if it is even and sum of all digits is divisible by 3.

e.g.: The number 6492 is divisible by 6 as it is even and sum of its digits $6 + 4 + 9 + 2 = 21$ is divisible by 3.

Divisibility by 7:

Step-1: Remove unit's digit. And double it.

Step-2: Subtract it from the rest of the number.

Step-3: Check whether the resulted number is divisible by 7 or not.

Step-4: Repeat the above steps until the resulted number is either 0 (zero) or divisible by 7.

e.g.: Consider the number 10717.

Step-1: Removing the unit's digit *i.e.* 7. Double of 7 = 14.

Step-2: $1071 - 14 = 1057$.

Step-3: Now remove 7 from 1057 and double it *i.e.* 14.

Step-4: $105 - 14 = 91$.

Step-5: Now remove 1 and double it *i.e.* 2.

Step-6: $9 - 2 = 7$

The final result 7 is divisible by 7. So the given number *i.e.* 10717 is also divisible by 7.

Divisibility by 8: A number is divisible by 8, if the number formed by last 3 digits is divisible by 8.

e.g.: The number 6573392 is divisible by 8 as the last 3 digits '392' is divisible by 8.

Divisibility by 9: A number is divisible by 9 if the sum of its digit is divisible by 9.

e.g.: The number 15606 is divisible by 9 as the sum of the digits $1 + 5 + 6 + 0 + 6 = 18$ is divisible by 9.

Divisibility by 10: Last digit should be zero.

e.g.: The last digit of 4470 is zero. So, it is divisible by 10.

Divisibility by 11: A number is divisible by 11 if the difference of the sum of the digits at *odd places* and sum of the digits at the *even places* is either zero or divisible by 11. **(or)** Subtract the first digit from a number made by the other digits. If that number is divisible by 11 then the original number is also divisible by 11.

e.g.: In the number 9823, the sum of the digits at odd places is $9 + 2 = 11$ and the sum of the digits at even places is $8 + 3 = 11$. The difference between them is $11 - 11 = 0$.

Hence, the given number is divisible by 11.

e.g.: 14641

$1464 - 1$ is 1463

$146 - 3$ is 143

$14 - 3 = 11$, which is divisible by 11, so 14641 is also divisible by 11.

• If a number 'N' is divisible by two numbers 'a' and 'b', where a, b are co primes, then 'N' is divisible by 'ab'.

Co-prime Numbers: Two numbers are co-prime to each other if they have 'no common factor except 1'.

Divisibility by 12: A number is divisible by 12 if it is divisible by 3 and 4.

e.g.: The number 1644 is divisible by 12 as it is divisible by 3 and 4. Here 3 and 4 because they are co-prime to each other.

Divisibility by 13: Iteratively add 4 times the last digit to the rest until you get a number divisible by 13.

e.g.: $7462 \Rightarrow 746 + (2 \times 4) = 754 \Rightarrow 75 + (4 \times 4) = 91$

91 is divisible by 13. So, 7462 is also divisible by 13.

Divisibility by 14: The number is divisible by 7 and 2.

Divisibility by 15: The number is divisible by 3 and 5.

Divisibility by 16:

With a 3 digit number: Multiply hundreds digit by 4, then add the last two digits.

e.g.: $352 \Rightarrow (3 \times 4) + 52 = 12 + 52 = 64$

64 is divisible by 16. So, 352 is also divisible by 16.

With a more than 3 digit number: The last four digits form a number is divisible by 16.

e.g.: $38512 \Rightarrow$ Here is 8512 is divisible by 16. So, 38512 is also divisible by 16.

Divisibility by 17:

Subtract 5 times the last digit from the rest.

e.g.: $3961 \Rightarrow 396 - (1 \times 5) = 391 \Rightarrow 39 - (1 \times 5) = 34$

34 is divisible by 17. So, 3961 is also divisible by 17.

Divisibility by 18: An even number satisfying the divisibility test by 9 is also divisible by 18.

e.g.: The number 80388 is divisible by 18 as it satisfies the divisibility test of 9.



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Divisibility by 19: Add twice the last digit to the rest.

e.g.: $10944 \Rightarrow 1094 + (4 \times 2) = 1102$

$\Rightarrow 110 + (2 \times 2) = 114 \Rightarrow 11 + (4 \times 2) = 11 + 8 = 19.$

Divisibility by 20: Last digit is zero & tens digit is even.

e.g.: 980; Last digit is zero. And tens digit is even.

Divisibility by 25: A number is divisible by 25 if the number formed by the last two digits is divisible by 25 or the last two digits are zero.

e.g.: The number 7975 is divisible by 25 as the last two digits are divisible by 25.

• **Common Factors:**

A common factor of two or more numbers is a number which divides each of them exactly.

e.g.: 3 is a common factor of 6 and 15.

▪ **Highest Common Factor (HCF):**

Highest common factor of two or more numbers is the greatest number that *divides each of them exactly*.

e.g.: 3, 4, 6, 12 are the factors of 12 and 36. Among them the greatest is 12. Hence the HCF of 12, 36 is 12.

HCF is also called as Greatest common divisor (GCD) or Greatest Common measure (GCM).

Method of Finding HCF: Method of division

▪ **HCF of Two Numbers:**

Step 1: Greater number is divided by the smaller number.

Step 2: Divisor of step-1 is divided by its remainder.

Step 3: Divisor of step-2 is divided by its remainder. This could be continued until the remainder is 0.

Then HCF = Divisor of the last step.

e.g.: Find the HCF of 96 and 348.

Explanation: Here the divisor of the last step is 12. So, HCF of 96 and 348 is 12.

$$\begin{array}{r} 96)348(3 \\ \underline{288} \\ 60)96(1 \\ \underline{60} \\ 36)60(1 \\ \underline{36} \\ 24)36(1 \\ \underline{24} \\ \longrightarrow 12)24(2 \\ \underline{24} \\ \underline{0} \end{array}$$

▪ **HCF of More than Two Numbers:**

Step 1: Take any two numbers as your wish and find their HCF.

Step 2: Now find the HCF of third number and HCF obtained for the previous two numbers.

Step 3: Now find the HCF of fourth number and HCF obtained in the previous step. Continue the same process till the last number. The final HCF is concluded to be the HCF of all the given numbers.

e.g.: Find the HCF of 120, 246, 100.

$$\begin{array}{r} 120)246(2 \\ \underline{240} \\ \longrightarrow 6)120(20 \\ \underline{120} \\ 0 \end{array}$$

6 is HCF of 120, 246. Now take 3rd number (*i.e.* 100) and HCF obtained in the above step (*i.e.* 6) and find HCF.

$$\begin{array}{r} 6)100(16 \\ \underline{96} \\ 4)6(1 \\ \underline{4} \\ \longrightarrow 2)4(2 \\ \underline{4} \\ 0 \end{array}$$

▪ **HCF of Decimals:**

e.g.: Find the HCF of 3.2, 4.12, 1.3, 7.

Explanation: First eliminate the influence of decimals by multiplying it either by 10 or 100 or 1000 etc. Here multiply the numbers with 100 to make all the numbers decimal free. *i.e.* 320, 412, 130, 700.

Now, find the HCF of above numbers. We get it as 2. Did you remember we multiplied all the numbers by 100 to eliminate the influence of decimals. Hence, now we divide the answer by 100 to get HCF of the original

numbers. The HCF is $\frac{2}{100} = 0.02$

▪ **LCM (Least Common Multiple):**

Least common multiple of two or more given numbers is the '*least or lowest number*' which is divisible by each of them exactly. In the sense without a non zero remainder.

Method of Finding LCM:

Step-1: Write numbers in a line separated by comma.

Step 2: Divide any two of the given numbers exactly with a least possible prime number then the quotients and the undivided numbers are written in the next line.

Step 3: Repeat the same process till all the numbers in the line are prime to each other *i.e.* no more common factors exist.

Conclusion: The product of all divisors and the numbers in the last line is the LCM of the numbers.

e.g.: Find the LCM of 14, 18, 24, 30.

2	14, 18, 24, 30
3	7, 9, 12, 15
	7, 3, 4, 5

The LCM of 14, 18, 24, 30 = $2 \times 3 \times 7 \times 3 \times 4 \times 5 = 2520$.

▪ **LCM of Decimals:** Let us observe an example.

Find the LCM of 1.6, 0.28, 3.2, 4.9.

Explanation: First eliminate the decimals by multiplying with either 10 or 100 or 1000 etc. In this case, multiply all the numbers with 100.

Then numbers will become 160, 28, 320, 490.

Now, find the LCM of the above numbers as earlier.

2	160, 28, 320, 490
2	80, 14, 160, 245
2	40, 7, 80, 245
2	20, 7, 40, 245
2	10, 7, 20, 245
5	5, 7, 10, 245
7	1, 7, 2, 49
	1, 1, 2, 7

LCM 160, 28, 320, 490 = $2 \times 2 \times 2 \times 2 \times 5 \times 7 \times 2 \times 7 = 15680$.

Did you remember, we have multiplied all the numbers by 100 to eliminate the influence of decimals. Hence, we divide the answer by 100 to get actual LCM of the given

numbers. So, the LCM is $\frac{15680}{100} = 156.80$

▪ **Finding LCM and HCF of Fractions:**

$$\text{LCM} = \frac{\text{LCM of the numbers in numerator}}{\text{HCF of the numbers in denominator}}$$

$$\text{HCF} = \frac{\text{HCF of the numbers in numerator}}{\text{LCM of the numbers in denominator}}$$

e.g.: Find the LCM of $\frac{2}{5}, \frac{81}{100}, \frac{125}{302}$.

Explanation: First find the 'LCM of the numerator'.

As there is no common number (prime) which can divide any two of the numbers hence the product itself is the LCM. i.e. LCM = $2 \times 81 \times 125 = 20250$.

Now find the 'HCF of the numbers in denominator'.

HCF of 5 and 100 is 5 and HCF of 5 and 302 is 1.

∴ LCM of the given fractions = $\frac{20250}{1} = 20250$

e.g.: Find the HCF of $\frac{4}{9}, \frac{10}{21}, \frac{20}{63}$

Explanation: HCF of numerators 4, 10 and 20 = 2.

LCM of denominators 9, 21 and 63 = 63.

HCF of the given fractions = $\frac{2}{63}$.

▪ **Key Points on LCM and HCF:**

1) HCF of fractions is always a fraction but LCM of fractions may be a fraction or an integer.

2) The product of any two numbers is equal to product of their LCM and HCF.

e.g.: What is LCM and HCF of 32 and 450 ?

a) 7200, 8 b) 7100, 2 c) 7800, 2 d) 7200, 2

Explanation: Product of 32 and 450 is 14400

The LCM of 32 and 450 is 7200.

The HCF of 32 and 450 is 2.

(or) You can verify from options.

Option-a: $7200 \times 8 \neq 32 \times 450$.

Option-b: $7100 \times 2 \neq 32 \times 450$.

Option-c: $7800 \times 2 \neq 32 \times 450$.

Option-d: $7200 \times 2 = 32 \times 450$.

3) To find the greatest number that will exactly divide x , y and z ; Required number = HCF of x , y , z .

4) To find the greatest number that will divide x , y and z leaving remainders a , b and c respectively.

Required number = HCF of $(x-a)$, $(y-b)$ and $(z-c)$.

5) To find the least number which is exactly divisible by x , y and z . Required number = LCM of x , y and z .

6) To find the least number which when divided by x , y , z leaves the remainders a , b , c respectively.

Then it is always observed that,

$(x-a) = (y-b) = (z-c) = K$ (Assume).

Required number = (LCM of x , y and z) - K .

7) To find the least number which when divided by x , y and z leaves the same remainder ' r ' in each case. Required number = (LCM of x , y and z) + r .

8) To find the greatest number that will divide x , y and z leaving the same remainder in each case,

If the value of remainder ' r ' is given, then

Required number = HCF of $(x-r)$, $(y-r)$ and $(z-r)$.

If the value of remainder is not given, then

Required number = HCF of $|x-y|$, $|y-z|$, $|z-x|$.

• **Complete Remainder:**

A remainder obtained by dividing a given number by the method of successive division is called complete remainder.

e.g.: A certain number when successively divided by 2, 3 and 5 leave remainders 1, 2 and 4 respectively. What is the complete remainder or remainder when the same number be divided by 30?

Explanation: For example, if a number when divided by 2, leaves remainder 1 would be of form = $2n + 1$.

And a number when divided by 3, leaves remainder 2 would be of form = $3n + 2$.

So, a number when successfully divided by 2, 3, 5 leaves remainder 1, 2, 4 would be of the form $= 2[3(5n+4)+2]+1 = 30n+29$.

When $(30n + 29)$ is divisible by 30, the remainder is 29.

- 1) When there are two divisors d_1, d_2 and two remainders r_1, r_2 the complete remainder is given by $d_1 r_2 + r_1$.
- 2) When there are three divisors d_1, d_2, d_3 and three remainders r_1, r_2, r_3 the complete remainder is given by $d_1 d_2 r_3 + d_1 r_2 + r_1$.
- 3) When there are four divisors d_1, d_2, d_3, d_4 and four remainders r_1, r_2, r_3, r_4 the complete remainder is given by $d_1 d_2 d_3 r_4 + d_1 d_2 r_3 + d_1 r_2 + r_1$.
- 4) In any case if there are no remainders consider them as zeros.

▪ Fractions and Ordering Fractions:

- 1) In the fraction $\frac{3}{4}$; bottom number (denominator) says how many parts the whole is divided into. The top number (the numerator) says how many parts we have.

$$2) \text{ Fraction} = \frac{\text{Numerator}}{\text{Denominator}}$$

Such a fraction is known as common fraction.

- 3) A fraction whose denominator is 10 or 100 or 1000 etc is called a decimal fraction.

- 4) Fractions whose denominators are same are called like fractions. For example, $\frac{3}{7}, \frac{5}{7}$ are like fractions.

- 5) Fractions whose denominators are different are called unlike fractions. For example, $\frac{3}{4}, \frac{5}{13}$.

- 6) When two fractions have the same denominator, the greater fraction is that which has greater numerator.

- 7) When two fractions have the same numerator, the greater fraction is that which has the smaller denominator.

- 8) If the identity is not possible, convert the fraction into the convenient form.

e.g.: Arrange $\frac{3}{5}, \frac{13}{16}, \frac{5}{7}, \frac{97}{104}$ in ascending order.

Explanation: LCM of 5, 16, 7, 104 is 7280.

Now multiply the numerator and denominator of the fractions with a number such that the denominator equals 7280.

$$\begin{aligned} \text{i.e. } & \frac{3 \times 1456}{5 \times 1456}, \frac{13 \times 455}{16 \times 455}, \frac{5 \times 1040}{7 \times 1040}, \frac{97 \times 70}{104 \times 70} \\ &= \frac{4368}{7280}, \frac{5915}{7280}, \frac{5200}{7280}, \frac{6790}{7280} \end{aligned}$$

Now compare the fractions.

$$\frac{4368}{7280} < \frac{5200}{7280} < \frac{5915}{7280} < \frac{6790}{7280}$$

The order is $\frac{3}{5} < \frac{5}{7} < \frac{13}{16} < \frac{97}{104}$.

- 9) To find a fraction that lies between the two fractions

$$\frac{a}{b} \text{ and } \frac{x}{y}, \text{ use the formula } \frac{a}{b} < \frac{a+x}{b+y} < \frac{x}{y}.$$

e.g.: Find three fractions between $\frac{1}{3}$ and $\frac{4}{5}$.

Explanation: $\frac{1}{3}, \left(\frac{1+4}{3+5}\right), \frac{4}{5} = \frac{1}{3}, \frac{5}{8}, \frac{4}{5}$

Now, find one fraction between $\frac{1}{3}$ and $\frac{5}{8}$ and one

fraction between $\frac{5}{8}$ and $\frac{4}{5}$.

$$\Rightarrow \frac{1}{3}, \left(\frac{1+5}{3+8}\right), \frac{5}{8}, \left(\frac{5+4}{8+5}\right), \frac{4}{5} \Rightarrow \frac{1}{3}, \frac{6}{11}, \frac{5}{8}, \frac{9}{13}, \frac{4}{5}$$

• Finding the Square Root:

Division Method: Let us take an example 64516.

$$\begin{array}{r} 2) \overline{6 \ 45 \ 16} \quad \underline{(2 \ 5 \ 4)} \\ \underline{4} \\ 45) \overline{245} \\ \underline{225} \\ 50 \ 4) \overline{20 \ 16} \\ \underline{2016} \\ 0 \end{array}$$

∴ Square root of 64516 is 254.

Let us observe the above working rule in words.

Step 1: Group the digits in pairs, starting with the digit in the units place.

Step 2: Think of the largest number whose square is equal to or just less than the first pair. Take this number as the divisor and also as the quotient.

In the given example, largest number whose square is near to 6 is 2 (i.e. $2^2 = 4$). So, 2 is the divisor and quotient.

Step 3: Subtract the product of the divisor and the quotient from the first pair and bring down the next pair to the right of the remainder. This becomes the new dividend.

Step 4: Double the quotient and put a blank for a number beside it (i.e. 4[?]). Now think of a largest number (for example 5) to fill in the blank in such a way that the product of a new divisor (i.e. 45) and this digit (i.e. 5) is equal to or less than new dividend (i.e. 245).

Step 5: Repeat steps (2), (3) and (4) till all the pairs have been taken up. Now, the quotient so obtained is the required square root of the given number.

Observe another example below.

Square Root of 119716 is 346.

Step 1: Group two digits as pairs. 11, 97, 16.

Step 2: Largest number whose square is near to the 11 is 3. Hence 3 is the divisor and also quotient.

$$\begin{array}{r} 3 \overline{) 11 \ 97 \ 16} \quad (3 \\ \underline{9} \end{array}$$

Step 3: Now 297 is the new dividend.

$$\begin{array}{r} 3 \overline{) 11 \ 97 \ 16} \quad (3 \\ \underline{9} \quad \quad \quad 2 \ 97 \end{array}$$

Step 4: Double the quotient 3 i.e. $3 \times 2 = 6$ and put a blank for a number beside 6 i.e. 6[?]. Now think of a largest number (for example 4) to fill in the blank in such a way that the product of a new divisor (i.e. 64) and this digit (i.e. 4) is less than or equal to new dividend (i.e. 297).

Step 5:

$$\begin{array}{r} \begin{array}{c} 3 \times 2 = 6 \\ \downarrow \end{array} \quad \begin{array}{r} 3 \overline{) 11 \ 97 \ 16} \quad (3 \underline{4} \ 6 \\ \underline{9} \quad \quad \quad 6 \ 4 \ 297 \\ \underline{256} \quad \quad \quad 68 \ 6 \ 4116 \\ \underline{4116} \quad \quad \quad \quad \quad \quad 0 \end{array} \quad \begin{array}{c} \downarrow \\ 34 \times 2 = 68 \end{array} \end{array}$$

For this type of questions, it is better to check from options in the exam.

• Key Points on Finding Square Root:

1. A number ending with 2, 3, 7, 8 cannot be a perfect square. The last digit of any perfect square must be any one among 0, 1, 4, 5, 6, 9.

2. A number ending with odd number of zeros can never be a perfect square. e.g.: 1000, 2000 etc.

3. The difference between squares of two consecutive numbers is always an odd number.

e.g.: $4^2 - 3^2 = 16 - 9 = 7$ (odd).

4. Finding square root of a decimal fraction:

First eliminate the decimal point by dividing and multiplying with even powers of 10 then find the square root of both numerator and denominator separately and then you can conclude the square root.

e.g.: Find the square root of 1190.25.

$$\sqrt{1190.25} = \sqrt{\frac{1190.25}{10^2} \times 10^2} = \frac{\sqrt{119025}}{10^2} = \frac{345}{10} = 34.5$$

• **Simplification:** In simplification we are supposed to follow the order which is essentially demanded by Mathematics and given by a common note of remembrance as VBODMAS.

V – Vinculum (bar \bar{x}),

B – Bracket () { },

O – of,

D – Division (\div),

M – Multiplication (\times),

A – Addition (+),

S – Subtraction ($-$).

Use of Algebraic Identities: The following algebraic identities will be useful in simplification.

1. $(a + b)^2 = a^2 + 2ab + b^2$

2. $(a - b)^2 = a^2 - 2ab + b^2$

3. $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$

4. $(a + b)^2 - (a - b)^2 = 4ab$

5. $a^2 - b^2 = (a + b)(a - b)$

6. $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 = a^3 + b^3 + 3ab(a + b)$

7. $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3 = a^3 - b^3 - 3ab(a - b)$

8. $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

9. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

8. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

10. $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

11. $a^4 - b^4 = (a^2 + b^2)(a^2 - b^2)$

• Number of Divisors of a Composite Number

If N is a composite number of the form $N = a^p b^q c^r \dots$

where a, b, c are primes, then the number of divisors of N is given by $(p+1)(q+1)(r+1) \dots$

e.g.: Let the number be 600.

$$\begin{array}{r} 2 \overline{) 600} \\ 2 \overline{) 300} \\ 2 \overline{) 150} \\ 3 \overline{) 75} \\ 5 \overline{) 25} \\ 5 \end{array}$$

$$600 = 2^3 \times 3^1 \times 5^2$$

\therefore Number of divisors of 600 = $(3+1)(1+1)(2+1) = 24$.

In these 24 divisors 1 and the number itself are also included. So, number of divisors of 600 excluding 1 and its self is $24 - 2 = 22$.

• Sum of Divisors of a Composite Number :

If N is a composite number of the form $a^p b^q c^r \dots$

Where a, b, c are primes, then the sum of the divisors, S_N

is given by $S_N = \frac{(a^{p+1}-1)(b^{q+1}-1)(c^{r+1}-1)}{(a-1)(b-1)(c-1)}$

e.g.: Let the number be 600. $600 = 2^3 \times 3^1 \times 5^2$

Sum of the divisors $S_N = \frac{(2^{3+1}-1)(3^{1+1}-1)(5^{2+1}-1)}{(2-1)(3-1)(5-1)}$

$$\Rightarrow \frac{(16-1)(9-1)(125-1)}{(1)(2)(4)} \Rightarrow \frac{(15) \times (8) \times (124)}{(1) \times (2) \times (4)} = 1860$$



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• Important Key Points:

1) Sum of natural numbers from 1 to $n = \frac{n(n+1)}{2}$.

2) Sum of squares of first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$.

3) Sum of cubes of first n natural numbers $\left[\frac{n(n+1)}{2} \right]^2$

4) Number of odd numbers from 1 to $n = \frac{\text{Last Odd Number} + 1}{2}$.

5) Number of even numbers from 1 to $n = \frac{\text{Last Even Number}}{2}$.

6) Sum of even numbers from 1 to n is $k(k+1)$, where k indicates number of even numbers from 1 to n .

e.g.: Sum of even no from 1 to 80 = $40(40+1) = 1640$.

Here from 1 to 80 there exists 40 even numbers.

7) Sum of odd numbers from 1 to $n = k^2$, where k is equal to number of odd numbers from 1 to n .

e.g.: Sum of odd numbers from 1 to 60 is $(30)^2 = 900$.

30 odd natural numbers exist from 1 to 60.

8) Sum of the squares of first ' n ' even natural numbers = $\frac{2}{3}(n)(n+1)(2n+1)$.

9) Sum of squares of first ' n ' odd natural numbers is $\frac{n(2n+1)(2n-1)}{3}$.

10) Sum of any 5 consecutive whole numbers will always be divisible by 5.

e.g.: $(3 + 4 + 5 + 6 + 7) = 25$ is divisible by 5.

11) $XY - YX$; The difference between a two digit number and its reverse is divisible 9.

e.g.: Let the two numbers be 95 and 59. Here 59 is reverse of 95. Now $95 - 59 = 36$ (which is divisible by 9).

12) **Products:** odd \times odd = odd;
odd \times even = even;
even \times even = even;

13) $n! = n(n-1)(n-2)(n-3) \dots (3)(2)(1)$.

e.g.: $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$.

The product of any ' r ' consecutive integers is divisible by $(r!)$

14) Finding the units digit of the numbers like $(252)^{54}$.

Here the units digit of 252 is 2 and the index is 54. We know that $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$. Here units digit is repeated after each 4 indices. So divide 54 by 4 to get the remainder. Here the remainder is 2.

Hence the last digit in $(252)^{54}$ is same as 2^2 i.e. 4.

CONCEPTUAL EXAMPLES

1) Find the sum of first 20 multiples of 12.

a) 1830 b) 2520 c) 3494 d) None

Explanation: Sum of first 20 multiples of 12 are
 $= (12 \times 1) + (12 \times 2) + (12 \times 3) + \dots + (12 \times 19) + (12 \times 20)$
 $= 12(1+2+3+\dots+20)$

Use the formula: $\frac{n(n+1)}{2} \Rightarrow \frac{12 \times (20 \times 21)}{2} = 2520$.

Ask doubt with Question Id: 1647

2) The smallest number which when added to 4, the sum is exactly divisible by 24, 36, 48 and 60 is:

a) 700 b) 716 c) 720 d) 730

Explanation:

2	24	36	48	60
2	12	18	24	30
3	6	9	12	15
2	2	3	4	5
	1	3	2	5

\therefore LCM of 24, 36, 48, 60 = $2 \times 2 \times 3 \times 2 \times 3 \times 2 \times 5 = 720$.

\therefore Required number = 716

Ask doubt with Question Id: 1648

3) Mr. Srinivas saves one coin of ₹5 on first day of the week, three coins of ₹5 on the second day of the week. Five coins of ₹5 on third day and so on. How much money will he has at the end of the week?

a) 78 b) 125 c) 245 d) 289

Explanation: Number of ₹5 coins with him at the end of week = $5 \times (1 + 3 + 5 + 7 + 9 + 11 + 13)$

$= 5 \times (\text{sum of first 7 odd numbers})$

(By using the formula discussed earlier).

\therefore Sum of all numbers = $5 \times 7^2 = 245$.

Ask doubt with Question Id: 1649

4) Number of divisors of 22050 except 1 and itself is.

a) 24 b) 28 c) 36 d) 52

Explanation:

2	22050
3	11025
3	3675
5	1225
5	245
7	49
	7

$\Rightarrow 22050 = 2^1 \times 3^2 \times 5^2 \times 7^2$

Using the formula discussed earlier,

\therefore Number of divisors = $(1+1)(2+1)(2+1)(2+1) = 54$

\therefore Number of divisors except 1 and itself = $54 - 2 = 52$.

Ask doubt with Question Id: 1650

5) $\sqrt{12+\sqrt{12+\sqrt{12+\dots}}}$ ∞ terms = ?

- a) 2 b) 3 c) 4 d) 5

Explanation: Let the given expression = x

Then, we can write $\sqrt{12+x} = x \Rightarrow 12+x = x^2$

$$\therefore x^2 - x - 12 = 0 \Rightarrow (x-4)(x+3) = 0$$

So, $x = +4$ (x cannot be negative since $\sqrt{12} = 3.46$).

Ask doubt with Question Id: 1651

6) A Mango seller saves two coins of ₹2 on first day of the week, four coins of ₹2 on the second day of the week. Six coins of ₹2 on third day and so on. The total amount saved by him at the end of the week is

- a) 246 b) 112 c) 88 d) None

Explanation: Number of ₹2 coins saved by him at the end of the week = $2 \times (2+4+6+8+10+12+14)$

Sum of first seven even numbers = $k(k+1) = 7 \times 8 = 56$

where k = number of even numbers.

Sum of the money with him = $56 \times 2 = ₹112$.

Ask doubt with Question Id: 1652

7) The sum of all the odd numbers starting from 1 and ending at the greatest number of three digits is.

- a) 500 b) 5000 c) 2500 d) 250000

Explanation: Greatest number of three digits = 999.

There are 500 odd numbers from 1 to 999.

\therefore Sum of first 500 odd numbers = $(500)^2 = 250000$.

Ask doubt with Question Id: 1653

8) What is the number whose eleventh part multiplied by its fifth part gives 2695.

- a) 385 b) 434 c) 560 d) 583

Explanation:

Let x be the required number. Then $\frac{x}{11} \times \frac{x}{5} = 2695$

$$x^2 = 11 \times 5 \times 2695 \Rightarrow x^2 = 11 \times 5 \times 5 \times 7 \times 7 \times 11 \Rightarrow x = 5 \times 7 \times 11 = 385$$

Alternate Method: To solve by options.

Ask doubt with Question Id: 1655

9) What least number must be added to the least number of six digits so that the resulting number may be a perfect square.

- a) 283 b) 344 c) 489 d) 523

Explanation: The least number of six digits = 100000

3	10 00 00	317
	9	
61	100	
	61	
627	3900	
	4389	
	- 489	

Least number to be added = 489.

Alternative method is to solve by options.

Ask doubt with Question Id: 1654

10) What is the least number of cut pieces of equal length that can be cut out of two lengths 10 meters 857 millimeters and 15 meters 87 millimeters.

- a) 78 b) 184 c) 232 d) None

Explanation: Here, you need to find the HCF. Because, to get least number of equal cut pieces you should cut as big as possible. So, HCF of 10857 and 15087 = 141. (This is the size of each cut piece). Then the number of cut pieces = $(10857 + 15087) \div 141 = 184$.

Ask doubt with Question Id: 1656

11) A certain number when successively divided by 3, 4 and 5 leaves remainders 1, 2 and 3 respectively. When the same number be divided by 4, what is the remainder?

- a) 3 b) 4 c) 5 d) 6

Explanation: Let p be the certain number and q, r, s are successive quotients upon successive division. Given,

$$\frac{p}{3} = q, \text{ Remainder } 1; \Rightarrow p = 3q + 1 \dots\dots\dots (I)$$

$$\frac{q}{4} = r, \text{ remainder } 2; \Rightarrow q = 4r + 2 \dots\dots\dots (II)$$

$$\frac{r}{5} = s, \text{ Remainder } 3; \Rightarrow r = 5s + 3 \dots\dots\dots (III)$$

$$\text{From (I) and (II), } p = 3(4r + 2) + 1 \Rightarrow p = 12r + 7 \dots\dots\dots (IV)$$

$$\text{From (IV) and (III), } p = 12(5s + 3) + 7 \Rightarrow p = 60s + 43.$$

Now question asked for remainder if p is divided by 4.

$$\text{i.e. } \frac{60s + 43}{4}.$$

Observe carefully when $60s$ is divided by 4, it leaves remainder 0, but when 43 is divided by 4 it leaves remainder 3.

So when $60s + 43$ is divided by 4 it leaves remainder 3.

Alternate Method-1:

So, a number when successfully divided by 3, 4, 5 leaves remainder 1, 2, 3 would be of the form = $3[4(5n+3)+2]+1 = 60n+43$.

Now, if $60n+43$ is divided by 4, the remainder is 3.

• **Alternate Method-2: Formula Approach.**

As discussed earlier, when there are three divisors d_1, d_2, d_3 and three remainders r_1, r_2, r_3 the complete remainder is given by $d_1 d_2 r_3 + d_1 r_2 + r_1$.

By applying above formula, we get,

$$(3)(4)(3) + (3)(2) + (1) = 36 + 6 + 1 = 43.$$

When 43 is divided by 4 the remainder is 3.

Ask doubt with Question Id: 1657

12) Find the greatest number of four digits which is perfectly divisible by 3 and when divided by 5, 7 and 9 leaves a remainder 3 in each case.

- a) 9985 b) 9960 c) 9768 d) 9660

Explanation: LCM of 3, 5, 7, 9 = 315.

Greatest number of four digits which is divisible by 315 is 9765. The required number = $9765 + 3 = 9768$.

Ask doubt with Question Id: 1658

13) Find greatest number of four digits which when increased by 3568 is exactly divisible by 6, 8, 12, 20.

- a) 9992 b) 9785 c) 9840 d) None

Explanation: Greatest number of 4 digits = 9999.

$9999 + 3568 = 13567$. LCM of 6, 8, 12 and 20 is 120.

120)13567(113

13560

7 The remainder is 7.

\therefore Required number of 4 digits = $9999 - 7 = 9992$

i.e. 9992 is the number to which if 3568 is added, then it is exactly divisible by 6, 8, 12, 20.

Ask doubt with Question Id: 1659

14) Find the greatest number which is such that when 794, 858 and 1351 are divided by it, the remainders are all same.

- a) 35 b) 21 c) 14 d) 1

Explanation: Given, the remainders are same i.e. differences of that numbers are exactly divisible.

Hence, you have to find HCF ($x-y$, $y-z$, $z-x$).

$858-794 = 64$; $1351-794 = 557$; $1351-858 = 493$.

HCF of (64, 557, 493) = 1.

Ask doubt with Question Id: 1660

15) Find the greatest number of five digits to which if 7143 is added, the final number becomes exactly divisible by 18, 24, 30, 32 and 36.

- a) 99846 b) 99682 c) 99417 d) None

Explanation: LCM of 18, 24, 30, 32 and 36 is 1440.

$99999 + 7143 = 107142$.

Dividing 107142 by 1440, the remainder is 582.

\therefore Required number = $99999 - 582 = 99417$

Alternate Method: Cross check with options.

Ask doubt with Question Id: 1662

16) Two numbers are in the ratio of 11:13. If the HCF of these numbers is 19, determine those numbers.

- a) 304, 369 b) 209, 247 c) 182, 199 d) None

Explanation: Let the numbers be $11x$ and $13x$.

Since the HCF of given numbers is 19 which indicates that 19 is the common factor of these two numbers. Hence, it is obvious that value of x is 19.

\therefore The numbers are 209 and 247 respectively.

Ask doubt with Question Id: 1665

17) Find the least number which when divided by 6, 9, 14, 21 and 24 leaves 1, 4, 9, 16 and 19 as remainders respectively, but when divided by 17 leaves no remainder.

- a) 2425 b) 1895 c) 1003 d) 944

Explanation: LCM of 6, 9, 14, 21 and 24 is 504.

Required number = $(504k-5)$ which is divisible by 17 for the least value of k .

$(504k-5) = (493k+11k-5) = (17 \times 29)k + (11k-5)$

Let $k=1 \Rightarrow (11 \times 1 - 5) = 6$ (not divisible by 17)

Let $k=2 \Rightarrow (11 \times 2 - 5) = 17$ (divisible by 17)

$\therefore (17 \times 29)k + (11k-5)$ is exactly divisible by 17 for $k=2$.

\therefore Required Number = $(504)k - 5 = (504 \times 2) - 5 = 1003$.

Ask doubt with Question Id: 1663

18) I collected some money by raising subscription for opening a society. If the whole amount collected by 720 currency notes of ₹1000 denomination and each person subscribed as many rupees as twice the number of subscribers. Then find the number of subscribers.

- a) 500 b) 550 c) 600 d) 650

Explanation: Total amount collected = $720 \times 1000 = 720000$.

Let there be x subscribers so that each paid ₹ $2x$.

Total amount collected = (Number of subscribers) \times (Amount paid by each subscriber).

$x \times 2x = 720000 \Rightarrow 2(x^2) = 720000 \Rightarrow x^2 = 360000 \Rightarrow x = 600$

Ask doubt with Question Id: 1664

19) 3 bells commence tolling together and toll at intervals of 4, 7 and 14 seconds respectively. At which of the following time they might toll together?

- a) 30 sec b) 78 sec c) 84 sec d) 92 sec

Explanation: Calculate LCM for time of tolling together.

LCM of 4, 7, 14 = 28 sec.

These 3 balls toll together after every 28 sec.

\therefore By checking with options, 84 is divisible by 28.

\therefore They will toll together at 84th sec.

Ask doubt with Question Id: 7699

20) What is the HCF of the fractions $\frac{6}{10}, \frac{9}{24}, \frac{15}{20}$.

- a) $\frac{1}{120}$ b) $\frac{4}{120}$ c) $\frac{120}{3}$ d) $\frac{3}{120}$

Explanation: HCF of fraction = $\frac{\text{HCF of numerator}}{\text{LCM of denominator}}$
$$= \frac{\text{HCF}(6, 9, 15)}{\text{LCM}(10, 24, 20)} = \frac{3}{120}$$

Ask doubt with Question Id: 7700



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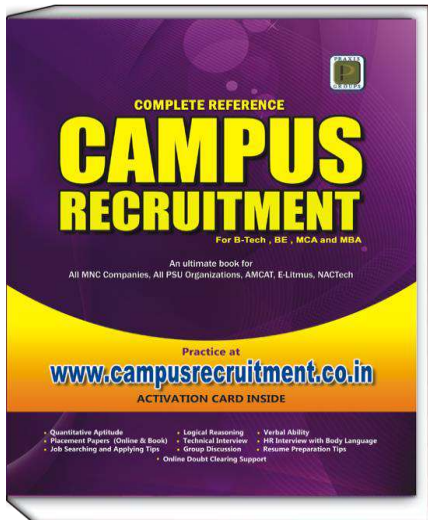
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EXERCISE

1) Find the greatest number of five digits which is a perfect square.

- a) 99225 b) 99856 c) Both a, b d) None

2) Simplify $\frac{17}{2} - \left[\frac{16}{5} \div \frac{9}{2} \text{ of } \frac{16}{3} + \left\{ 11 - \left(3 - \left(\frac{5}{4} - \frac{5}{8} \right) \right) \right\} \right]$

- a) $-\frac{11}{120}$ b) $-\frac{21}{120}$ c) $-\frac{31}{120}$ d) None

3) Find the LCM of the fractions $\frac{108}{375}, \frac{42}{25}, \frac{54}{55}$.

- a) $\frac{756}{5}$ b) $\frac{326}{5}$ c) $\frac{434}{5}$ d) $\frac{282}{5}$

4) Sum of three numbers is 132. First number is twice the second and third number is $\frac{1}{3}$ of the first. Find the second number.

- a) 12 b) 24 c) 36 d) 42

5) If $\sqrt{1+x} = \frac{13}{12}$ then the value of x is.

- a) $\frac{9}{144}$ b) $\frac{16}{144}$ c) $\frac{25}{144}$ d) $\frac{36}{144}$

6) Five bells begin to toll together and they toll at an interval of 36, 45, 72, 81 and 108 seconds. After what interval of time they will keep on tolling together?

- a) 3240 sec b) 3080 sec c) 3140 sec d) 3200 sec

7) The least perfect square number which is exactly divisible by 4, 6, 8, 10 or 12 is

- a) 9260 b) 7921 c) 5625 d) 3600

8) Each student in a class contributed as many paise as the number of students in the class, the teacher contributed ₹13, the total collection is of ₹ 49. How many students were there in the class?

- a) 48 b) 60 c) 72 d) None

9) The sum of square of two numbers is 80 and the square of their difference is 36. The product of the two numbers is.

- a) 22 b) 34 c) 42 d) 51

10) Find the greatest number that will divide 148, 246 and 623 leaving remainders 4, 6 and 11 respectively.

- a) 11 b) 12 c) 13 d) 14

11) Find the least number which when divided by 36, 48 and 64 leaves the remainders 25, 37 and 53 respectively

- a) 656 b) 563 c) 565 d) 657

12) $\sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}}$ = ?

- a) $3^{\frac{31}{64}}$ b) $3^{\frac{31}{32}}$ c) $3^{\frac{1}{64}}$ d) None

13) The HCF of two numbers is 16 and their LCM is 160.

If one number is 32, then other number is.

- a) 48 b) 80 c) 96 d) 112

14) Find the size of the largest square slabs which can be paved on the floor of a room 5 meters 44 cm long and 3 meters 74 cm broad.

- a) 56 b) 42 c) 38 d) 34

15) Least number that must be added to 8492 such that the resulting number may be divisible by 72 is.

- a) 68 b) 25 c) 11 d) 4

16) The LCM of two numbers is 1950 and their HCF is 65. If one of the number is 195, find the other number.

- a) 398 b) 650 c) 792 d) None

17) Find the greatest number that will divide 532, 894 and 1003 leaving remainders 22, 44 and 68 respectively.

- a) 85 b) 105 c) 90 d) 95

18) A biscuit dealer has 378 kgs, 434 kgs and 582 kgs of three different qualities of biscuits. He wants it all to be packed into boxes of equal size without mixing. Find the capacity of the largest possible box.

- a) 5 kg b) 3 kg c) 2 kg d) 1 kg

19) Find the least number which when divided by 35 leaves remainder 25, when divided by 25 leaves remainder 15, when divided by 15 leaves remainder 5.

- a) 420 b) 515 c) 435 d) 518

20) Find the least number which when increased by 4 is divisible by 21, 25, 27 and 35.

- a) 4721 b) 4725 c) 4758 d) 2418

21) The product of two numbers is 211428 and their LCM is 3356. Find their GCM?

- a) 72 b) 48 c) 36 d) 63

22) Find the least number for which when 5046 is divided or multiplied, becomes a perfect square.

- a) 25 b) 15 c) 10 d) 6

23) Find the smallest number between 450 to 550 which is exactly divisible by 7, 8 and 14.

- a) 454 b) 482 c) 504 d) 546

24) Three bells ring at an interval of 10, 12 and 14 seconds respectively. They ring together at 11:00 then at what time they ring together again.

- a) 12 hours 12 min 12 sec b) 11 hours 7 min
c) 11 hours 35 min d) 10 hours 45 min

25) Sum of 4 consecutive natural numbers each divisible by 5 is 130. What is the greatest number?

- a) 35 b) 40 c) 45 d) 50

26) The smallest number on being divided by 3, 4, 6, 10 and 16 leaves 9 as remainder in each case but is completely divisible by 9. What is that number?

- a) 720 b) 729 c) 846 d) None

14) 5 meters 44 cm = 544 cm;

3 meters 74 cm = 374 cm

The side of the square slab = HCF of 544, 374 = 34.

Ask doubt with Question Id: 1680

15) Divide 8492 by 72, the remainder is 68.

∴ Least number to be added = 72 – 68 = 4.

Ask doubt with Question Id: 1681

$$16) \frac{\text{HCF} \times \text{LCM}}{\text{Given number}} = \frac{65 \times 1950}{195} = 650$$

Ask doubt with Question Id: 1682

17) 532 – 22 = 510; 894 – 44 = 850; 1003 – 68 = 935;

HCF of 510 and 850 is 170. HCF of 170 and 935 is 85.

Ask doubt with Question Id: 1683

18) The capacity of the largest possible box =

HCF (378, 434, 582) = 2.

Ask doubt with Question Id: 1684

19) Here 35 – 25 = 25 – 15 = 15 – 5 = 10

Required number = (LCM of 35, 25, 15) – 10.

$$= 525 - 10 = 515.$$

Ask doubt with Question Id: 1685

20) LCM of 21, 25, 27, 35 = 4725

∴ Required number = 4725 – 4 = 4721.

Ask doubt with Question Id: 1686

21) GCM × LCM = Product of the two numbers

$$\text{GCM} = \frac{211428}{3356} = 63$$

Ask doubt with Question Id: 1687

22) 5046 = 6 × 29 × 29.

Hence 5046 must be multiplied or divided by 6 to make it a perfect square. If you multiply by 6 it becomes $(6 \times 29)^2$ which is a perfect square (or) if you divide by 6 it becomes $(29)^2$ which is also a perfect square.

Ask doubt with Question Id: 1688

23) We have to find the least common multiple of 7, 8, 14 that lies between 450 and 550.

2	7, 8, 14
7	7, 4, 7
	1, 4, 1

LCM of 7, 8, 14 = 56.

∴ Required number = 504 which is exactly divisible by 56.

Ask doubt with Question Id: 1690

24)

2	10, 12, 14
	5, 6, 7

∴ LCM = $2 \times 5 \times 6 \times 7 = 420$ sec = 7 minutes

i.e. They ring together again at 11 hours 7 min.

Ask doubt with Question Id: 1691

25) Let the 4 consecutive numbers divisible by 5 are

$x, x+5, x+10, x+15$.

$$\therefore x + (x+5) + (x+10) + (x+15) = 130 \Rightarrow x = 25$$

Largest number = $(x+15) = 25 + 15 = 40$.

Ask doubt with Question Id: 7701

26) LCM of 3, 4, 6, 10 and 16 = 240.

Hence the smallest number which when divided by 3, 4, 6, 10 and 16 leaves 9 as remainder in each case will be $240 + 9 = 249$.

But 249 is not completely divisible by 9.

Hence on considering $(240 \times 2 + 9), (240 \times 3 + 9) \dots$,

By trial and error we conclude that $240 \times 3 + 9 = 729$ is the required number.

Ask doubt with Question Id: 1666

27) There is a rule: When two numbers divided by a third number leaves the same remainder, the difference of the two numbers is also divisible by the third number.

$$\text{Difference} = 2880 - 2035 = 845 = 5 \times 169.$$

Hence, 169 is the required number of three digits.

Ask doubt with Question Id: 1661

28) ₹ 1 + ₹ 2 + ₹ 3 + + ₹ n = 36

$$\frac{n(n+1)}{2} = 36 \Rightarrow n^2 + n = 72 \Rightarrow n^2 + n - 72 = 0$$

$$n^2 + 9n - 8n - 72 = 0 \Rightarrow (n+9)(n-8) = 0$$

$$n = -9 \text{ (or) } n = 8$$

Days cannot be negative, hence $n = 8$.

Ask doubt with Question Id: 7702

29) A number is divisible by 8, if the number formed by last 3 digits of it is divisible by 8.

Last 3 digits of given number = 25#. From the given options only 256 is perfectly divisible by 8.

Ask doubt with Question Id: 7703

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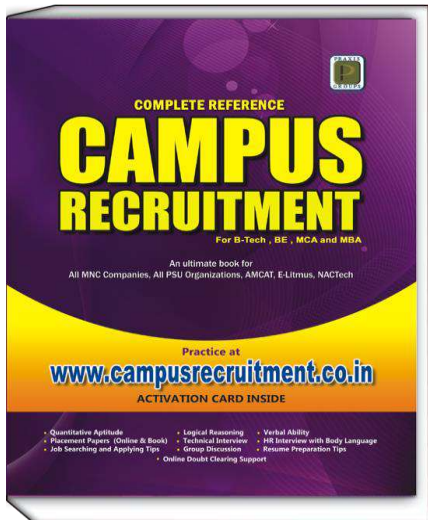
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RATIO – PROPORTION

CONCEPTS

Ratio: A ratio is the relation between two quantities which is expressed by a fraction.

• The ratio of the number 'a' to the number 'b' is written as $\frac{a}{b}$ (or) $a : b$ or a to b

e.g.: The ratio of 5 hours to 3 hours can be written as $\frac{5}{3}$ (or) 5:3.

• The ratio is always a comparison between the quantities of same kind or of same units.

For example, you cannot form the ratio between 5 hours and 3 days. Because the two numbers are expressed in different units. Hence, convert 3 days to hours.

i.e. 3 days = 72 hours. Thus the proper form of this ratio is $\frac{5}{72}$ (or) 5:72.

• Two quantities which are being compared ($a : b$) are called its terms. The first term (a) is called *antecedent* and second term (b) is called *consequent*.

• The ratio of two quantities is always an abstract number (without any units).

• If the terms of a ratio are multiplied or divided by the same quantity the value of the ratio remains unaltered.

e.g.: The ratio $a : b$ is same as $Ma : Mb$.

Proportion: Equality of two ratios is called proportion. Consider the two ratios, $a : b$ and $c : d$, then proportion is written as,

$$a : b :: c : d \text{ (or) } a : b = c : d \text{ (or) } \frac{a}{b} = \frac{c}{d}$$

Here a, b, c, d are called *Terms*. a, d are called *Extremes* (end terms) and b, c are called *Means* (middle terms).

e.g.: Since the ratio 4:20 (or) $\frac{4}{20}$ is equal to the ratio

$$1:5 \text{ (or) } \frac{1}{5} \text{ we may write the proportion as } 4 : 20 :: 1 : 5$$

$$\text{or } 4 : 20 = 1 : 5 \text{ or } \frac{4}{20} = \frac{1}{5}$$

• In a proportion, product of *means* (middle terms) is equal to product of *extremes* (end terms).

$$\text{i.e. } ad = bc \text{ or } \frac{a}{b} = \frac{c}{d}.$$

Key Notes: If a and b are two quantities, then

1) Duplicate ratio of $a : b = a^2 : b^2$

2) Sub-duplicate ratio of $a : b = \sqrt{a} : \sqrt{b}$

3) Triplicate ratio of $a : b = a^3 : b^3$

4) Sub-triplicate ratio $a : b = \sqrt[3]{a} : \sqrt[3]{b}$

5) Inverse or reciprocal ratio of $a : b = \frac{1}{a} : \frac{1}{b}$

6) Third proportional to a and b is $\frac{b^2}{a}$.

7) If $a : b = x : y$ and $b : c = p : q$, then

a) $a : c = \frac{x \times p}{y \times q}$

b) $a : b : c = px : py : qy$

8) Compound Ratio of $(a : b), (c : d), (e : f)$ is $\frac{a}{b} \times \frac{c}{d} \times \frac{e}{f}$.

9) The ratio in which two kinds of substances must be mixed together one at ₹ x per kg and another at ₹ y per kg, so that the mixture may cost ₹ n per kg. The ratio is $\frac{n-y}{x-n}$.

10) Let the incomes of two persons be in the ratio of $a : b$ and their expenditure be in the ratio of $x : y$ and if the savings of each person is ₹ n then income of each is

$$₹ \frac{an(y-x)}{ay-bx} \text{ and } ₹ \frac{bn(y-x)}{ay-bx} \text{ respectively.}$$

11) In a mixture the ratio of milk and water is $a : b$. In this mixture another n liters of water is added, then the ratio of milk and water in the resulting mixture became $a : m$. Then, the quantity of milk in the original mixture = $\frac{an}{m-b}$ and the quantity of water in the original

$$\text{mixture} = \frac{bn}{m-b}$$

12) In a mixture of n liters, the ratio of milk and water is $x : y$. If another m liters of water is added to the mixture, the ratio of milk and water in the resulting mixture = $xn : (yn + mx + my)$

13) If four numbers a, b, c and d are given then

a) $\frac{ad-bc}{(b+c)-(a+d)}$ should be added to each of these numbers so that the resulting numbers may be proportional.

b) $\frac{ad-bc}{(a+d)-(b+c)}$ should be subtracted from each of these numbers so that the resulting numbers may be proportional.



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CHAIN RULE / VARIATION

CONCEPTS

What is Chain Rule or Variation:

Variations deal with, how one quantity changes with respect to one or more other quantities. Basically there are two types of variations: Direct variation and Indirect variation.

Direct Variation: Suppose that a painter charges ₹100 to paint a room. The below table shows the relationship between the number of rooms painted and the cost of the total job for 1 through 5 rooms.

Number of Rooms	Cost of the Job
1	₹ 100
2	₹ 200
3	₹ 300
4	₹ 400
5	₹ 500

From the above table we observe that as the number of rooms *increase*, cost of the job also *increases* and vice versa. There is a *direct variation* between these two quantities. It means these two quantities are *directly proportional* to each other.

• If the two quantities 'x' and 'y' are directly proportional to each other, then $x = k y$ (or) $\frac{x_1}{x_2} = \frac{y_1}{y_2}$.

e.g.: If 5 computers costs ₹ 275, how much would 18 computers cost?

Explanation: More number of computers : More cost

Less number of computers : Less cost

The two quantities, *computers* and *cost* are directly proportional to each other.

$$\begin{array}{cc} \text{Computers} & \text{Cost} \\ 5 (x_1) & 275 (y_1) \\ 18 (x_2) & ? (y_2) \end{array}$$

$$\frac{x_1}{x_2} = \frac{y_1}{y_2} \Rightarrow \frac{5}{18} = \frac{275}{x} \Rightarrow x = 990.$$

$$\text{(or)} x = k y \Rightarrow 5 = 275 k \Rightarrow k = \frac{1}{55}$$

$$18 = k y \Rightarrow 18 = \frac{1}{55} y \Rightarrow y = 990.$$

Indirect Variation: When two variables or quantities change in opposite directions, you have inverse variation.

The below table shows the relationship between the number of persons and number of days required to complete a work.

Persons	Days
1	120
2	60
3	20
4	5
5	1

If the number of persons *increase*, the days required to complete the work will *decrease*. There is an *indirect variation* between these two quantities. It means these two quantities are *inversely proportional* to each other.

• If the two quantities *x*, *y* are indirectly proportional to each other, then $x = \frac{k}{y}$ (or) $\frac{x_1}{x_2} = \frac{y_2}{y_1}$.

e.g.: There are 6 workers to paint a house. They typically paint the house in 8 hours. If 4 workers are not came to work today, how long will it take the remaining workers to paint the house.

Explanation: If there are *more workers*, it takes *less days* to complete the work. These two quantities are indirectly proportional each other.

$$\begin{array}{cc} \text{Workers} & \text{Hours} \\ 6 (x_1) & 8 (y_1) \\ 2 (x_2) & ? (y_2) \end{array}$$

$$\frac{x_1}{x_2} = \frac{y_2}{y_1} \Rightarrow \frac{6}{2} = \frac{x}{8} \Rightarrow x = 24.$$

Combined Variation:

It involves both direct and indirect variation.

• If 'x' varies directly with 'y' and indirectly with 'z', then the general form of the combined variation is

$$x = k \frac{y}{z} \text{ or } \frac{x_1}{x_2} = \frac{y_1}{y_2} \times \frac{z_2}{z_1}.$$

e.g.: If 300 men can complete a work in 16 days, how many men would do $\frac{1}{5}$ of the work in 15 days?

Explanation:

Men	Work	Days
300 (x_1)	1 (y_1)	16 (z_1)
x (x_2)	$\frac{1}{5}$ (y_2)	15 (z_2)

Compare *men* with *work* and *days*.

More men can do *more work*. (Direct Variation)

If there are *more men*, it takes *less days* to complete the work. (Indirect Variation)

Hence, It is a Combined Variation: $\frac{x_1}{x_2} = \frac{y_1}{y_2} \times \frac{z_2}{z_1}$.

$$\frac{300}{x} = \frac{1}{1/5} \times \frac{15}{16} \Rightarrow \frac{4}{x} = \frac{1}{16} \Rightarrow x = 64.$$

CONCEPTUAL EXAMPLES

1) 20 men complete one-fourth of a piece of work in 10 days. How many more men should be employed to finish the remaining work in 15 more days?

- a) 32 b) 40 c) 20 d) 12

Explanation:

$$\text{Work done} = \frac{1}{4}; \quad \text{Work to be done} = 1 - \frac{1}{4} = \frac{3}{4}$$

Let the required number of men = x

Work	Days	Men
$\frac{1}{4}$	10	20
$\frac{3}{4}$	15	x

Compare *men* with *work* and *days*.

Men and *work* are directly proportional.

Men and *days* are indirectly proportional.

$$\text{It is a combined variation. i.e. } \frac{20}{x} = \frac{1/4}{3/4} \times \frac{15}{10} \Rightarrow x = 40$$

Total 40 men. Given that, 20 men are already employed, hence 20 more men are required.

Ask doubt with Question Id: 1355

2) If 5 examiners can examine a certain number of answer books in 6 days by working 4 hours a day; for how many hours a day would 6 examiners have to work in order to examine thrice the number of answer books in 10 days?

- a) 4 b) 6 c) 8 d) 10

Explanation:

Books	Days	Examiners	Hours
1	6	5	4
3	10	6	x

Compare *hours* with *Books*, *Days* and *Examiners*.

If there are more *Books*, it takes more *hours* to correct them (*Direct Variation*).

If there are more *Examiners*, it takes less *hours* for them to complete the correction. (*Indirect variation*)

If there are more *Days*, less *hours* per day are required to complete the work. (*Indirect Variation*)

$$\frac{4}{x} = \frac{1}{3} \times \frac{10}{6} \times \frac{6}{5} \Rightarrow x = 6.$$

Alternative method:

Let the number of answer books = $5 \times 4 \times 6$.

Examiner hours days = 120

Thrice = $120 \times 3 = 360$

$$\therefore 360 = 6 \times 10 \times x \Rightarrow x = \frac{360}{60} = 6$$

Ask doubt with Question Id: 1356

3) 3 men and 4 women earn ₹ 264 in 8 days. 2 men and 3 women earn ₹ 184 in the same specified time. In how many days 6 men and 7 women will earn ₹ 315?

- a) 4 b) 5 c) 6 d) 7

Explanation: The time of their earning is same.

\therefore The ratio of both these terms will be equal.

$$\frac{3 \text{ men} + 4 \text{ women}}{2 \text{ men} + 3 \text{ women}} = \frac{264}{184} \Rightarrow 3 \text{ men} = 7 \text{ women}$$

3 men + 4 women = 11 women

6 men + 7 women = 21 women

Women	Earning	Days
11	264	8
21	315	x

Days \leftrightarrow Women (Indirect Variation)

Days \leftrightarrow Earning (Direct Variation)

$$\frac{8}{x} = \frac{21}{11} \times \frac{264}{315} \Rightarrow x = 5$$

Ask doubt with Question Id: 1357

EXERCISE

1) If the cost of 46 apples is ₹ 391. Then find the cost of 7 dozen of apples ?

- a) ₹714 b) ₹821 c) ₹687 d) ₹736 e) ₹724

2) If 8 men working 9 hours per day can complete a work in 32 days. Then 12 men working 8 hours per day, require how many days to complete the work?

- a) 18 b) 22 c) 36 d) 24 e) 28

3) 25 workers construct 25 houses in 25 days. Find one worker construct one house in how many days?

- a) 12.5 b) 25 c) 5 d) 1 e) 50

4) 6 men or 9 women can do a piece of work in 30 days. Then find in how many days 10 men and 12 women can do the work?

- a) 9 b) 16 c) 12 d) 15 e) 10

5) 12 clerks can clear 600 files in 20 days. Then how many clerks are required to complete 400 files in 10 days?

- a) 14 b) 12 c) 16 d) 15 e) 18

6) The cost of 12 cartons of each weighs $4\frac{1}{2}$ kg of chocolates is ₹10800. Then find the cost of 20 chocolate cartons weighing 5 kg each?

- a) ₹19600 b) ₹18400 c) ₹16800 d) ₹20000 e) ₹18000

7) 4 men can reap 40 hectares in 12 days, then how many hectares, 24 men reap in 20 days?

- a) 400 hectares b) 360 hectares c) 320 hectares
d) 380 hectares e) 420 hectares

8) 8 rail engines consume 12 tons of coal when each engine is running 6 hours a day. 12 rail engines running at 9 hours a day will consume how many tons of coal?

- a) 27 b) 20 c) 25 d) 30 e) 50



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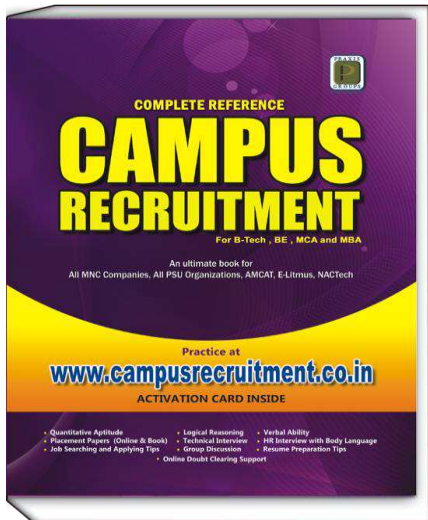
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PERCENTAGES

CONCEPTS

A percentage is a way of expressing a number as a fraction of 100. The word 'per cent' or 'percentage' means for every one hundred. In other words, it gives rate of a parameter per hundred. It is denoted by the symbol %.

e.g.: 30% means 30 out of one hundred or $\frac{30}{100}$.

Key Notes:

- To convert a percent into a fraction, divide by 100.

e.g.: $20\% = \frac{20}{100} = \frac{1}{5}$

- To convert a fraction into a percent, multiply by 100.

e.g.: $\frac{3}{4} = \frac{3}{4} \times 100 = 75\%$

- To write a decimal as a percent we move the decimal point two places to the right and put the % sign.

e.g.: $0.35 = \frac{35}{100} = 35\%$

- Conversely to write a percent as a decimal, we drop the % sign and insert or move the decimal point two places to the left.

e.g.: $43\% = 0.43$; $12\% = 0.12$.

Calculating a Percentage:

$$\text{Percentage} = \left(\frac{\text{Value}}{\text{Total}} \right) \times 100.$$

For example, if you obtained 18 marks out of 25 marks, what was your percentage of marks?

Explanation: Total marks = 25. Marks obtained = 18.

\therefore Percentage of marks obtained = $\frac{18}{25} \times 100 = 72\%$.

Calculating Percentage Increase or Decrease:

- % Increase :**

$$\text{New value} = (1 + \text{Increase \%}) \times (\text{Original Value})$$

- % Decrease :**

$$\text{New value} = (1 - \text{Decrease \%}) \times (\text{Original Value})$$

e.g.: If a book costs ₹ 80 and few months later it was offered at a 30% discount. How much does the book cost now?

Explanation:

$$\text{New Amount} = \left(1 - \frac{30}{100} \right) \times 80 = 0.70 \times 80 = 56$$

- Calculating Percent Change:**

Percentage change refers to the relative percent change of an increase or decrease in the original amount.

$$\text{Percent} = \frac{\text{Change}}{\text{Original Value}} \times 100$$

e.g.: If a book costs ₹80 and few months later it was offered at a price of ₹64. What was the discount percentage on that book?

Explanation: Change = $80 - 64 = 16$. Original Value = 80.

$$\text{Discount Percentage} = \frac{16}{80} \times 100 = \frac{1}{5} \times 100 = 20\%$$

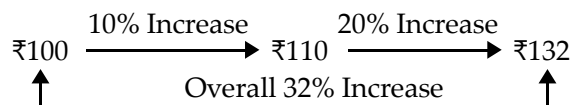
Calculating Successive Percentages:

- If a number is successively increased by $x\%$ and $y\%$ then a single equivalent increase in that number will be

$$\left(x + y + \frac{xy}{100} \right) \%$$

e.g.: The price of an article is successively increased by 10% and 20%. What is the overall percent increase in the price of the article.

Explanation:



(or) By using formula:

$$= \left(x + y + \frac{xy}{100} \right) \% = \left(10 + 20 + \frac{(10)(20)}{100} \right) \% = 30 + 2 = 32\%.$$

- If there's an increase and a decrease, in that case, the decrease will be considered a negative value.

e.g.: If there is an increase of 20% and then a decrease of 10% on the price of a commodity, the successive percentage will be

$$20 + (-10) + \frac{20 \times (-10)}{100} = 20 - 10 - 2 = 8\% \text{ increase.}$$

- In case of discounts, the value of discount percentages will be considered negative.

e.g.: If a shop keeper give 20% and 10% discounts on a festival day, the final discount given by shopkeeper is

$$(-20) + (-10) + \frac{(-20)(-10)}{100} = -100 + 25 = 75\% \text{ discount.}$$

- If there are three discounts as $x\%$, $y\%$ and $z\%$ then first find the total discount of $x\%$ and $y\%$ and using it find the total discount with $z\%$.

- If the price of commodity increases by $x\%$, the percentage should a family reduce its consumption so as not to increase the expenditure on the commodity =

$$\frac{x}{100 + x} \times 100.$$

- If the price of commodity decreases by $x\%$, the percentage should a family increase its consumption so as not to decrease the expenditure on the commodity =

$$\frac{x}{100 - x} \times 100.$$

- Let the present population of a town is P. If it increases at the rate of R% per annum, then:

$$\text{Population after 'n' years} = P \left(1 + \frac{R}{100} \right)^n$$

$$\text{Population 'n' years ago} = \frac{P}{\left(1 + \frac{R}{100} \right)^n}$$

Note:

- There are no units for percentage.
- 0.2 of a work means 20% of the work, vice-versa.
50% of work means 0.5 of a work.
- If A is 20% more than B means, A=120 if B=100.
- If A is 20% less than B means, A=80 if B=100.
- Take 100 as standard value, it will be easy to perform calculations on 100.
- For most of the percentage questions, assume any value and solve. No need to apply formulas, common sense is enough.

Shortcut ways to calculate percentages:

- To calculate 10% of any number, just move one decimal place to the left.

e.g.: 10% of 150 = 15.0 = 15.

$$40\% \text{ of } 150 = (4 \times 10\%) \text{ of } 150 = 4 \times 15 = 60.$$

- To calculate 1% of any number, just move two decimal places to the left. (i.e. 1% of 150 = 1.50)

$$3.5\% = \text{half of } 10\%. \text{ (i.e. } 5\% \text{ of } 150 = \frac{15}{2} = 7.5)$$

$$4.15\% \text{ of a number} = 10\% + 5\% \text{ of the number.}$$

$$5.20\% \text{ of a number} = 2 \times 10\% \text{ or divide the given number by } 5.$$

$$\text{e.g.: } 20\% \text{ of } 150 = 2 \times 15 = 30 \text{ (or) } \frac{150}{5} = 30.$$

$$6.25\% \text{ of a number} = \text{Divide the given number by } 4.$$

$$\text{e.g.: } 25\% \text{ of } 160 = \frac{160}{4} = 40.$$

$$7.50\% \text{ of a number} = \text{Divide the given number by } 2.$$

$$8.75\% \text{ of a number} = (50\% + 25\%) \text{ or } \frac{3}{4} \text{ of given number}$$

$$\text{e.g.: } 75\% \text{ of } 160 = 80 + 40 = 120 \text{ (or) } \frac{3}{4} \times 160 = 120.$$

Similarly you can calculate percentage value for any value very quickly.

CONCEPTUAL EXAMPLES

1) A reduction of 25% in the tax resulted in increase of 30% in the daily attendance in a theater. The total daily collection will be?

- a) $2\frac{1}{2}\%$ more b) Same c) 5% less d) $2\frac{1}{2}\%$ less

Explanation: Let cost of ticket be ₹ 100.

Let the attendance be 100 members.

$$\text{Total daily collection} = ₹ 100 \times 100 = ₹ 10000$$

Ticket rate is reduced by 25% and attendance increased by 30%.

$$\text{So, new ticket rate} = 75 \text{ and attendance} = 130.$$

$$\text{Total daily collection} = ₹ 75 \times 130 = ₹ 9750$$

$$\text{Decrease in collection} = 10000 - 9750 = 250$$

$$\text{Percentage Decrease} = \frac{250}{10000} \times 100 = 2.5 = 2\frac{1}{2}\%$$

Option-d is the correct answer.

Ask doubt with Question Id: 1383

2) The population of a town is 30000. During first year the population increased by 15%. During second year the population increased by 10%. During third year the population increased by 10%. Find the population after 3 years.

- a) 32800 b) 41745 c) 54895 d) None

Explanation: The population after 3 years

$$= 30000 \left(1 + \frac{15}{100} \right) \left(1 + \frac{10}{100} \right) \left(1 + \frac{10}{100} \right)$$

$$= 30000 \times \frac{115}{100} \times \frac{110}{100} \times \frac{110}{100} = 41745$$

Ask doubt with Question Id: 1385

3) The population of a city increased by 20% in the first year and decreased by 25% in the second year. If the present population is 54000, population before two years is.

- a) 55000 b) 57500 c) 60000 d) 62500

Explanation: Let the population before two years = x.

$$\text{Present population} = 54000.$$

$$\frac{120}{100} \times \frac{75}{100} \times x = 54000 \Rightarrow \frac{54000 \times 10}{9} = 60000$$

Ask doubt with Question Id: 1384

4) In an examination a student who secured 28% marks failed by 60 marks and another student who secured 32% marks got 8 marks more than necessary to pass. What is the percentage of marks required to pass?

- a) 42.5 b) 31.53 c) 28.5 d) 15



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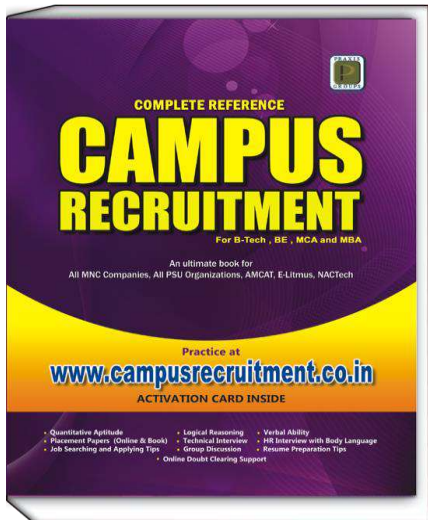
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TIME AND WORK

CONCEPTS	CONCEPTUAL EXAMPLES
<p>1) If a person completes a piece of work in 'n' days, then work done by that person in one day = $\frac{1}{n}$th part of the work.</p> <p>2) If a person completes $\frac{1}{n}$th part of the work in one day, then the person will take 'n' days to complete the work.</p> <p>3) The total work to be done is usually considered as one unit.</p> <p>4) If M_1 persons can do W_1 work in D_1 days and M_2 persons can do W_2 work in D_2 days then $M_1 D_1 W_2 = M_2 D_2 W_1$.</p> <p>5) If M_1 persons can do W_1 work in D_1 days working T_1 hours per day and M_2 persons can do W_2 work in D_2 days working T_2 hours per day then $M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$.</p> <p>6) If A can do a piece of work in 'x' days and B can do it in 'y' days then A and B working together will do the same work in $\frac{xy}{(x+y)}$ days.</p> <p>7) If A, B and C can do a piece of work in x, y and z days respectively then all of them working together can finish the work in $\frac{xyz}{(xy+yz+zx)}$ days.</p> <p>8) If A is thrice as good a workman as B then, Ratio of work done by A and $B = 3 : 1$. Ratio of times taken by A and B to finish a work = $1 : 3$.</p> <p>9) If A is 'k' times efficient than B and is therefore able to finish a work in 'n' days less than B, then</p> <p>a) A and B working together can finish the work in $\frac{kn}{k^2-1}$ days.</p> <p>b) A working alone can finish the work in $\frac{n}{k-1}$ days.</p> <p>c) B working alone can finish the work in $\frac{kn}{k-1}$ days.</p> <p>10) If A, working alone takes a days more than A and B working together. B alone takes b days more than A and B working together. Then the number of days taken by A and B working together to finish the job is \sqrt{ab}.</p>	<p>1) A is twice as good a workman as B and takes 10 days less to do a piece of work than B takes. Find the time in which B alone can complete the work. a) 22 days b) 25 days c) 23 days d) 20 days Explanation: Let B alone takes 'x' days to complete the work. A is twice as good workman as B. It means A takes $\frac{x}{2}$ days to complete the work. From the given information we can write $x - \frac{x}{2} = 10$ $\Rightarrow \frac{2x-x}{2} = 10 \Rightarrow \frac{x}{2} = 10 \Rightarrow x = 20$.</p> <p>Alternate Method: Using Formula. Here, $k = 2$ and $n = 10$ \therefore Time taken by B working alone to complete the work = $\frac{kn}{k-1}$ days $\Rightarrow \frac{2 \times 10}{2-1} = 20$ days.</p> <p>Ask doubt with Question Id: 1179</p> <p>2) 25 men can reap a field in 20 days. When should 15 men leave the work, if the whole field is to be reaped in $37\frac{1}{2}$ days after they leave the work. a) 5 days b) 4 days c) 3 days d) $4\frac{1}{2}$ days Explanation: 25 men can reap the field in 20 days. \Rightarrow 1 man can reap that field in 25×20 i.e. 500 days. Let 15 men leave the work after x days so that remaining 10 men can complete the work in $37\frac{1}{2}$ days. It means 25 men have worked for x days and 10 men have worked for $37\frac{1}{2}$ days. $\therefore 25x + 10 \times 37\frac{1}{2} = 500 \Rightarrow 25x = 500 - 375 = 125$ (or) $x = 5$ \therefore 15 men must leave the work after 5 days.</p> <p>Ask doubt with Question Id: 1180</p> <p>3) A man is paid ₹30 for each day he works, and forfeits ₹5 for each day he is idle. At the end of 60 days he gets ₹50. Then, he was idle for _____ days. a) 20 b) 25 c) 30 d) 50 Explanation: Suppose, the man was idle for x days. $\therefore 30(60-x) - 5x = 50 \Rightarrow x = 50$</p> <p>Ask doubt with Question Id: 1181</p> <p>4) 12 men or 15 women can do a work in 20 days. In how many days 7 men and 5 women would complete the work? a) 21.8 b) 22.8 c) 25.3 d) 29 Explanation: <i>or</i> means either men or women. <i>and</i> means both men and women. 12 men or 15 women \Rightarrow 12 men = 15 women \Rightarrow 4 men = 5 women.</p>



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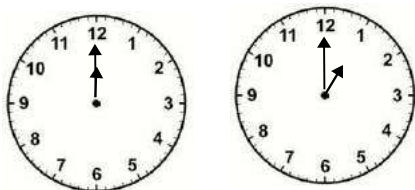
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CLOCKS

CONCEPTS

- 1) 60 minute space traces an angle of 360° .
 \therefore 1 minute space traverses an angle of 6° .
- 2) In 1 hour:
 Minute hand traverses 60 minute space or 360° .
 Hour hand traverses 5 minute space or 30° .
- 3) The minute hand travels 90° in 15 minutes.
- 4) The hands of the clock are in straight line when they coincide (or) when they are opposite to each other.
- 5) The hands of the clock are perpendicular to each other for 22 times in 12 hours and for 44 times in day.
- 6) The hands of the clock are opposite to each other for 11 times in 12 hours and 22 times in a day.
- 7) The hands of the clock coincides with each other for 11 times in 12 hours and 22 times per day.
- 8) The hands of the clock are 44 times in a straight line per day.
- 9) 55 minute spaces are gained by minute hand in 60 minutes period.



To find how many minute spaces it has actually gained, let us assume a standard point where the both minute hand and hour hand coincides. After 60 minutes, minute hand moves 60 minute spaces and hour hand moves 5 minute spaces. Now there are 55 minute spaces between minute hand and hour hand. So we can say in 60 minutes of time, minute hand leads/gains hour hand by 55 minute spaces.

10) Angle Concept: To find angle between hour hand and minute hand use the below formula.

$$\theta = \frac{11}{2}m - 30h \quad \left(\text{if } \frac{11}{2}m > 30h \right) \quad (\text{or})$$

$$\theta = 30h - \frac{11}{2}m \quad \left(\text{if } 30h > \frac{11}{2}m \right)$$

e.g.: At what time between 2 O'clock and 3 O'clock the hands of the clock be together.

Explanation: At 2 O'clock the minute hand is at 12 and hour hand is at 2. They are 10 minute spaces apart. To be together, minute hand must gain 10 minute spaces over hour hand.

55 minutes are gained in 60 minutes.

10 minutes are gained in x minutes.

$$\text{i.e. } x = \frac{10 \times 60}{55} = 10\frac{10}{11} \text{ minutes after 2 O'clock the}$$

two hands of a clock will be together.

Alternate Method: Hands of the clock are together. It means the angle between minute hand and hour hand is zero.

$$\theta = \frac{11}{2}m - 30h \Rightarrow \frac{11}{2}m - (30 \times 2) = 0$$

$$\frac{11}{2}m = 60 \Rightarrow m = \frac{120}{11} = 10\frac{10}{11}$$

e.g.: At what time between 2 O'clock and 3 O'clock the hands of the clock are opposite to each other.

- a) $3\left(\frac{6}{11}\right)$ past 2 O'clock b) $43\left(\frac{7}{11}\right)$ past 2 O'clock
 c) $56\left(\frac{8}{11}\right)$ past 2 O'clock d) $64\left(\frac{9}{11}\right)$ past 2 O'clock



Explanation:

To coincide minutes hand with the hour hand, first it should trace 10 minute spaces. And then the hands of the clocks to be opposite to each other minute hand should trace 30 minute spaces *i.e.* totally it should gain $10 + 30 = 40$ minute spaces to be opposite to hour hand.

55 minutes are gained in 60 minutes.

40 minutes are gained in x minutes.

$$x = 40 \times \left(\frac{60}{55}\right) = 43\left(\frac{7}{11}\right)$$

Hence the hands of the clock will be opposite to each other at $43\left(\frac{7}{11}\right)$ past 2 O'clock.

Therefore, option-b is correct.

• **When clock is too fast, too slow:**

1) If a clock indicates 6 hours 10 mins when the correct time is 6, it is said that the clock is 10 minutes too fast.

2) If it indicates 6.40 when the correct time is 7, it is said to be 20 minutes too slow.

e.g.: My watch, which gains uniformly, is 2 minutes behind when shown at noon on Sunday. And it is 4 min 48 seconds fast at 2 pm on the following Sunday. When was it correct?

Explanation: From Sunday noon to the following Sunday at 2 pm there are 7 days 2 hours. (or) 170 hours.

The watch gains $\left(2 + 4\frac{4}{5}\right) = 6\frac{4}{5} \text{ min}$ in 170 hours.

To show the correct time, the clock has to gain 2 minutes initially.



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PROFIT AND LOSS

CONCEPTS

Cost Price (CP) is the price at which an article is bought.

Selling Price (SP) is the price at which an article is sold.

Marked Price (MP) or List Price is the price marked on the article. For example, a vendor buys 1kg of mangoes for ₹50. He labeled the price as ₹80. But sold for ₹70. Here CP = ₹50, MP = ₹80, SP = ₹70.

The expenses incurred on transportation, maintenance, packaging, advertisement etc. are considered as *overhead*. These *overheads* and the *profit* when added to the *cost price* determine the *selling price*.

Profit or Gain: Profit is made when the selling price is greater than the cost price.

$$\text{Profit} = \text{SP} - \text{CP}; \quad \text{Profit \%} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$$

Considering the same example given above,

$$\text{Profit} = 70 - 50 = ₹20. \quad \text{Profit \%} = \frac{20}{50} \times 100 = 40\%$$

Loss: Loss is made when the cost price is greater than the selling price.

$$\text{Loss} = \text{CP} - \text{SP}; \quad \text{Loss \%} = \frac{\text{Loss}}{\text{Cost Price}} \times 100$$

• Profit or Loss is calculated on cost price only.

Discount is always calculated on the marked price.

$$\text{Discount} = \text{MP} - \text{SP}; \quad \text{Discount \%} = \frac{\text{Discount}}{\text{MP}} \times 100$$

Consider the same example given above,

$$\text{Discount} = 80 - 70 = 10; \quad \text{Discount \%} = \frac{10}{80} \times 100 = 12.5\%$$

• To calculate Gain, Loss, Selling Price and Cost Price directly use the formula,

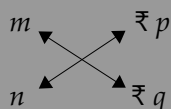
$$\text{SP} = \frac{(100 \pm \text{Gain or Loss}) \times \text{CP}}{100}$$

Use + sign for profit and – sign for loss.

Example: Cost Price of an article is ₹70. At what price it should be sold in order to gain 20%?

$$\text{SP} = \frac{(100 + 20) \times 70}{100} = \frac{120 \times 70}{100} = 12 \times 7 = 84$$

• If a man purchased m articles for ₹ p and sold n articles for ₹ q . Then how much profit or loss does he make?



$$\text{Profit or Loss \%} = \frac{mq - np}{np} \times 100$$

Example: A merchant purchased 7 watches for ₹500 and sold 5 watches for ₹400. What is loss or gain percent?

Explanation:

$$\frac{7 \times 400 - 5 \times 500}{5 \times 500} \times 100 = \frac{2800 - 2500}{2500} \times 100 = \frac{300}{25} = 12$$

• By selling an article for ₹ P , a merchant would gain or loss $x\%$. The price at which he sell it to gain or loss $y\%$ is

$$\text{SP} = P \left(\frac{100 \pm y}{100 \pm x} \right). \quad (+ \text{ sign for gain; } - \text{ sign for loss})$$

Example: By selling a furniture for ₹180 a merchant will loss 10%. At what price must he sell to gain 20%.

$$\text{Explanation: } \text{SP} = 180 \times \left(\frac{100 + 20}{100 - 10} \right) = 240.$$

• When a man buys two things on equal price each and in those things one is sold at a profit of $x\%$ and another is sold at a loss of $x\%$, then there will be no loss or no gain percent.

Example: A merchant purchased a watch and a bag for ₹100 each. But he sold the watch at a profit of 20% and bag at a loss of 20%. What is his loss or gain percentage?

	CP	SP
Watch -	₹100 + 20% Profit	= ₹120
Bag -	₹100 - 20% Loss	= ₹80
	₹200	₹200

Cost price = Selling Price. Hence, no gain or no loss.

• By selling two articles at the same price a merchant incurs $x\%$ loss on the first article and $x\%$ gain on the second article. In such a case there is always a loss.

$$\text{Loss} = \frac{2 \times \text{SP}}{\left(\frac{100}{x} \right)^2 - 1}$$

Example: By selling a watch and a bag at ₹100 each a merchant incurred a loss of 20% on watch and gain of 20% on bag. What is his loss or gain percentage?

	SP	CP
Watch	₹100 (20% Loss on CP)	= ₹125
Bag	₹100 (20% Profit on CP)	= ₹83.33
	₹200	₹208.33

$$\text{Here, CP} > \text{SP. Hence, Loss} = \frac{8.33}{208.33} \times 100 = 3.9\%$$

$$\text{(or) Using Formula: Loss} = \frac{2 \times 100}{\left(\frac{100}{20} \right)^2 - 1} = \frac{200}{24} = 8.33.$$

$$\text{Then Cost Price} = 200 + 8.33 = 208.33$$

$$\text{And Loss Percentage} = \frac{8.33}{208.33} \times 100 = 3.9\%$$



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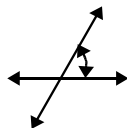
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BASIC GEOMETRY

CONCEPTS

Angle: When two non-parallel and co-planar lines (lines in the same plane) intersect, at the point of intersection the measure of rotational displacement is called an angle.



Types of Angles: If θ is an angle such that

- 1) If $\theta = 0^\circ$ then θ is *zero angle*.
- 2) If $0^\circ < \theta < 90^\circ$ then θ is called an *acute angle*.
- 3) If $\theta = 90^\circ$ then θ is *right angle*.
- 4) If $\theta > 90^\circ$ then θ is *obtuse angle*.
- 5) If $\theta = 180^\circ$ then θ is called a *straight angle*.
- 6) If $180^\circ < \theta < 360^\circ$ then θ is called *reflex angle*.
- 7) If $\theta = 360^\circ$ then θ is called *complete angle*.

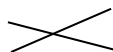
Parallel and Non-Parallel lines:

- 1) Two lines are said to be parallel lines if they are co-planar (in the same plane) and non intersecting.



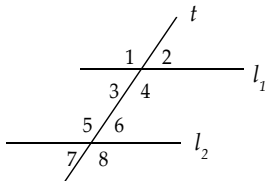
The point of intersection of parallel lines is at infinite places which is not real.

- 2) The angle between parallel lines is undefined, or it can be either 0° or 180° or any multiple of 180° .
- 3) Two lines are said to be non parallel (inclined lines) if they are co-planar and intersect at a real point.



The point of intersection of inclined lines is real.

Transversal: A line that intersects two parallel lines is called a *transversal*. Suppose l_1 , l_2 are two parallel lines and 't' is a transversal, then we will have eight angles as shown in figure.



• **Vertical Opposite Angles:** The angles $\angle 1\angle 4$, $\angle 2\angle 3$, $\angle 5\angle 8$, $\angle 6\angle 7$ pair wise are called pairs of *vertical angles*. The corresponding pairs of vertical angles are always equal i.e. $\angle 1 = \angle 4$, $\angle 2 = \angle 3$, $\angle 5 = \angle 8$, $\angle 6 = \angle 7$.

• **Corresponding Angles:** The angles $\angle 1\angle 5$, $\angle 2\angle 6$, $\angle 3\angle 7$, $\angle 4\angle 8$ pair wise are called *corresponding angles*. The pairs of corresponding angles are always equal. i.e. $\angle 1 = \angle 5$, $\angle 2 = \angle 6$, $\angle 3 = \angle 7$, $\angle 4 = \angle 8$.

• **Alternate Interior Angles:** The angles $\angle 3\angle 6$, $\angle 4\angle 5$ are called pairs of *alternate interior angles*.

The corresponding pairs of alternate angles are equal. i.e. $\angle 3 = \angle 6$, $\angle 4 = \angle 5$

• **Alternate Exterior Angles:** The angles $\angle 1\angle 8$, $\angle 2\angle 7$ are called pairs of *alternate exterior angles*. $\angle 1 = \angle 8$, $\angle 2 = \angle 7$.

• **Complementary Angles:** Two angles whose sum is 90° are called *complementary angles*.

• **Supplementary Angles:** Two angles whose sum is 180° are called *supplementary angles*.

POLYGONS

• A closed plane figure made up of several line segments that are joined together is called a Polygon.

• If all the sides of a polygon are equal then it is called Regular Polygon.

Regular polygons are both equiangular and equilateral.

Equiangular = all angles are equal.

Equilateral = all sides are the same length.

Exterior angle: The angle subtended by a side of the regular polygon at the vertex outside.

Sum of the exterior angles of any polygon = 360° .

Each exterior angle (regular polygon) = $\frac{360}{n}$.

(where 'n' is the number of sides in a polygon).

Interior angle:

Sum of the interior angles of a polygon = $(n-2) \times 180^\circ$.

Each interior angle of a regular polygon = $\frac{180(n-2)}{n}$.

• The number of diagonals in a polygon = $\frac{n(n-3)}{2}$.

• The number of triangles (when you draw all the diagonals from one vertex) in a polygon = $(n-2)$.

Polygon Names:

Sides	Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
10	Decagon

Special Triangles:

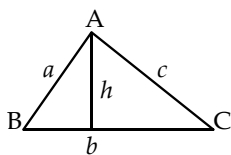
Equilateral, Isosceles, Scalene, Right Angled, Acute, Obtuse.

Special Quadrilateral:

Square, Rhombus, Parallelogram, Rectangle, Trapezoid.

TRIANGLE

1) Sum of the three angles in a triangle is always 180° .
i.e. $\angle 1 + \angle 2 + \angle 3 = 180^\circ$.



2) In a triangle sum of the lengths of any two sides is greater than the third side.

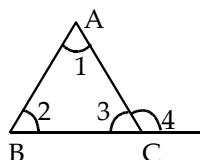
i.e. $AB + BC > AC$; $AB + AC > BC$; $BC + CA > AB$;

3) Area of the $\triangle ABC = \frac{1}{2} \times \text{Base} \times \text{Height} = \frac{1}{2} \times b \times h$.

Perimeter (P) of $\triangle ABC = a + b + c$.

4) The side opposite to greatest angle is greatest and the side opposite to smallest angle is smallest.

5) The exterior angle is equal to the sum of the other two interior opposite angles. i.e. $\angle 4 = \angle 1 + \angle 2$.

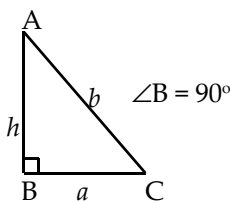


Types of Triangles:

• **Right Angled Triangle:** One angle is 90° .

Perimeter = $a + b + h$.

Area = $\frac{1}{2} \times a \times h$.

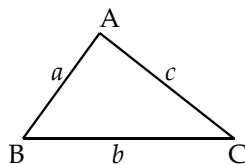


• **Scalene Triangle:** All angles are different and all sides have different length.

Perimeter = $a + b + c$

Area = $\sqrt{s(s-a)(s-b)(s-c)}$;

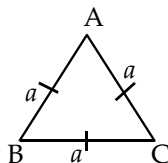
where $s = \frac{a+b+c}{2}$.



• **Equilateral Triangle:** Every angle is equal (i.e. 60°). Every side is equal in length.

Perimeter = $3a$.

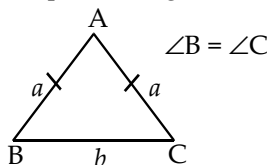
Area = $\frac{\sqrt{3}}{4} \times a^2$



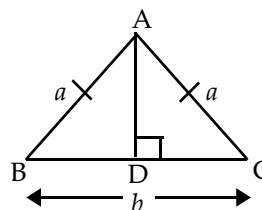
• **Isosceles Triangle:** Two angles of the triangle are equal. Two sides of the triangle are equal in length.

Perimeter = $2b + a$

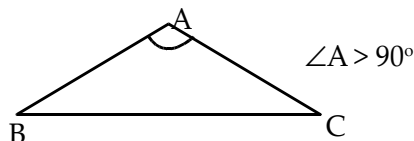
Area = $\frac{b}{4} \sqrt{4a^2 - b^2}$



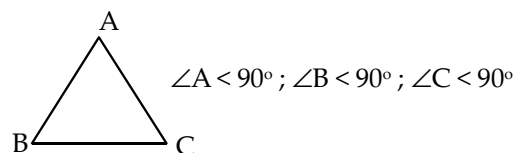
The perpendicular from the vertex to the base line (the height) in an isosceles triangle divides the triangle into two equal right angled triangles.



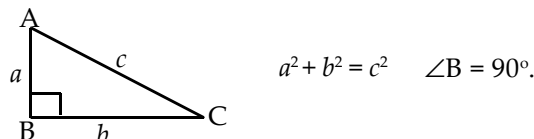
• **Obtuse Triangle:** One angle is greater than 90° . The longest side is opposite to the largest angle.



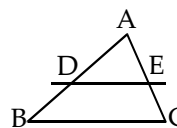
• **Acute Triangle:** One angle is less than 90° .



Pythagoras theorem: In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.



6) The line joining mid point of two sides of a triangle is always parallel to the 3rd side and it is half of the 3rd side.

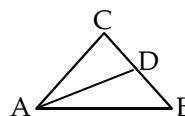


i.e. $DE \parallel BC$ and $DE = \frac{1}{2} BC$

7) **Basic Proportionality Theorem:** If a line is drawn parallel to one side of a triangle, then it divides other two sides in the same ratio.

If $DE \parallel BC$ then $\frac{AD}{DB} = \frac{AE}{EC}$

8) **Median of Triangle:** A line joining the mid point of a side to the opposite vertex is called Median of a triangle.



9) **Property of Median:** In a $\triangle ABC$, if 'AD' is the median then it divides $\triangle ABC$ into two equal parts i.e. $\triangle ADB = \triangle ADC$.



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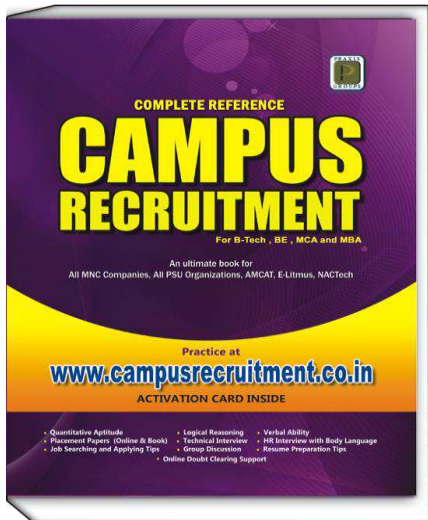
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PERMUTATIONS AND COMBINATIONS

CONCEPTS

• Fundamental Principal of Multiplication:

In general if some procedure can be performed in n_1 different ways, and if, following this procedure, a second procedure can be performed in n_2 different ways, and if, following this second procedure, a third procedure can be performed in n_3 different ways, and so fourth then the number of ways the procedure can be performed in the order indicated is the product of $n_1 \cdot n_2 \cdot n_3 \dots$

e.g.: A letter lock consists of 5 rings each marked with 10 different letters. What is the maximum number of unsuccessful attempts to open the lock.

Explanation: Each ring is marked with 10 different letters. Hence each ring has 10 positions.

Thus, the total number of attempts that can be made to open the lock is $10 \times 10 \times 10 \times 10 \times 10 = 10^5$.

Out of these, there must be one attempt in which the lock will open.

\therefore Total number of unsuccessful attempts $= 10^5 - 1$.

• Fundamental Principle of Addition:

If there are two operations such that they can be performed independently in m and n ways respectively, then either of the two operations can be performed in $(m+n)$ ways.

• Factorial: The product of first ' n ' natural numbers is called the ' n '-factorial and is denoted by $n!$

$$n! = 1.2.3.4 \dots (n-2).(n-1).n$$

$$\text{Example: } 4! = 1.2.3.4 = 24, \quad 5! = 1.2.3.4.5 = 120, \\ 5! = 5.4! = 5.24 = 120, \quad 6! = 6.5! = 6.120 = 720.$$

Note: 1) $0! = 1$

2) The product of ' r ' consecutive positive integers is divisible by $r!$

3) $(kn)!$ Is divisible by $(n!)^k$ for all k is a positive constant.

4) The product of $2n!$ consecutive positive integers is equal to $2(n!)^2$.

PERMUTATIONS

• Permutation: An arrangement of any $r \leq n$ of these objects in a given order is called an r -permutation or a permutation of the ' n ' objects taken ' r ' at a time.

Example: Consider the set of letters a, b, c , and d . Then

(i) $bdca, dcba$ and $acdb$ are permutations of the 4 letters taken all at time.

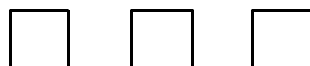
(ii) bad, adb, cbd and bca are permutations of the 4 letters taken 3 at a time.

(iii) ad, cb, da and bd are permutations of the 4 letters taken 2 at a time.

The number of permutations of ' n ' objects taken ' r ' at a time will be denoted by $P(n, r)$.

Before we derive the general formula for $P(n, r)$ we consider a special case. Find the number of permutations of 7 objects, say a, b, c, d, e, f, g taken three at a time. In other words, find the number of 'three letter words' with distinct letters that can be formed from the above seven letters.

Let the general three letters word be represented by three boxes.



Now the first letter can be chosen in 7 different ways; following this, the second letter can be chosen in 6 different ways; and, the last letter can be chosen in 5 different ways. Write each number in its appropriate box as follows:



Thus by the fundamental principle of counting there are $7.6.5 = 210$ possible three letter words without repetitions from the seven letters. (or) There are 210 permutations of 7 objects taken 3 at a time.

$$\text{i.e. } P(7, 3) = 210.$$

The derivation of the formula for $P(n, r)$ follows the procedure in the preceding example:

The first element in an r -permutation of n -objects can be chosen in ' n ' different ways; following this, the second element in the permutation can be chosen in $(n-1)$ ways; and, the third element in the permutation can be chosen in $(n-2)$ ways. Continuing in this manner, we have that the r^{th} (last) element in the r -permutation can be chosen in $n-(r-1) = n-r+1$ ways.

$$\text{Thus } P(n, r) = n(n-1)(n-2) \dots (n-r+1) = \frac{n!}{(n-r)!}$$

The second part of the formula follows from the fact that $n(n-1)(n-2) \dots (n-r+1) =$

$$\frac{n(n-1)(n-2) \dots (n-r+1) \cdot (n-r)!}{(n-r)!} = \frac{n!}{(n-r)!}$$

\therefore A formula for the number of possible permutations of ' r ' objects from a set of ' n ' is $P(n, r)$ or ${}^n P_r = \frac{n!}{(n-r)!}$

In the special case that $r = n$, we have $P(n, n) = n(n-1)(n-2) \dots 3.2.1 = n!$ (in other words there are $n!$ permutations of ' n ' objects taken all at a time).

PROBABILITY

CONCEPTS

•**Random Experiment:** Probability is the study of random or non deterministic experiments. If the dice is tossed in the air, then it is certain that the dice will come down, but is not certain that, say a 3 will appear.

Definition: A *random experiment* is an experiment whose result would not be predicted but the list of possible outcomes are known. The unpredicted outcomes could not be taken under random experiments. The result of random experiments may not be predicted exactly but the result must be with in the list of predicted outputs.

Example:

- 1) Tossing a fair coin.
- 2) Rolling a dice is a random experiment, since its results could not be predicted in any trial.
- 3) Selection of a plastic component and verification of its compliance.
- 4) Life time of a computer.
- 5) Number of calls to a communication system during a fixed length interval of time.

•**Outcome:** The result of a random experiment will be called an outcome.

Example:

- 1) Tossing a coin. The result is either Head(H) or Tail(T).
- 2) In an experiment of throwing a six-faced dice. The possible outcomes are 1, 2, 3, 4, 5 and 6.

•**Sample Space:** The set of all possible outcomes of some given experiment is called *sample space*. A particular outcome, *i.e.* an element in that set is called a *sample point* or *sample*.

Example:

- 1) Toss a dice and observe the number that appears on top. Then the sample space consists of the six possible numbers: $S = \{1, 2, 3, 4, 5, 6\}$
- 2) Toss a coin 2 times and observe the sequence of heads (H) and tails (T) that appears. Then the sample space S consists of four elements: $S = \{HH, HT, TH, TT\}$

Note: Shortcut: Tossing a coin 2 times is same as tossing 2 coins at a time.

$$S = \{H, T\} \times \{H, T\}$$

$$S = \{HH, HT, TH, TT\}$$

- 3) Toss a coin until a head appears and then count the number of times the coin was tossed. The sample space of this experiment is $S = \{1, 2, 3, \dots, \infty\}$. Here ∞ refers to the case when a head never appears and so the coin is tossed an infinite number of times. This is an example of a sample space which is countably infinite.

•**Events:** An event A is a set of outcomes or, in other words, a subset of the sample space S .

Example: If A random experiment is associated with what is the day today. It may be from Sunday to Saturday. If today is Friday and Friday belongs to the sample space $S = \{\text{Sun, Mon, Tue, Wed, Thu, Fri, Sat}\}$.

Different Types of Events:

•**Simple or Elementary Events:** An event with only one sample point is called *simple* or *elementary event*.

In an experiment of tossing three coins at a time, the event ' A ' is that all coins turns up with heads consists of only one point HHH. Then ' A ' is a simple event.

As a matter of fact each outcome of an experiment is a simple event.

•**Complimentary Event:** An event \bar{A} (or A^1) is said to be *complementary* to an event ' A ' in sample space ' S ' consists of all those points which are not in ' A '.

Example: In tossing a coin three times, sample space S consists of eight points.

$$S = \{HHH, HHT, HTH, THH, HTT, TTH, THT, TTT\}$$

The event ' A ' is such that there should be no heads in the sample point is $\{TTT\}$. Then the event \bar{A} (or A^1) complementary to ' A ' is that there exists at least one head in the sample space *i.e.* (HHH), (HHT), (HTH), (THH), (HTT), (TTH), (THT).

•**Equal Events:** Two events A and B are said to be *equal* if $A \subset B$ and $B \subset A$. This statement implies that all the points of A are also the points of B and vice-versa.

Example: Let sample space $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Let A be the event defined as '*even number*' and event B is defined as '*multiplies of 2*'.

Then $A = \{2, 4, 6, 8, 10\}$; $B = \{2, 4, 6, 8, 10\}$ here every point in A is also a point in B and vice-versa. Therefore events A and B are said to be equal events.

•**Transitivity of events:** If A , B and C are 3 events such that $A \subset B$ and $B \subset C$ it implies that $A \subset C$ such a property of events is known as *transitivity* of events.

Let the sample space $S = \{1, 2, \dots, 100\}$.

Event A be the '*even numbers*': $A = \{2, 4, 6, 8, \dots, 100\}$

Event B be the '*multiplies of 4*': $B = \{4, 8, 12, \dots, 100\}$

Event C be the '*multiplies of 8*': $C = \{8, 16, 24, \dots, 100\}$

Event point in C is also point in B and event point in B is also point in A but not vice-versa *i.e.* $A \subset B \subset C$.

•**Compound event:** An event which is not simple or elementary is called a *compound event*. Every compound event can be uniquely represented by the union of a set of elementary events.



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DATA SUFFICIENCY

CONCEPTS

Purpose of Data sufficiency:

Here the examiners intention is to check the student's capability in decision making. One can agree that the decision making is the sense of checking whether the data is sufficient or not.

Nature of Questions: You will be given a question followed with the two statements.

You don't need to solve the question. You just have to judge whether given two statements have enough information to solve the question.

CONCEPTUAL EXAMPLES

Each of the questions below consist of a question and two statements numbered I and II. You have to decide whether the data provided in the statements are sufficient to answer the given question. Read both the statements and give answer as

a: If the data in statement-I alone is sufficient and the data in statement-II alone is not sufficient to answer the question.

b: If the data in statement-II alone is sufficient and the data in statement-I alone is not sufficient to answer the question.

c: If the data either in statement-I or in statement-II alone are sufficient to answer the question.

d: If the data either in statement-I and II together are not sufficient to answer the questions. And some more data needed.

e: If the data in both statement-I and II together are necessary to answer the question.

1) What is the average of p , q and r ?

I. r is 25. II. $p + q$ is 20.

Explanation: To find the average, we need values of p , q , r . From the given two statements values of p , q , r are known. Hence, we require both the statement-I and II to answer the given question. Hence, option-e is correct.

Ask doubt with Question Id: 5503

2) Who is youngest among Raju, Vamsi and Rajni?

I. Raju is one year elder to Vamsi.

II. Vamsi age is average age of Raju and Rajni.

Explanation:

From statement-II, Vamsi's age is between the ages of Raju and Rajni.

From statement-I, Raju is one year elder to Vamsi. It means Rajni will be one year younger to Vamsi.

∴ From both the statements, we can say, Rajni is youngest among the three. Hence, option-e is correct.

Ask doubt with Question Id: 5504

3) What is the value of x ?

I. $x^2 + 2x - 3 = 0$ II. $x^2 + 4x - 5 = 0$

Explanation: From statement-I, $x^2 + 2x - 3 = 0$

$x^2 + 3x - x - 3 = 0 \Rightarrow x(x + 3) - 1(x + 3) = 0 \Rightarrow x = 1$ or -3

∴ From statement-I alone we can't say exact value of x .

From statement-II, $x^2 + 4x - 5 = 0 \Rightarrow x^2 + 5x - x - 5 = 0$

$x(x + 5) - 1(x + 5) = 0$ i.e. $x = 1$ or -5 .

∴ From statement-I and II, we conclude, $x = 1$.

As both the statements together are required to answer the given question, option-e is correct.

Ask doubt with Question Id: 5505

4) Find the area of the square?

I. The side of the square is 7 cm

II. The circumference of the square is 28 cm

Explanation: $\text{Area} = (\text{side})^2$

From statement-I, we know the value of *side*. Therefore *area* can be found.

From statement-II, circumference i.e. $4(\text{side}) = 28$.

From this we can find the value of *side*. As a result *area* can also be found.

Here, either of the statements-I or II alone are sufficient to answer the given question. Hence, option-c is correct.

Ask doubt with Question Id: 5506

5) What is the cost price of the chair?

I. The selling price of the chair is ₹324 at profit of 8%.

II. The profit is 12%.

Explanation:

From statement-I, $\text{CP} = \frac{100}{100 + 8} \times 324 = ₹300$

∴ Statement-I alone is sufficient to answer.

Statement-II does not have the enough information to solve the given question. Hence, option-a is correct.

Ask doubt with Question Id: 5507

6) Who is tallest?

I. C is eldest.

II. A is shortest and B is youngest but taller than C.

Explanation:

Statement-I alone is not sufficient to answer.

From statement-II, A is shortest. And B is taller than C.

It means B is taller than A and C. i.e. only statement -II is sufficient to answer the question.

Hence, option-b is correct.

Ask doubt with Question Id: 5508

7) Is $r > s$?

I. $r > t$

II. $at > ar, a < 0$.

Explanation: Statement-I and II gave information about t and r . But not s . So, it is not possible to say whether $r > s$ or not because of insufficient information



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DATA INTERPRETATION

CONCEPTS

The information related to any event given in the form of graphs, tables, charts etc is termed as data. The methodology of interpreting data to get the information is known as data interpretation.

Mathematical identities which we use in data interpretation are given below.

To solve the problems on data interpretation, you need to be thorough in 'Percentages', 'Ratios' and 'Averages' chapters.

Percentage: Proportions with the base 100 are known as percentages (%).

For example, $\frac{x}{y} \times 100$ is in percentage form.

e.g.: If the ratio of boys to total number of students in a college is $\frac{1015}{4060}$. This can be written in a percentage

form as $\frac{1015}{4060} \times 100 = 25\%$.

To find by how much percent 'x' is more or less than y (or over y) when compared to y is given as

$$\text{Required Percentage} = \frac{\text{Value of X} - \text{Value of Y}}{\text{Value of Y}} \times 100$$

Observe that the denominator contains the value with which the comparison is made.

In the above formula, if numerator is positive, then there is percentage growth. If numerator is negative, then there is a decline in the percentage.

Ratio: In the simplest possible form, ratio is a quotient or the numerical quantity obtained by dividing one figure by the other figure of same units.

TABULAR DATA INTERPRETATION

In this type of questions a table with data as well as a set of questions on the same data is given to you. You need to analyze the table data and answer the given questions.

Example: Study the following table carefully and answer the questions that follow.

Table: Percentage of marks scored by students in SSC

Marks percentage	Girls	Boys
>75	25	12
60-75	15	12
50-59	10	23
35-49	5	2
< 35	3	1

1) Give the total percentage of Girls who wrote SSC examination from that School.

a) 25% b) 54% c) 23% d) 58%

2) Give the percentage of students who scored distinction (> 75).

a) 43% b) 34.25% c) 24.85% d) 40%

3) Give fail percentage of students in SSC examination.

a) 1% b) 2% c) 4% d) 8%

4) Give pass percentage of boys in SSC examination.

a) 90% b) 88% c) 98% d) 99%

5) Give the percentage of students who scored more than 60% in the SSC examination.

a) 25% b) 59.3% c) 22.2% d) 50%

Explanation:

1)b; Total no.of girls appeared for SSC Examination = 25 + 15 + 10 + 5 + 3 = 58.

Total no.of students appeared for SSC examination = 58 + 50 = 108.

∴ Percentage of girls who wrote SSC Examination = $\frac{58}{108} \times 100 = 53.7 = 54\%$ (approximately)

2)b; No.of students who scored distinction = 25 + 12 = 37.

∴ Percentage of students who scored distinction = $\frac{37}{108} \times 100 = 34.25\%$

3)c; Total no.of students failed in SSC examination = 4.

∴ Fail % = $\frac{4}{108} \times 100 = 3.7 = 4\%$ (approximately)

4)c; No.of boys passed in the examination = 49.

∴ Boys pass percentage = $\frac{49}{50} \times 100 = 98\%$

5)b; No.of students who scored more than 60% = 64.

∴ Percentage of students who scored more than 60% = $\frac{64}{108} \times 100 = 59.26\% = 59.3\%$ (approximately)

Example: Production of cars by different companies in the span of 1980-2005 given. Interpret the data to answer the questions given below.

Company	Production of cars in thousands				
	1980-85	1985-90	1990-95	1995-00	2000- 05
Maruthi	12.5	15.0	16.2	18.0	22
Hindustan Motors	10.4	11.1	11.5	11.5	12
Hyundai Motors	12	14.3	16.2	17.8	18.9
Ford	14.4	14.1	13.2	18.1	25.3
General Motors	19.2	13.8	13.5	14.1	15.8



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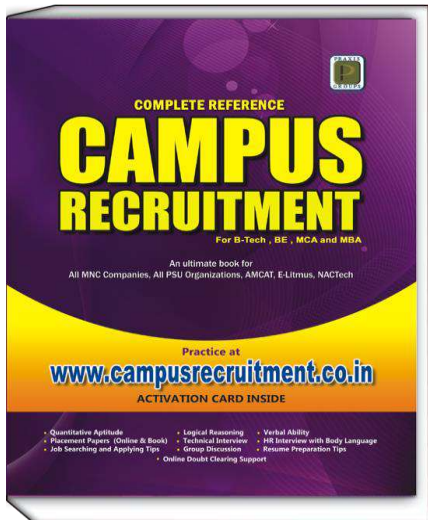
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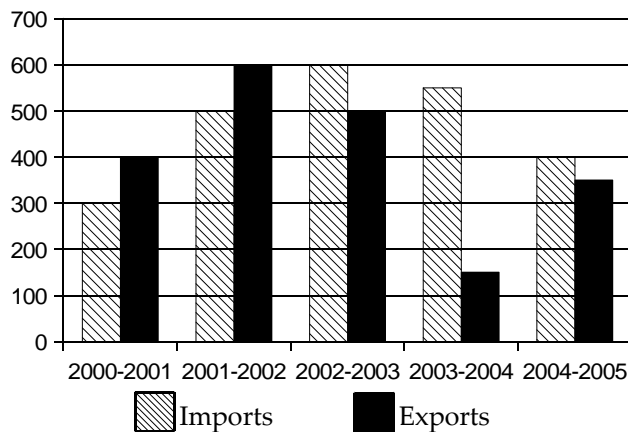
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BAR GRAPHS

Bar graphs normally comprise X-axis, Y-axis and bars. X and Y-axes represent the data. And bars represent the trend of data with respect X and Y-axes. In this type of questions, data is given in the form of bar graphs. You need to analyze the bars with respect to X and Y-axes to answer the given questions.

Example: Imports and exports of a country from 2000 - 2001 to 2004 - 2005.



1) In which of the following year the gap between import and export was maximum.

- a) 2001-02 b) 2002-03 c) 2003-04 d) 2004-05

2) In which of the following year the gap between imports and exports was minimum.

- a) 2002-2003 b) 2003-2004 c) 2004-2005 d) none

3) Exports in 2001-2002 was approximately how many times that of the year 2003-2004.

- a) 2 b) 3 c) 4 d) 5

4) Give the ratio between the number of years in which exports is greater than imports and import is greater than exports.

- a) 3 : 2 b) 2 : 3 c) 3 : 1 d) 1 : 3

5. Difference between average of imports and exports is

- a) 100 b) 90 c) 80 d) 70

Explanations:

1)c; From the graph, gap between import and export was maximum in 2003-2004.

2)c; From the graph, gap between imports and exports is minimum in 2004-2005 = 400-350 = 50 crore.

3)c; Exports of the year 2001-2002 = 600

Exports of the year 2003-2004 = 150

∴ Exports of 2001-2002 is 4 times greater than that of 2003-2004.

4)b; In 2 years i.e. 2000-2001 and 2001-2002 exports are greater than imports.

In 3 years i.e. 2002-2003, 2003-2004, 2004-2005 imports are greater than exports.

5)d; Average of imports during 2000-2005 =

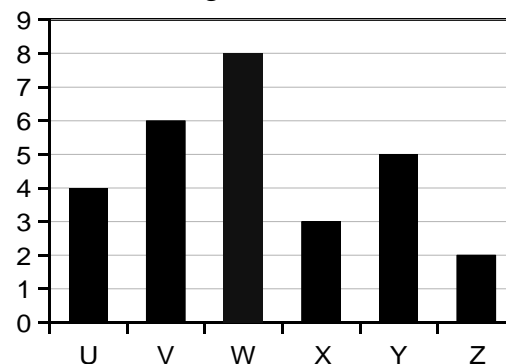
$$\frac{300+500+600+550+400}{5} = \frac{2350}{5} = 470$$

Average of exports during 2000-2005 =

$$\frac{400+600+500+150+350}{5} = \frac{2000}{5} = 400$$

∴ Difference = 470 - 400 = 70.

Example: Turnover in crores of six companies (U, V, W, X, Y and Z) are given.



1) Which company's turn over is highest?

- a) U b) V c) W d) X

2) What is the percentage of turn over of the company-X over the turn over of the company-V?

- a) 25% b) 50% c) 75% d) 100%

3) Give the difference of average turnovers of first three companies and last three companies.

- a) 3.33 b) 6.66 c) 2.67 d) 1.85

4) Give the percentage contribution of turnover of W in the overall turnover of all the companies.

- a) 12% b) 50% c) 40% d) 29%

5) Difference of average percentage contribution of turnovers of companies U, V and X, Y is.

- a) 1% b) 2% c) 3% d) 4%

Explanations:

1)c; It is clear from the graph that turn over of company W is highest i.e. 8 crores.

2)b; Turnover of company X = 3 crores

Turnover of company V = 6 crores

∴ Percentage of turn over of X over V = $\frac{3}{6} \times 100 = 50\%$

3)a; Average turn over of first three companies

$$\frac{4+6+8}{3} = \frac{18}{3} = 6$$

Average turn over of last three companies

$$\frac{3+5+2}{3} = \frac{10}{3} = 3.33$$

∴ Difference = 6.00 - 3.33 = 2.67



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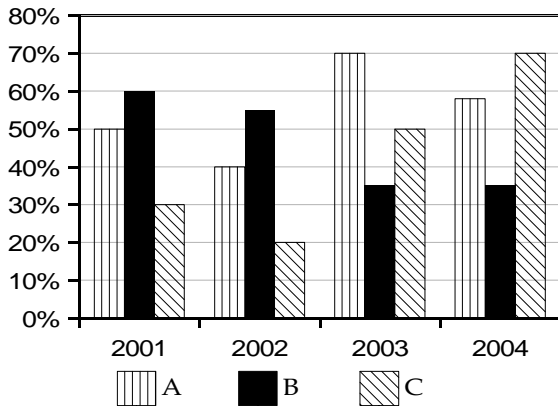
MIXED DIAGRAMS

CONCEPTS

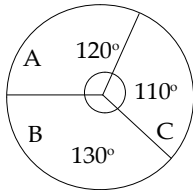
In this type of data interpretation, data will be given in the form of two or more diagrams. The combination of the diagrams can be a bar diagram and a pie chart (or) a line graph and a table diagram (or) a pie chart and line graph.

A) Study the following graphs carefully to answer the questions given below it.

Readers of newspapers in percentages in 3 different cities A, B and C over the years.



Total population of 3 crores in 3 cities is represented in the following diagram.



1) In 2002 in the city B how many people were reading a news paper in lakhs ?

- a) 108.333 b) 59.5883 c) 48.7499 d) 38.9421

2) According to the data in city B what is the difference between minimum number of newspaper readers in a particular year and maximum number of newspaper readers in a particular year (approximately)?

- a) 34 b) 31 c) 29 d) 27

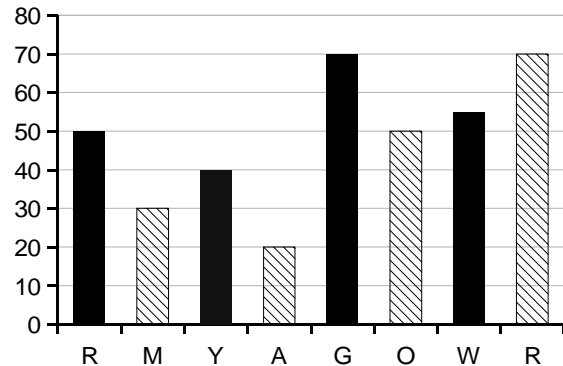
3) What is the sum of populations of city A those who don't read any newspapers in all the 4 years (in lakhs)?

- a) 220 b) 200 c) 180 d) 160

4) In the 2 years in which same and maximum percentage of readership is maintained in the cities A and C. What is the decrease in readership in the city A?

- a) 5 lakhs b) 10 lakhs c) 20 lakhs d) 30 lakhs

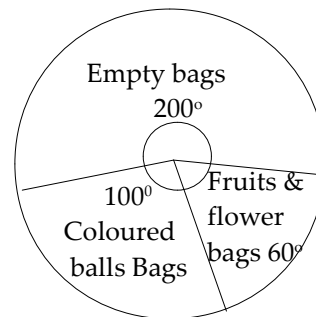
B) Study the following graphs carefully to answer the questions given below it. (Use most approximate figures, if necessary).



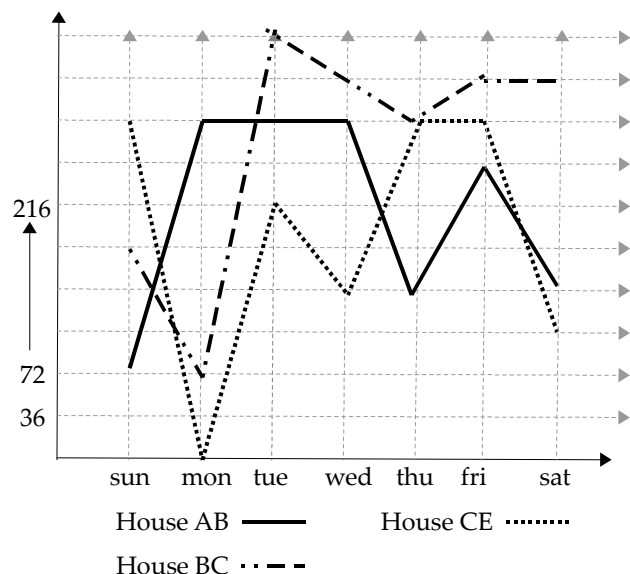
Different Bags containing colored (red, yellow, green, white) balls

Different Bags containing fruits and Flowers (Mango, Apple, Orange, Rose)

Percentage of bags (empty, fruits and Flowers, colored balls) available in every house is given in the following Pie chart.



There are 3 go-downs namely AB, BC, CE which have n bags in different days of the week as shown below.





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CODING - DECODING

CONCEPTS

A code is a system of words, letters or signs which is used to represent a message in secret form. Coding and Decoding test is to examine the student's ability to identify the rule interpreted and decode the given message.

Approach to solve the questions:

1. You will be given two messages, one is original message and another one is coded message.
2. You have to compare each element of the original message with corresponding element of coded message. Thereafter try to identify the rule in which coded message is formed.
3. Using the identified rule you can easily answer the question asked.

Tips to solve easily:

- 1) Remember English alphabets from A to Z with their position values i.e. A-1, B-2, C-3,, Z-26.
- 2) Remember reverse order of English alphabets. i.e. Z to A with their position values i.e. Z-1, Y-2, , A-26.
- 3) Remember the corresponding opposite letter of each alphabet with their position values. The following table will give the opposite letter of each alphabet.

1	2	3	4	5	6	7	8	9	10	11	12	13
A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N
26	25	24	23	22	21	20	19	18	17	16	15	14

To find out the opposite letter of a particular letter, we can use the below formula.

Sum of the position numbers of a letter and its opposite letter is always 27.

Position number of a letter + Position number of its opposite letter = 27.

e.g.: The opposite letter of 'H' is 'S'.

Because, H-8, S-19. $H+S=27 \Rightarrow 8+19=27$.

Types of Coding-Decoding:

(I) Letter Coding: In this type of coding, the original alphabets of the given word are replaced by certain other alphabets based on specific rule to form its code. You have to detect the hidden rule and answer the questions accordingly.

Examples: (1) In a certain code language, 'COLLEGE' is written as 'GSPPIKI' then how will 'GROUPS' be written in that code?

Explanation: Each letter of the word is moved four steps forward to obtain the code. So, GROUPS will be coded as KVSYTW.

2) 'ZYXW' as coded as 'ABCD' then 'STUV' is coded as.

Explanation: Here each letter is coded with its opposite letter. i.e. Z - A, Y - B, X - C, W - D.

Similarly, S - H, T - G, U - F, V - E.

3) 'bcd' is coded as 'def' then 'true' is coded as.

Explanation: Here every letter is moved two steps forward. i.e. b (+2) \rightarrow d, c (+2) \rightarrow e, d (+2) \rightarrow f.

Similarly, t \rightarrow v, r \rightarrow t, u \rightarrow w, e \rightarrow g.

So, the answer is 'vtwg'.

4) 'Hyderabad' is coded as 'ixedszcze' then 'chennai' is coded as?

Explanation:

Here the letters are alternatively increasing and decreasing by 1.

$h(+1) \rightarrow i$, $y(-1) \rightarrow x$, $d(+1) \rightarrow e$, $e(-1) \rightarrow d$, $r(+1) \rightarrow s$,

$a(-1) \rightarrow z$, $b(+1) \rightarrow c$, $a(-1) \rightarrow z$, $d(+1) \rightarrow e$.

So, chennai will be coded as dgfmzozj.

(II) Number Coding: In this type of coding, alphabets are assigned to the numbers or numerical code values are assigned to a word or alphabets. You have to compare the given codes to answer the questions.

Example:

1) If READ is coded as 7421 and BOOK is coded as 8335, then how would you encode BOARD?

Explanation: The alphabets are coded as follows.

R	E	A	D		B	O	O	K
7	4	2	1		8	3	3	5

From the above codes, we can say, B is coded as 8, O is coded as 3, A is coded as 2, R is coded as 7, D is coded as 1. Hence, BOARD is coded as 83271.

(III) Substitution: In this type, the names of objects are substituted with different names. We should carefully trace the substitution to answer the questions.

Example:

1) In a certain code language, 'book' is coded as 'pencil', 'pencil' is coded as 'mirror', 'mirror' is coded as 'board'. Then what is useful to write on a paper?

Explanation: We use pencil to write on a paper but here pencil is coded as mirror. So, the answer is mirror.

2) In a certain language, 'man' is called as 'woman', 'woman' is called as 'girl', 'girl' is called as 'boy', 'boy' is called as 'worker'. Then in the same language what does a 6 year old female is called?

Explanation: In general language, 6 years old female is called as girl. But in the given coded language 'girl' is called as 'boy'. So, the answer is 'boy'.

(IV) Mixed Letter/ Number Coding: In this type, few sentences are given in a code language. Based on that you are asked to find the code for a particular given word(s). To answer such questions, you have to compare the two messages and deduce the common words and its corresponding codes. Analyze the entire message until the code for the given word is found.

Example: 1) In a certain code language 'pqost ygx mnlia' is coded as 'manager is there'; 'xyrs kixt ygx' is coded as 'clerk is here'; 'ygyx srto pqost' is coded as 'manager is genius'. Then what is the corresponding code for 'there'.

Explanation:

pqost ygx mnlia → manager is there ----- (1)

xyrs kixt ygx → clerk is here ----- (2)

ygyx srto pqost → manager is genius ----- (3)

From (1) and (2), common word is 'is' and common code is 'ygyx'. i.e. 'is' → 'ygyx'.

Similarly, from (1) and (3), manager is coded as pqost. Substitute the codes of 'manager' and 'is' in (1), we get, 'there' is coded as 'mnlia'. Hence, mnlia is the answer.

2) In a certain code language, '2 4 7' means 'spread red carpet'; '2 3 6' means 'dust one carpet' and '2 3 4' means 'one red carpet'. Then what is the code for the word 'spread'?

Explanation: 2 4 7 → spread red carpet ----- (1)

2 3 6 → dust one carpet ----- (2)

2 3 4 → one red carpet ----- (3)

Comparing (1) and (3), we get, 'red carpet' means 2 4.

Hence, 'spread' means 7.

CONCEPTUAL EXAMPLES

1) In a certain code, CONCEPT is written as TQFDOPC. Then how VICTORY is written in the same code?

- a) YROTCIV b) RYOTCIV c) IVCTORY
d) YSPUDJV e) VSPUDJV

Explanation: In the given code, the letters of the word CONCEPT are reversed. After reversing except first and last letters, remaining all letters are moved one step forward to obtain the code. In the similar manner, VICTORY is coded as YSPUDJV.

Ask doubt with Question Id: 7950

2) If in a code language, JUMP is written as ITLO and COPIER is written as BNOHDQ, then how will CAMPUS be written in that code?

- a) SUPMAC b) ACPMSU c) BZLOTR
d) DBNQVT e) BLORTZ

Explanation: Each letter in the word is moved one step backward to obtain the corresponding code. In the same way, CAMPUS is coded as BZLOTR.

Ask doubt with Question Id: 7951

3) In a certain code, DANGER is written as BCLICT. In the same code, ORACLE will be written as?

- a) MTYEJG b) MPYEJG c) MTXCJG
d) GJEYTM e) none of these

Explanation: The letters at odd position are moved two steps backward and those at even position are moved two steps forward to obtain the corresponding letters of the code. Hence, option-a is correct choice.

Ask doubt with Question Id: 7952

4) In a certain code language, SUCCESS is written as 6344866 and NATIVE is written as 279508, then what will be the code for SENSITIVE ?

- a) 681659508 b) 632659503 c) 683659508
d) 648659504 e) 682659508

Explanation: The alphabets are coded as shown below.

S	U	C	C	E	S	S	N	A	T	I	V	E
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
6	3	4	4	8	6	6	2	7	9	5	0	8

From the above codes, we can write SENSITIVE as 682659508, which is option-e.

Ask doubt with Question Id: 7953

5) In a certain code language, 26891 is written as EGKPT, and 3457 is written as RUAL. Then how 58946 is written in that code?

- a) AKPUG b) GUPKA c) AKUPG
d) AKPGU e) none of these

Explanation: Numbers are coded as shown below.

2	6	8	9	1	3	4	5	7
↓	↓	↓	↓	↓	↓	↓	↓	↓
E	G	K	P	T	R	U	A	L

∴ 58946 is coded as AKPUG; Option-a is correct choice.

Ask doubt with Question Id: 7954

6) In a certain code language blue is called green, green is called yellow, yellow is called white, white is called red, red is called purple, purple is called orange. Then what is the color of milk ?

- a) White b) Red c) Green d) Orange e) Purple

Explanation: Actually the color of milk is white. But in the given language, white is called red. So, answer is 'red'.

Ask doubt with Question Id: 7955

7) In a certain code language, all the two wheeler vehicles are called buses, all the buses are called books, all the books are called trees, all the trees are called pens. Then what we use to read?

- a) Books b) Pens c) Trees d) Buses e) none of these

Explanation: We use books to read but in the given language books are called trees. So, the answer is trees.

Ask doubt with Question Id: 7956



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DAY SEQUENCE/ CALENDAR

CONCEPTS

In day sequence, questions will be asked on calendars to find a particular day of the week (or) a particular day of the given date. In order to solve these problems easily, you should have knowledge on calendar *i.e.* leap year, odd days etc.

• **Leap year:** If the last two digits of a given year is perfectly divisible by 4 then that year is a *leap year*.

Example: 2016 is a leap year because last 2 digits *i.e.* 16 is perfectly divisible by 4.

But a century year is not a leap year *i.e.* 100, 200, 300,....

But every 4th century year is a leap year.

i.e. 400, 800, 1200, 1600, 2000 etc.

A leap year has 366 days.

Examples:

(i) Each of the years 1764, 1028, 1948, 1676, 2004 etc is a leap year.

(ii) Each of the years 400, 800, 1200, 1600, 2000, 2400 etc is a leap year.

(iii) The years 2001, 2002, 2003, 2005, 1900, 2100 are not leap years.

• **Ordinary year:** The year that is not a leap year is called an *ordinary year*. An ordinary year has 365 days. In order to solve the questions on calendars, we use a concept called '*odd days*'.

• **Odd day:** The number of days more than a complete week are called *odd days* in a given period.

Lets discuss how to count the odd days in a given period.

• **Counting of odd days:**

To find the number of odd days in a given period, we divide the total number of days with 7. The remainder obtained is the total number of *odd days*.

Examples:

1) How many odd days are there in 10 days.

Explanation: 7) 10 (1

$$\frac{7}{}$$

3 = Remainder → 3 odd days.

2) How many odd days are there in 100 days.

Explanation: 7) 100 (14

$$\frac{98}{}$$

2 → odd days

3) How many odd days are there in an ordinary year?

Explanation: An ordinary year has 365 days. So,

$$7) 365 (52$$

$$\frac{364}{}$$

1 → odd day

• Hence, in an **ordinary year** there are 52 perfect weeks and **1 odd day**. [365 days = 52 weeks + 1 day]

4) How many odd days are there in a leap year?

Explanation: As we know, a leap year has 366 days. So,

$$7) 366 (52$$

$$\frac{364}{}$$

2 → odd days

• Hence, in a **leap year**, there are 52 perfect week and **2 odd days**. [366 days = 52 weeks + 2 days]

Note: Total number of odd days can be from 0 to 6 only.

• **Counting odd days for century years:**

1) 100 years = 76 ordinary years + 24 leap years.

$$= (76 \times 1 + 24 \times 2) \text{ odd days} = 124 \text{ odd days}$$

(Here 1 and 2 indicates number of odd days in an *ordinary year* and a *leap year* respectively)

$$124 \text{ odd days} = 17 \text{ weeks} + 5 \text{ days} = 5 \text{ odd days.}$$

∴ Number of odd days in **100 years** = 5.

2) Number of odd days in **200 years** = (5×2) = 3.

3) Number of odd days in **300 years** = (5×3) = 1.

4) Number of odd days in **400 years** = (5×4+1) = 0.

Similarly..., each one of 800, 1200, 1600, 2000 year etc has 0 (zero) odd days as they are multiples of 400.

• **Some Important points to remember:**

1) In every *normal / ordinary year* the first day (1st January) and the last day (31st December) are always same. For example, if January 1st is *Monday* then December 31st is also *Monday*.

2) In every leap year if the first day (January 1st) is *Sunday*, then last day (December 31st) will be it's next day *i.e.* *Monday*.

3) In every year, the calendar for the months *April* and *July* are always same.

4) For every 400 years, the day repeats.

For example, if 14-April-1604 is *Saturday*, then 14-April-2004 will also be *Saturday*.

5) The last day of a century cannot be either *Tuesday* or *Thursday* or *Saturday*.

Questions on day sequence/ calender are mainly 5 types.

1) Problems based on Total Day–Particular Day.

2) Problems based on Leap Year.

3) Problems based on Particular Date–Day.

4) Problems based on Same Calendar Year.

5) Problems based on Same Day–Date of the Month.



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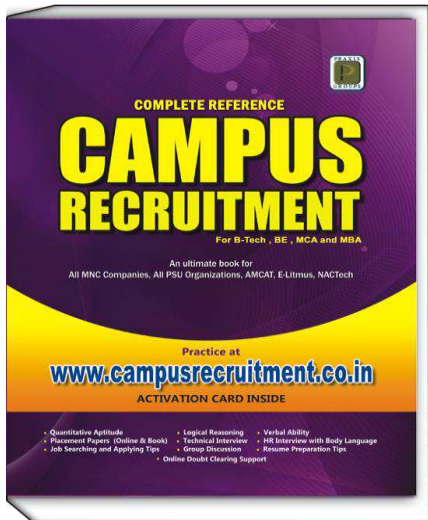
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DIRECTION SENSE TEST

CONCEPTS

Direction sense test question will be asked to check the candidates ability in deciding the shortest way within time. In this type of questions, we will see persons or things moving in East, West, North and South directions from an initial point.

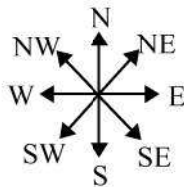
There are 4 directions viz., East, West, North, South.

And 4 cardinal directions viz., North-East, North-West, South-East, South-West.

There are 4 types of problems which are frequently been asked in Campus Recruitment Tests.

- 1) Problems on Distances
- 2) Problems on clocks
- 3) Problems on Angles
- 4) Problems on Shadows

The diagram below illustrates the relevant positions of all the 8 directions.



Problems on directions can be solved in 2 ways.

- (1) Diagrammatic way
- (2) Shortcut way

While solving the problems on directions, it is very important for you to remember the left and right directions of each direction. i.e. Left of the East is North. Right of East is South and so on.

Type-(1): Problems on Distances:

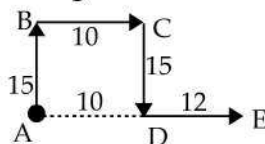
Steps for shortcut method:

- 1) If the directions are same, then add the distances.
- 2) If directions are opposite, then subtract the distances and write the direction which has maximum value.
- 3) If directions are North-East, North-West, South-East or South-West then take both directions as single direction and calculate the distance using the formula.

$$\sqrt{(\text{First Distance})^2 + (\text{Second Distance})^2}$$

Example: A man walk 15 km towards North. From there he walks 10 km towards East. Then 15 km towards South. Finally he walks towards East 12 km. How far and in which direction is he with reference to his starting point?

Explanation: Diagrammatic Method



The shortest distance is $AD + DE = 10 + 12 = 22$ km and the direction is East.

Shortcut Method:

First he walked 15 km North, so write N(15).

Next he walked 10 km East, so write E(10) i.e. N(15)E(10) and continue till the last statement.

Then we get, N(15) E(10) S(15) E(12)

Now apply the tips discussed above.

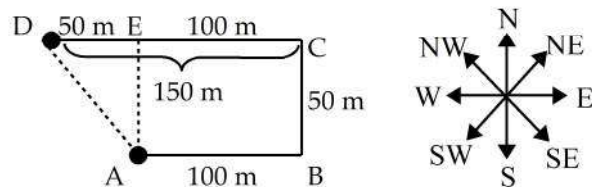
i.e. add E(10) and E(12) = E(22) (\because same directions)

and subtract N(15) and S(15) = 0 (\because opposite directions)

\therefore Finally he is in East direction with distance 22 km.

Example: A Boy started to school from his home. He walks 100 m in East. Then he walks 50 m to his left. From there he walks 150 m to his left again, finally he reached his school. How far and in which direction his school is located from his home?

Explanation: Diagrammatic Method:



From $\triangle ADE$ the shortest distance is AD.

$BC \parallel EA$. So, $BC = EA = 50$.

$$AD = \sqrt{(AE)^2 + (DE)^2} = \sqrt{(50)^2 + (50)^2}$$

$$AD = \sqrt{2500 + 2500} = \sqrt{5000} = 10\sqrt{50}$$

The school is in North West direction and at a distance of $10\sqrt{50}$ meters from his home.

Shortcut Method:

Write from starting point to destination.

i.e. E(100) N(50) W(150)

East and West are opposite directions to each other, so subtract them and write the direction which has highest value. i.e. W(50).

$$N(50) W(50) = NW \left[\sqrt{(50)^2 + (50)^2} \right]$$

$$= NW \left[\sqrt{2500 + 2500} \right] = NW \left[\sqrt{5000} \right] = NW \left[10\sqrt{50} \right]$$

Required direction = North-West; Distance = $10\sqrt{50} m$

Type-(2): Problems on Clocks:

Steps to Solve:

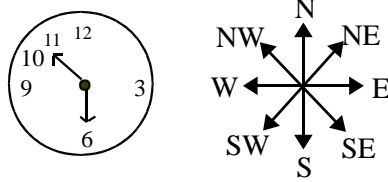
- 1) Representing the given time in a clock diagram.

Rotate the directions diagram according to the given clock timings. (Rotation of the direction arrows either clock wise or and clockwise but maximum 180° only).

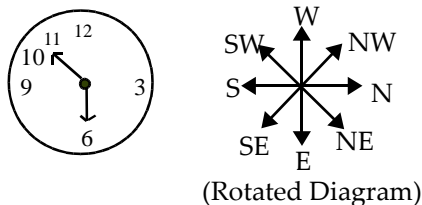
- 2) If two timings are given in the problem, then apply the same rotated directions to second timing also.

Example: A clock shows 10:30 (*am/pm*). If its minute hand points to East, then its hour hand points to?

Explanation: Represent the given time in a clock.



In the question it is given that, minute hand is pointing to *East*. But in the above diagram minute hand is pointing to *South*. So, rotate the directions diagram in such a way that the minute hand points to *East*. To do so, we have to rotate directions diagram 90° clock wise as shown below.



(Rotated Diagram)

Now you see the hour hand in the clock and compare its direction with rotated directions diagram. Then we will come to know that the hour hand points SW direction.

Type-3: Problems on Angles:

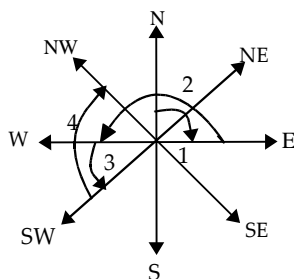
Steps to Solve:

- 1) If the given object moves in *clockwise* or it's *right hand side* then do *addition*. If it moves in *anti clockwise* or it's *left hand side* then do *subtraction*.
- 2) Now you will get a single degree value like 45° , 90° so on up to 180° . If the value is *positive* move the object in *clock wise* direction from its starting point or if the value is *negative* move the object in *anti clock wise* direction from its starting point.

Example: A man is facing North, he turns to his right 90° . Then he turns 180° in anti clock wise direction. Again he turns in the same direction 45° . Finally he turns 90° in the clock wise direction. In which direction is he facing now?

Explanation: Diagrammatic Method:

Indicate the movements of the person according to the given question.



Numbers in the above diagram indicates his movements from starting point to ending point. So, finally he is facing in *North-West* direction.

Shortcut Method: First the given object (man) moves in right hand side 90° , so write $+90^\circ$. Next the man moves 180° in anti clock wise, so write -180° . Next he turns 45° in the same direction *i.e.* in his previous direction, so write -45° . Finally he turns 90° in clockwise direction, so write $+90^\circ$. Now, by combining all the above four we get, Direction = $90^\circ - 180^\circ - 45^\circ + 90^\circ = -45^\circ$.

(*minus* indicates anti clock wise direction)

So move 45° in anti clock wise direction from his starting point.

i.e. 45° anti clockwise from *North* = *North-West* direction.

So, the man is facing NW direction finally.

Type-(4): Problems on shadows:

In this type of problems we will see two objects. These problems always depends on the sun. Here we are giving some tips to solve these problems easily.

- 1) Locate the person in the **North**, if the shadow is falling to his right (If Sun is in East only; morning time).
- 2) Locate the person in the **South**, if the shadow is falling to his left (If Sun is in East only; morning time).
- 3) If the sun is in **West** (*i.e.* in the evening time) then interchange North and South in (1) and (2).

Example: One morning after sunrise P went for a walk, he found that his friend Q is coming in opposite direction. P observed that, the shadow of Q is exactly falling to his right. Form which direction is P coming?

Explanation: Given that the shadow is falling to the right of P. So, locate P in the North. Then Q will be in South. So, we can say, P is coming from North direction.

CONCEPTUAL EXAMPLES

1) A girl is going to her friend's house. She went 45m West. Next she went 60m to her right, then she again took right and walked 75m. From there she went in her left direction and walked 30m to reach her friend's house. How far her friend's house is located with reference to her starting point.

a) 205 m b) 305 m c) 300 m d) $40\sqrt{10}m$ e) $30\sqrt{10}m$

Explanation: Using shortcut method:

W(45)N(60)E(75) N(30).

East and West are opposite. So subtract = E(30).

N(60) and N(30) are same direction. So add = N(90).

$$N(90) E(30) = NE \left(\sqrt{(90)^2 + (30)^2} \right) = NE \left(30\sqrt{10} \right)$$

Her friend's house is located at $30\sqrt{10}m$ distance with reference to her starting point.

Ask doubt with Question Id: 8011



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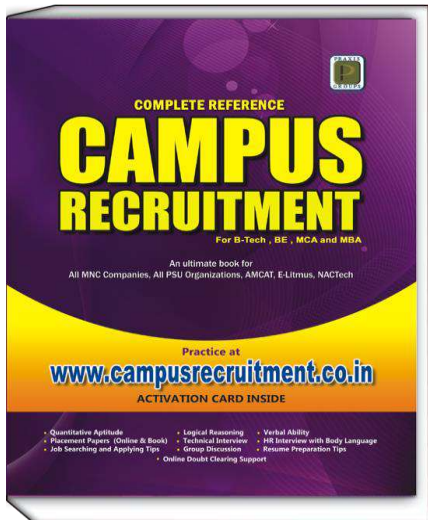
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SYLLOGISMS

CONCEPTS

Questions on syllogism contains statements followed by conclusions. You have to analyze the given statements carefully and find which of the conclusions logically follow.

Each statement of syllogism contains of three parts. They are, *subject*, *predicate* and *copula*.

Subject is that about which something is said.

Predicate is that part of the statement that which affirms is denied about the subject.

Copula is the word of the statement which denotes the relation between the subject and predicate.

Example: Consider the statement, '*woman is talented*'.

Here an information about *woman* is given. So, *woman* is the subject. '*talented*' is the quality affirmed for this subject. So it is the predicate. '*is*' denotes the relation between subject and predicate. So, it is *copula*.

Here we will discuss three types of methods to solve the questions on syllogism.

- 1) Diagrammatic method
- 2) Rules and Application method
- 3) Numbering and Apply method

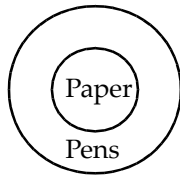
1) Diagrammatic Method:

To solve the syllogism questions in this method, you have to represent the given statements in the form of a diagram.

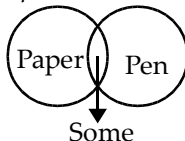
In syllogisms, frequently we come across the terms like *all*, *some* and *no*, *not* etc.

Example: 1) *All papers are pens.*

If the above statement are represented in a diagram, *papers* will be in inner circle and *pens* will be in outer circle. i.e.

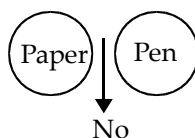


2) *Some papers are pens.*



3) *No paper is pen.*

'*no*' indicates there is no relations exists between subject and predicate of the given statement. Hence, the two circles will not meet each other.



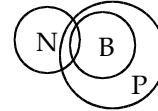
Example: Statements: Some Note books are books

All books are papers

Conclusions: I. Some Notebooks are papers

II. No papers is notebook

Explanation: The possible Venn diagram for the given statements is as follows:



From the given statements, statement-I follows from the above diagram but statement-II does not follow.

Ask doubt with Question Id: 8078

2) Rules and Application Method:

The following rules are very useful while solving problems using this method.

<i>all</i>	+	<i>all</i>	→	<i>all</i>
<i>all</i>	+	<i>no</i>	→	<i>no</i>
<i>some</i>	+	<i>all</i>	→	<i>some</i>
<i>all</i>	+	<i>some</i>	→	no conclusion
<i>no</i>	+	<i>no</i>	→	no conclusion
<i>some</i>	+	<i>some</i>	→	no conclusion
<i>some</i>	+	<i>no</i>	→	<i>some-not</i>
<i>no</i>	+	<i>all</i>	→	reverse of <i>some-not</i>
<i>no</i>	+	<i>some</i>	→	reverse of <i>some-not</i>

some-not/reverse of *some-not* + anything = no conclusion.

Implication Statements:

1) All → Some

If '*all A's are B's*' then '*some A's are B's*' is also true.

2) Some ↔ Some

If '*some cats are rats*' then '*some rats are cats*' is also true.

3) No ↔ No

If '*no car is bus*' then '*no bus is car*' is also true.

Note: For *either-or* option: If one conclusion is positive (i.e. starts with *all/ some*) and the other conclusion is negative (i.e. starts with *no*) and if they both have same objects as that of the given statements then the answer will be those two conclusions with *either-or* words.

Example: 1) Statements: Some keys are locks

All locks are doors

Conclusions: I. All keys are doors

II. Some keys are doors

III. Some keys are not doors

a) only conclusion-(I) follows

b) only conclusion-(II) follows

c) only conclusion-(III) follows

d) both conclusion-(I) and (III) follows

e) None of the given conclusions follow

Explanation:

Step-1: Compare special words in both the statements.
i.e. *some* + *all*. Then, from the rule, *some* + *all* → *some*.

Step-2: Compare *predicate* of the first statement and *subject* of the second statement. If both are same then cancel them and deduce a new conclusion.

Some keys are ~~locks~~

+

All ~~locks~~ are doors

↓

Some keys are doors

'some keys are doors' is there in conclusion-(II). So, only conclusion-(II) follows. Hence, option-b is correct.

Note: From the given two statements if *subject* of the first statement and *predicate* of the second statement are not same, then it is not possible to deduce any conclusion from the two statements.

Ask doubt with Question Id: 8079

2) Statements: All bags are books

All pens are pencils

Conclusions: I. All bags are pencils

II. Some bags are pens

III. All pens are books

a) only conclusion-(I) follows

b) only conclusion-(II) follows

c) only conclusion-(III) follows

d) no conclusion follows

Explanation: Since the *subject* of the first statement and *predicate* of the second statement are not same, we cannot apply any rule. Hence, no conclusion follows.

Ask doubt with Question Id: 8080

3) Numbering and Apply Method:

The following rules are also very useful while solving the problems in this method.

s.no	1 st statement	2 nd statement	Final Conclusion
1	Positive	Positive	Positive
2	Positive	Negative	Negative
3	Negative	Positive	Negative
4	Negative	Negative	No Conclusion

Positive → *some/all*; Negative → *no/some-not*

Direct Relation: If any conclusion is/are directly derived from any of the given statement then it is called direct relation.

Indirect Relation: If the conclusion is not directly derived from any of the given statements then it is called indirect relation.

Consider the below *value table* which helps in solving the problems in this method.

Value Table:

Statement	Subject	Predicate
<i>all</i>	100	50
<i>some</i>	50	50
<i>no</i>	100	100

Note: Consider the values given for the words in the *statements* as *income*. And values given for the words in the *conclusions* as *expenditure*.

Example: Statements: Some notebooks are books

All books are papers

Conclusions: I. Some notebooks are papers

II. No papers is notebook

Using the above value table we can number *subject* and *predicate* parts of the given statements and conclusions as shown below.

Statements	Conclusions
50 50	50 50
Some notebooks are books	Some notebooks are papers
100 50	100 100
All books are papers	No papers is notebook
Incomes	Expenditures

Steps to Solve:

Step-1: Observe the statements and conclusions using *positive* and *negative* table. If it is applicable then only go to the next step, else conclude.

Step-2: Assign the values to statements and conclusions using value table.

Step-3: Check every conclusion whether it has direct relation with the given statements. If yes go to step-4 else go to step-5.

Step-4: If the conclusion has direct relation then, compare total *income* and *expenditure* of subject and predicate separately and check if $income \geq expenditure$.

If both subject's and predicate's $income \geq expenditure$ then that conclusion is said to be true.

Step-5: If no direct relation exists between subject and predicate of any conclusion, then check which two statements has to be combined to get that particular conclusion. Then find the common word in those statements. Common word must have at least one value as 100. If Income of every word \geq Expenditure of every word, then that conclusion is true.

Lets apply these method to an example.



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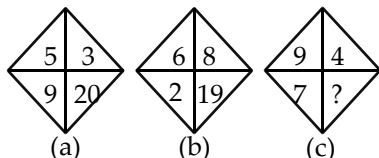
CHARACTER PUZZLE

CONCEPTS

In this type of questions, a figure or a matrix is given in which some numbers are filled according to a rule. A place is left blank. You have to analyze the given character or number and find out the missing number or letter from the given possible answers which may be filled in the blank space.

CONCEPTUAL EXAMPLES

1) Which number will replace the question mark?



- a) 236 b) 336 c) 286 d) 386 e) 436

Explanation:

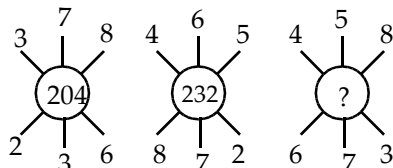
From figure (a), $9 + 5 + 3 = 17 \Rightarrow 17 + 3 = 20$

From figure (b), $2 + 6 + 8 = 16 \Rightarrow 16 + 3 = 9$

From figure (c), $7 + 9 + 4 = 20 \Rightarrow 20 + 3 = 23$

Ask doubt with Question Id: 8206

2) Which number will replace the question mark?



- a) 23 b) 18 c) 22 d) 21 e) None of these

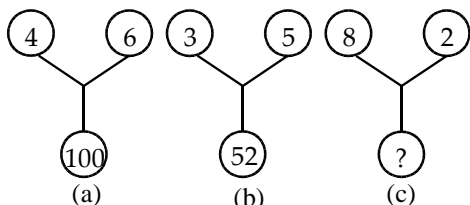
Explanation: $[3 \times 7 \times 8] + [2 \times 3 \times 6] = 204$

$$[4 \times 6 \times 5] + [8 \times 7 \times 2] = 232$$

Similarly, $[4 \times 5 \times 8] + [6 \times 7 \times 3] = 286$

Ask doubt with Question Id: 8207

3) Which number will replace the question mark?



- a) 81 b) 84 c) 516 d) 514 e) 86

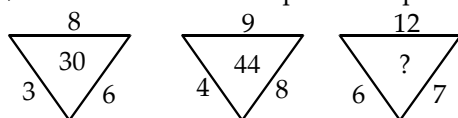
Explanation: From (a), $4^3 + 6^2 = 64 + 36 = 100$

$$\text{From (b), } 3^3 + 5^2 = 27 + 25 = 52$$

So, From (c), $8^3 + 2^2 = 512 + 4 = 516$

Ask doubt with Question Id: 8208

4) Which number will replace the question mark?



- a) 79 b) 89 c) 99 d) 69 e) 109

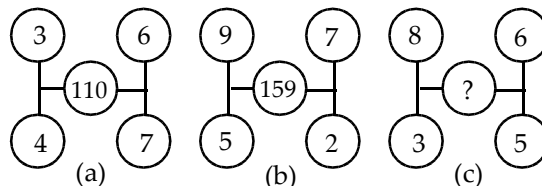
Explanation: From (a), $8 \times 3 + 6 = 30$

$$\text{From (b), } 9 \times 4 + 8 = 44$$

$$\text{So, from (c), } 12 \times 6 + 7 = 79$$

Ask doubt with Question Id: 8209

5) What number will replace the question mark?



- a) 229 b) 134 c) 329 d) 439 e) 339

Explanation: From (a), $3^2 + 6^2 + 4^2 + 7^2 = 110$

$$\text{From (b), } 9^2 + 7^2 + 5^2 + 2^2 = 159$$

$$\text{So, from (c), } 8^2 + 6^2 + 3^2 + 5^2 = 134$$

Ask doubt with Question Id: 8210

6) Which number will replace the question mark?

12	19	16
4	3	?
6	3	8
8	19	4

- a) 8 b) 16 c) 4 d) 2 e) None of these

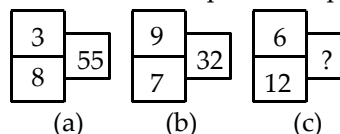
Explanation: From Column-I: $(12 \times 4) \div 6 = 8$

From column-II: $(19 \times 3) \div 3 = 19$

So, from column-III: $(16 \times ?) \div 8 = 4 \Rightarrow 16 \times ? = 32 \Rightarrow ? = 2$.

Ask doubt with Question Id: 8211

7) Which number will replace the question mark?



- a) 108 b) 46 c) 64 d) 104 e) can't be determined

Explanation: From (a), $8^2 - 3^2 = 55$

$$\text{From (b), } 9^2 - 7^2 = 32$$

$$\text{So, from (c), } 12^2 - 6^2 = 108$$

Ask doubt with Question Id: 8212

8) Which character will replace the question mark?

A ₅	F ₁₀	K ₁₅
B ₁₆	G ₂₁	L ₂₆
C ₂₇	H ₃₂	?

- a) M₃₇ b) N₃₆ c) O₃₇ d) M₃₆ e) M₃₈

Explanation:

From column-I, A → B → C (5+11+11)

From column-II, F → G → H (10+11+11)

From column-III, K → L → M (15+11+11)

The character M₃₇ will replace the question mark

Ask doubt with Question Id: 8213



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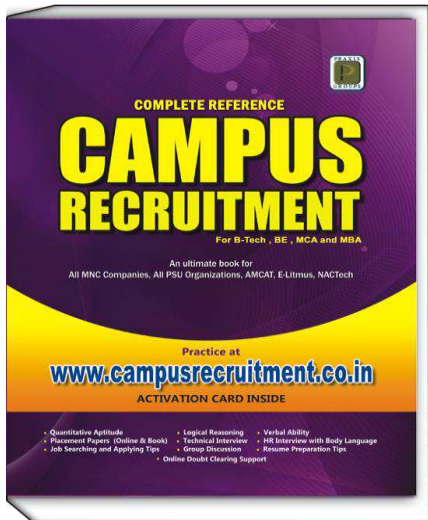
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ARITHMETIC REASONING

CONCEPTS

Arithmetic Reasoning involves logical calculation, Venn-diagram and data-based problems. In this type of problems, some information is given, which makes us get confused. You need to analyze that information carefully and answer the question accordingly.

CONCEPTUAL EXAMPLES

1) Kiran, an eight years old boy has 27 toys. He gave 19 toys to his brother Gourav, while Gourav playing all but 6 got destroyed. While Kiran playing all but 3 got destroyed. Finally how many toys left with both of them?

- a) 10 b) 18 c) 9 d) 8 e) none of these

Explanation: While Gourav playing 'All but 6 got destroyed' means 'All except 6 got destroyed'.

i.e., 13 toys got destroyed. It means now Gourav has 6 toys. While Kiran is playing 'All but 3 got destroyed' means 'except 3 all are not working i.e; 3 toys are good working so total toys at both of them is $6 + 3 = 9$.

Ask doubt with Question Id: 8282

2) Rohith, who works in a parcel service, has a certain number of small plastic boxes to pack into parcels. If he packs 3, 4, 5 or 6 in a parcel, he is left with one over; if he packs 7 in a parcel, none is left over. What is the number of boxes, he may have to pack?

- a) 300 b) 500 c) 301 d) 200 e) 201

Explanation: The required number of boxes is such that it leaves a remainder of 1 when divided by 3, 4, 5 or 6 and no remainder of 1 when divided by 3, 4, 5 or 6 and no remainder when divided by 7. Such a number is 301.

Ask doubt with Question Id: 8283

3) If man pays ₹20 for each km which he travels by taxi and ₹10 for each km which he travels by bus. If in one week he paid ₹800 for traveling 60 km. How many kilometers did he travel by taxi?

- a) 10 b) 15 c) 25 d) 20 e) 50

Explanation: Let the distance covered by the taxi be ' x ' km. Then, distance covered by bus = $(60 - x)$ km.

$$20x + 10(60 - x) = 20x + 600 - 10x = 800$$

$$10x = 200 \Rightarrow x = 20 \text{ km.}$$

He traveled 20 km by taxi.

Ask doubt with Question Id: 8284

4) In a group of dogs and peacocks, the number of legs are 18 less than four times the number of heads. How many peacocks are there in that group?

- a) 9 b) 16 c) 8 d) 12 e) 13

Explanation: Let the number of dogs be ' x ' and the number of peacocks by ' y '.

Then, number of legs in the group = $4x + 2y$.

Number of heads in the group = $x + y$

$$\text{So, } 4x + 2y = 4(x + y) - 18 \Rightarrow 2y = 18 \Rightarrow y = 9$$

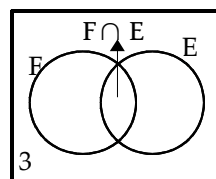
Number of peacocks in that group = 9.

Ask doubt with Question Id: 8285

5) In a group of 15 people, 8 read English, 7 read French while 3 of them read none of these two. How many of them read French and English both?

- a) 6 b) 3 c) 5 d) 4 e) 2

Explanation: In the following Venn diagram, F and E represent people who read French and English respectively.



$$\text{Now, } [F + (F \cap E)] + E = 15 - 3 \text{ (or) } F + E + (F \cap E) = 12 \dots\dots(1)$$

$$\text{Also, } F + (F \cap E) = 7; \quad E + (F \cap E) = 8.$$

$$\text{By adding, } F + E + 2(F \cap E) = 15 \dots\dots\dots(2)$$

By subtracting (1) from (2), we get $(F \cap E) = 3$.

\therefore 3 of them read both French and English.

Ask doubt with Question Id: 8286

EXERCISE

1) The number of girls in a class is 5 times the number of boys. Which one of the following numbers cannot represent the total number of children in the class.

- a) 36 b) 41 c) 42 d) 48 e) 72

2) In a class, there are 21 boys who are over 160 cm tall. If these constitute three-fourth of the boys and the total number of boys is one-fourth of the total number of students in the class. What is the total number of girls in the class?

- a) 84 b) 68 c) 74
d) 64 e) cannot be determined

3) In a BCCI meeting there are ten people. All shake hands with each other once. How many handshakes will be there altogether?

- a) 10 b) 100 c) 45 d) 95 e) 15

4) A certain number of donkeys and an equal number of men are going to a village. Half of the men are on their donkey's back while the remaining are walking along leading their donkeys. If the number of legs walking on the ground is 70. How many donkeys are there?

- a) 16 b) 18 c) 17 d) 14 e) 28



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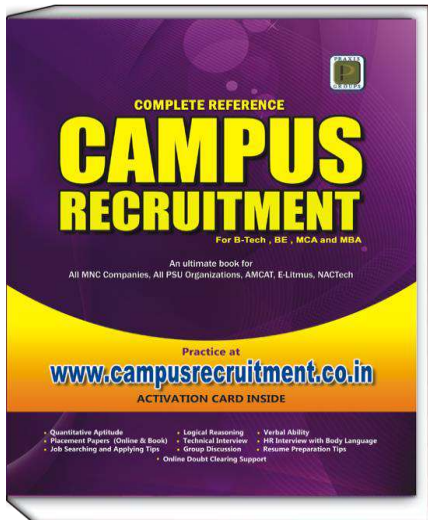
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STATEMENTS AND ARGUMENTS

CONCEPTS

In this type of questions, the statement deals with all general aspects of day to day life which may include socio economic, scientific, political issues etc. A statement is followed by two arguments. One supports the statement by pointing out the positive aspects and the other deny the statement by pointing out it's negative impact. You have to analyze given statement, arguments and decide which of the arguments strongly supports the statement by giving an appropriate opinion on the subject. Read the given arguments in the question and discard them if they are *ambiguous*, *disproportionate*, *irrelevant*, *comparative*, *simplistic*.

1) Ambiguous: If the given arguments does not have a clear reason or if it is not contextual or not expressing its opinion whether supporting or not. Such an argument should be discarded.

2) Disproportionate: If the given arguments are too large or too small in comparison with given statements. This kind of arguments can be discarded.

3) Irrelevant: If the given arguments are irrelevant to the context of the given statements, they can be discarded.

4) Comparative: If the argument do not state the reasons for why the proposed action is implemented and its consequences. Such arguments can be discarded.

5) Simplistic: If the given arguments do not have sufficient information to support the given statements, they cannot be considered.

CONCEPTUAL EXAMPLES

Direction: Each of the following examples consists of a statement followed by two arguments (I) and (II). Give your answer as,

a: if only argument-(I) is strong.

b: if only argument-(II) is strong.

c: if either argument-(I) or (II) is strong.

d: if neither of the arguments is strong.

e: if both the arguments are strong.

1) Statement: Should number of holidays be increased to private employees?

Arguments:

I. Yes, because employee satisfaction will be better.

II. No, it will lead to decreased productivity of private organizations.

Explanation: Though employee satisfaction is important but this will adversely affect the productivity and revenue of the organization. So the

argument-(I) does not hold strong. Hence, only argument-(II) is strong.

Ask doubt with Question Id: 8322

2) Statement: Should taxes on air conditioners be further increased?

Arguments:

I. Yes, air conditioner is a luxury item and rich people can only buy them.

II. No, air conditioners are bought by financially backward sector also.

Explanation: Generally, taxes on any commodities or goods doesn't depend on the financial position of the individuals so, both the arguments does not hold strong. Hence, option-d is correct choice.

Ask doubt with Question Id: 8323

3) Statement: Should Indian software professionals who are working abroad be called back?

Arguments:

I. Yes, they must serve the mother land first and forget about high pay scales or facilities etc.

II. No, we have adequate talent here, let them stay according to their will and wish.

Explanation: The demands of an individual are as important as the demands of motherland. So, argument-(I) is not strong. Argument-(II) is weak because of its complacent attitude. Hence, option-d is correct choice.

Ask doubt with Question Id: 8324

4) Statement: Should education to women be made free in India?

Arguments:

I. No, this will weaken our present social structure.

II. Yes, this is the only way to bring back glory to Indian woman hood.

Explanation: Argument-(I) is strong. It is links, providing free education to women with weakening of social structure, which is not sensible. Argument-(II) also weak because of the term '*only*'.

Hence, option-d is correct choice.

Ask doubt with Question Id: 8325

5) Statement: Are joint families better than small families.

Arguments:

I) Yes, joint families provide more security and unity and also reduce the burden of work.

II) No, small families ensure more freedom.



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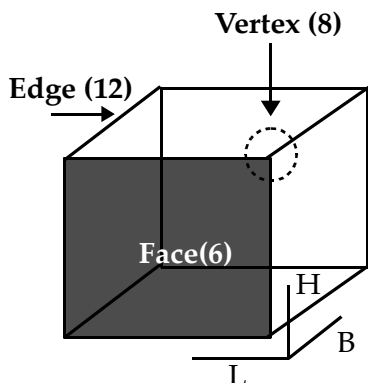
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CUBES AND DICES

CONCEPTS

- **Cubes:** A cube is a three dimensional figure, which have 6 surfaces, 8 corners and 12 edges.

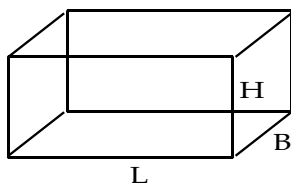


If a cube is painted with same colour and let ' n ' be the number of separations made to the bigger cube then

1. Number of smaller cubes with 3 surfaces painted = 8.
2. Number of smaller cubes with 2 surfaces painted = $(n-2) \times 12$.
3. Number of smaller cubes with one surface painted = $(n-2)^2 \times 6$.
4. Number of smaller cubes with no surface painted = $(n-2)^3$.

• In general, a cube of edge length ' a ' units can be divided into ' a^3 ' unit cubes i.e. the number is equal to the volume of the cube.

- **Cuboid:** A Cuboid is a solid body with each face being a rectangle. Hence, Cuboid has length, breadth and height.



Let the *length*, *breadth* and *thickness(height)* be a , b and c respectively.

Volume of Cuboid = $\text{length} \times \text{breadth} \times \text{height}$

• A cuboid with length a , breadth b and height c is divided into unit cubes i.e. $a \times b \times c$ unit cubes = volume.

Number of unit cubes with 3 face visible = 8

Number of unit cubes with 2 faces visible =

$$4(a-2) + 4(b-2) + 4(c-2) = 4[a+b+c-6]$$

Number of unit cubes with 1 face visible =

$$2[(a-2)(b-2) + (b-2)(c-2) + (a-2)(c-2)]$$

Number of unit cubes with no face is visible

$$=(a-2)(b-2)(c-2)$$

- **Dices:** Dices are three dimensional figures, which can be either cubes or cuboids. They have 6 faces and each face is numbered from 1 to 6. The labeling of the 6 faces of the dice can be done as follows:

Approach: 1) Study the figures given and the numbers labeled on the faces of the dice.

2) Find the adjacent numbers of each number.

3) Find the missing numbers of each figure.

4) With the help of the adjacent and the missing number of the figures, we can answer the given dice problem.

CONCEPTUAL EXAMPLES

- 1) A cube is painted blue on all of its surfaces. It is then cut in to 27 smaller cubes of equal size. Find how many smaller cubes have no color?

Explanation: If the cube is cut in to 27 smaller cubes, then number of separations made = $n = 3$ (since $3 \times 3 \times 3 = 27$).

$$\text{Number of smaller cubes with no color} = (n-2)^3 = (3-2)^3 = 1^3 = 1$$

Ask doubt with Question Id: 7742

- 2) A cube 125 mt is colored pink on two opposite surfaces and then cut in to 125 smaller cubes then find how many number of cubes have pink color?

Explanation: 125 m is cube got separated in to 125 smaller cubes.

$$\therefore \text{Size of the big cube} = 5 \text{ m}$$

$$(\text{Since } 5\text{m} \times 5\text{m} \times 5\text{m} = 125 \text{ m}^3)$$

$$\text{Size of the smaller cube} = 1 \text{ m.}$$

$$\text{Number of separations made} = \frac{5}{1} = 5$$

The no. of small cubes get painted on one surface = 25.

$$\text{Total no. of smaller cubes get pink color} = 25 + 25 = 50$$

Ask doubt with Question Id: 7743

- 3) A cube is painted such that one pair of surfaces is painted brown and the other pair of surfaces is painted orange. The cube is cut in to 64 small cubes of equal size. Find how many cubes have both the color brown and orange?

Explanation: There are 6 surfaces to the cube. In which opposite surfaces are painted brown and other 2 opposite surfaces are painted orange. Then 4 edges of the cube have both the colors. Since the big cube cut in to 64 smaller cubes, the 4 edges of the cube have both the colors. Since the big cube cut into 64 smaller cubes, the 4 edges of the big cube has $4 \times 4 = 16$ smaller cubes have both brown and orange colors. Answer = 16.

Ask doubt with Question Id: 7744

4) Adjacent surfaces of a cube are painted yellow color. The cube is cut in to 8 smaller cubes. Find how many cubes have yellow color?

Explanation: The cube is painted with 2 adjacent surfaces and remaining 4 surfaces are not painted. In which, edges of cube are not at all painted. In one edge, it has two smaller cubes. Remaining all are painted.

Number of cubes painted in the cube = $8 - 2 = 6$

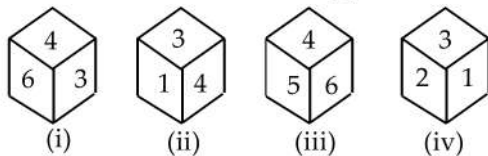
Ask doubt with Question Id: 7745

5) A cube of adjacent 3 surfaces are painted white and the other surfaces painted green. If the cube cut in to 216 equal cubes. Find how many cubes have both the colors white and green?

Explanation: From the adjacent diagram, The smaller cubes occurred in 4 edges (Out of 12) have both the colors white and green. \therefore No. of required cubes = $4 \times 6 = 24$

Ask doubt with Question Id: 7746

6. Find the number on the dice opposite to number 2?

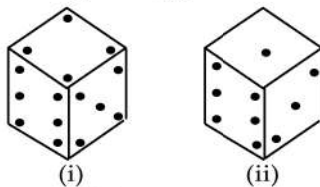


- a) 6 b) 5 c) 4 d) 3

Explanation: In figure-(ii), 4 is adjacent to 1 and 3. In figure-(iv), 2 is adjacent to 1 and 3. Hence, we can say, 4 is opposite to 2. Hence, option-c is correct choice.

Ask doubt with Question Id: 7747

7. Two positions of a dice are given below. Find the number at the place opposite to 4?

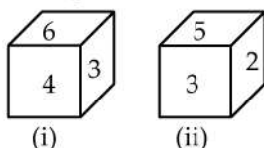


- a) 1 b) 2 c) 3 d) 5

Explanation: From figure-(i) and (ii), either 1 or 3 can be opposite to 4. If we observe the dice (i), if turns two steps upwards LHS, then it came 1 at top and 4 has gone to bottom. So, 1 is opposite to 4.

Ask doubt with Question Id: 8335

8. From the below figures, find the number at the bottom, when top is 5?



- a) 6 b) 4 c) 3 d) 2

Explanation: Imagine, as if the figures are rotated in such a way that the common side i.e. 3 at the bottom in

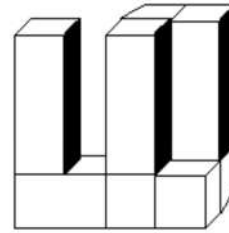
both the figures. Then compare the sides.

Then 6 is opposite to 2 and 4 is opposite to 5.

Ask doubt with Question Id: 8546

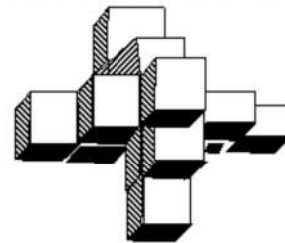
EXERCISE

1) Count the number of blocks in the given figure.



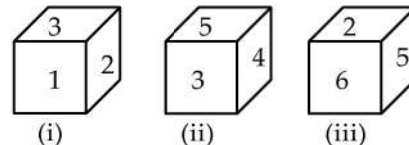
- a) 6 b) 7 c) 8 d) 9 e) 10

2) Count the number of cubes in the given figure?



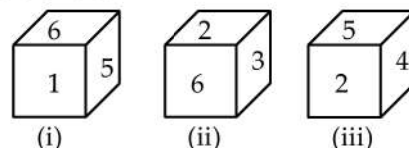
- a) 17 b) 13 c) 15 d) 16 e) 14

3) From the below diagrams, find what numbers are opposite to 3 and 1.



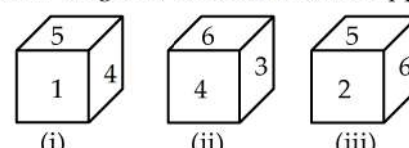
- a) 2, 5 b) 4, 2 c) 2, 4 d) 5, 6 e) 6, 5

4) From the below diagrams find what numbers are opposite to 5 and 6?



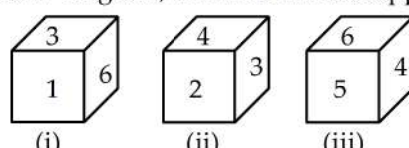
- a) 1, 2 b) 3, 4 c) 4, 5 d) 4, 6 e) 2, 3

5) From below diagram, find the number opposite to 2?



- a) 1 b) 3 c) 4 d) 5 e) 6

6) From below diagram, find the number opposite to 2?



- a) 1 b) 3 c) 4 d) 5 e) 6



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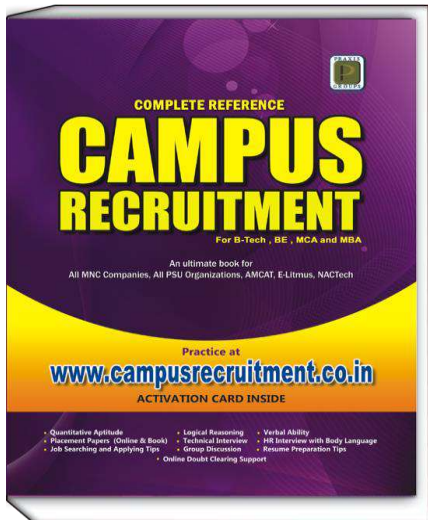
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PARTS OF SPEECH

Parts of speech in a language mean the role or part played by a word in a sentence. This is similar to the roles we play in our lives. In one place you might be a student, in another a friend, yet in another, if you are working, you might be a boss or a subordinate. We also play different roles at home when we interact with different people. In all the roles we play, our role and interaction depends upon the relationship with the people with whom we are interacting. Similarly, words are categorized according to the role or part they play in a sentence. Seeing a word, we cannot categorize it as a noun/ pronoun/ verb/ adjective etc. In order to categorize a word, we need to know what role it plays in the sentence. Words are normally categorized into 8 parts of speech. Here we give you the categories with some examples:

Part of Speech	Function	Example Words	Example Sentences
NOUN	Name of a person, place, thing or quality	Girl, Manchester, Gandhiji, peace, honesty	• <i>Gandhiji</i> loved peace.
PRONOUN	Words used instead of a noun	He, she, our, theirs, my ...	• <i>She</i> is <i>our</i> teacher.
ADJECTIVE	Words used to describe nouns.	Beautiful, big, tall, awesome ...	• The girl is <i>tall</i> . • Gandhi was a <i>great</i> leader.
VERB	Words which tell the state of a thing, possession and action.	Be verbs, have verbs and do verbs, am, Is, are, was, were, have, has, had Do, does, did work, talk, walk ...	• She <i>is</i> my friend. • He <i>paints</i> well. • She <i>works</i> meticulously.
ADVERB	Words which tell us where, when and how an action takes place, as well as to what degree an action takes place.....	fast, very, sincerely, properly, quite	• She works <i>fast</i> . • This train is <i>quite fast</i> .
PREPOSITION	Words which tell us the position or relationship between two nouns in a sentence.	In, on, between, under, for, near, by, with ...	• There's a park <i>near</i> my house. • Your pen has fallen <i>under</i> the chair.
CONJUNCTION	Words which join other words or sentences to make language more concise	And, but, or, neither...nor, either...or, so when, while, who whom.....	• Bread <i>and</i> butter is taken by many for breakfast. • He started early <i>but</i> could not reach on time.
INTERJECTION	Words used to express sudden feelings and expressions.	Wow! Great! Spectacular! Awesome!	• <i>Wow!</i> What a great shot! • What a <i>spectacular</i> performance!

Let's see these parts of speech in detail:

NOUN

Nouns are commonly called naming words. *i.e.* names of persons, places, things, quality and material.

Nouns are of five kinds:

- **Proper nouns** are names of persons, places, rivers and mountains.

e.g.: Ravi, India, Hyderabad, Godavari, Himalayas.

These always start with a capital letter.

- **Common nouns** are names given commonly for places, persons, animals, things etc.

e.g.: village, town, boy, girl, dog, pen, pencil, trees, etc

- **Collective noun** is the name given to a group of animals, things and people.

e.g.: a staff of teachers, a school of fish, a flock of birds, a bunch of grapes etc.

- **Abstract noun** is the name given to things which cannot be seen or felt, but thought of.

e.g.: happiness, wisdom, intelligence, patience etc.

- **Material nouns** refer to the names of material of which products are made.

e.g.: wood, leather, silk etc.

Apart from this, nouns are also classified according to number and gender.

Number:

- All nouns which can be counted are called *countable*.

e.g.: books, girls, pens, rooms, villages etc.

- Nouns which cannot be countable are called *uncountable*.

e.g.: milk, oil, hair, stars, news, advice, information etc.

1. Countable nouns can be either singular or plural. Singular denotes one and plural denotes more than one. Plurals are formed by adding- 's', 'es' or 'ies'.

e.g.: Girl – Girls, Church – Churches, Lily – Lilies.

2. Words ending in 'f' and 'fe' change into 'ves'.

e.g.: Life – Lives, Wife – Wives.

3. Plurals are also formed by changing the middle vowel. e.g.: Man – Men, Foot – Feet, Mouse – Mice

4. Words ending in 'y' preceded by a consonant change into 'ies' to form plurals.

e.g.: Story – Stories, Baby – Babies, Lady – Ladies.

5. Words of foreign origin form their plurals in a different way.

e.g.: Alumnus – Alumni, Curriculum – Curricula, Medium – Media.

There are certain exceptions to these rules which have to be memorized.

e.g.: Ox – Oxen, Roof – Roofs, Safe – Safes.

6. Some nouns do not have a plural form and are always used with a singular verb.

e.g.: advice, news, furniture.

The news is good.

Wooden furniture is expensive.

Your advice has been taken.

7. Units of counting hundred, thousand, pair, dozen, score etc, retain their singular form when used after numbers.

e.g.: She bought two score papers for her project.

(not *two scores*)

I need three dozen eggs.

Four hundred chairs were ordered for this hall.

8. Some nouns are used only in the plural:

a) Names of certain instruments which are used as a pair: scissors, pincers, pliers, tongs, spectacles.

b) Names of certain articles of dress: trousers, pants, shorts.

c) Names of certain diseases: mumps, measles.

d) Names of certain games: billiards, draughts.

e.g.: His new spectacles are very expensive.

These tongs are damaged.

His trousers are short.

Billiards is an interesting game.

Gender: There are four types of genders.

- Masculine gender refers to males.

e.g.: man, boy, lion, conductor.

- Feminine gender refers to females.

e.g.: woman, girl, lioness, conductress.

- Common gender refers to both males and females.

e.g.: child, teacher, engineer, servant.

- Neuter gender refers to lifeless or inanimate objects.

e.g.: table, book, chair etc.

Troublesome Rules and Confusing Areas

1. Failure in identifying nouns leads to common mistakes. Nouns generally end in:

-ness	- kindness, sadness, happiness
-tion	- nation, ration, action
-ssion	- commission, omission, permission, mission
-er	- player, driver, scavenger
-ice	- justice, practice
-sion	- division
-ance	- finance
-ment	- government, increment
-hood	- neighborhood, childhood
-dom	- freedom, kingdom, martyrdom
-cy	- hesitancy, piracy, conspiracy
-ist	- florist, chemist, dentist
-ity	- charity, enmity, locality
-ship	- friendship, workmanship

<p>2. Plurals of possessive nouns, which end in the letter 's', are formed by adding an apostrophe after the word. e.g.: Srinivas' desk, students' notebooks, girls' hostel.</p> <p>3. In case of joint possession, only the last word shows possession. e.g.: Rani and Raju's dog.</p> <p>4. In compound nouns only the last word shows possession. e.g.: Father-in-law's house, Editor-in-chief's office.</p> <p>5. Material nouns are not used in plural numbers. e.g.: This furniture is made of <i>wood</i>. (not <i>woods</i>)</p> <p>6. A collective noun usually takes a singular verb and is substituted by a singular pronoun. e.g.: The team <i>has</i> performed well. <i>It</i> has scored the highest number of runs in this series. But, if the members of the group act as individuals, not as a group, then the collective noun takes a plural verb and is substituted by a plural pronoun. e.g.: The council <i>has</i> submitted its report. (Here, <i>the council</i> is used as singular. So, singular verb, <i>has</i> is used) The council <i>are</i> divided on the outcome of the issue. (Here, the council is used as plural. So, plural verb, <i>are</i> is used).</p>	<p>14. He ate two breads for breakfast. (<i>two slices of bread</i>. <i>bread</i> is not countable)</p> <p>15. Ten miles are a long distance. (<i>is</i>)-a unit of distance so used as a singular.</p>
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Correction of Sentences

<p>1. The crowd were very big. (<i>was</i>)</p> <p>2. The chair is made of woods. (no plural for material nouns)</p> <p>3. My spectacles is broken. (<i>spectacles</i> is always plural so verb should be '<i>are</i>'. <i>Spectacle</i> also means scene).</p> <p>4. The Indian Army are helping the people of Nepal affected by earthquake. (<i>is</i>)</p> <p>5. Sachin Tendulkar scored more than twenty thousands runs in test cricket. (<i>thousand</i> - units of counting retain singular form).</p> <p>6. His trouser is new. (<i>trousers</i> - always plural) His trousers are new – <i>Correct</i>.</p> <p>7. He has a lot of properties. (<i>property</i> - abstract nouns not used in the plural)</p> <p>8. He has bought new furnitures. (<i>furniture</i>-no plural)</p> <p>9. She has got her hairs cut. (<i>hair</i> - not countable)</p> <p>10. You must brush your teeths regularly. (<i>teeth</i> itself is the plural form)</p> <p>11. The childrens of this school have performed well in the public examination. (<i>Children</i> - itself is the plural form)</p> <p>12. His wives purse was stolen. (<i>wife's</i>)</p> <p>13. I am visiting the New Delhi. (no article needed for proper names)</p>	
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SUBJECT - VERB AGREEMENT

1. All subjects must agree in number and person with the verb.

e.g.: The *students* of the primary section *are* going on a picnic.

The *quality* of these mangoes *is* very good.

2. Two or more singular subjects connected by 'and' usually take a verb in the plural.

e.g.: Sheela and Ragini *are* here.

Wealth and generosity *don't* go together.

3. If two singular nouns refer to the same person or thing the verb must be singular.

e.g.: My best friend and confidant *has* come.

(a *confidant* is a friend in whom you can confide your secrets)

The Chairman and Managing Director *is* going to address the employees.

4. If two subjects together express one idea, the verb is singular:

e.g.: Slow and steady *wins* the race.

Bread and butter *is* his only food.

5. Words joined to a singular subject by 'with, together with, in addition to, or as well as' are parenthetical and so the verb should be in singular.

e.g.: The house with its contents *was* insured.

The price of silver as well as gold *has* fallen.

6. Two nouns qualified by 'each' or 'every' even though connected by 'and' require a singular verb.

e.g.: Each senior member *was* honored.

Every man and woman *was* present at the festival.

7. Two or more singular subjects connected by 'or, neither..... nor, either.....or' take a verb in the singular.

e.g.: Neither he nor I *was* there.

Either he or I *am* mistaken.

8. When the subjects joined by 'or, nor' are of different numbers, the verb must be plural and the plural subject must be placed before the verb.

e.g.: Rana or his brothers *have* done this.

Neither the Principal nor the teachers *were* present.

9. When the subjects joined by 'or, nor' are of different persons, the verb agrees in person with the one nearest to it.

e.g.: Either he or I *am* mistaken.

Neither you nor he *is* to blame.

10. A singular verb should be used with a collective noun, when the collection is thought of as one whole.

A plural verb should be used with a collective noun when it refers to the individuals who comprise it.

e.g.: The crew *was* large.

The crew *were* taken prisoners.

The council *has* chosen its president.

The council *are* divided on the issue of making Aadhar card mandatory.

11. Some nouns which are plural in form, but singular in meaning, take a singular verb.

e.g.: The news *is* true.

Civics *is* important for people who wish to enter the civil services.

12. When the plural noun is a proper name for some single object or some collective unit, the verb should be singular.

e.g.: The United States *has* a big army.

Gulliver's travels *was* written by Swift.

13. When a plural noun denotes some specific quantity or amount considered as a whole, the verb is generally singular.

e.g.: Ten miles *is* not a short distance.

Fifty thousand rupees *is* a large sum.

14. A common blunder is to leave the Participle without proper subject.

e.g.: Sitting on a gate, a scorpion stung him. (*wrong*)
(who was sitting on the gate)

While he was sitting on the gate a scorpion stung him. (*correct*)

Being a hot day, I stayed at home. (*wrong*)

(who or what is the hot day)

It being a hot day, I stayed at home. (*correct*)

Correction of Sentences

1. She is going to temple everyday.

(simple present; so *goes*)

2. These school children needs books and pencils. (*need*)

3. When he is playing cricket, he fell down. (*was playing*)

4. She has completed her graduation last year.

(remove 'has')

5. They are living here since 2010. (*have been living*)

6. When the ambulance came the patient died. (*had died*)

7. They are having the same car for 10 years. (*have had*)

8. She will leave for Mumbai tomorrow. (*is leaving*)

9. We have gone to Chennai last week. (*have been to*)

10. She is hearing to carnatic music. (*listening*)

11. She never visited Charminar before.

(*had never visited*)

12. Your parcel didn't come yet. (*hasn't*)

13) He sleeping while his wife cleaning the house.

(*was sleeping was cleaning*)

14. I am liking mangoes. (*like*)

15. He is always forgetting my phone number. (*forgets*)



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CONJUNCTION

• A conjunction is a word which merely joins together words or sentences, they do no other work.

e.g.: She *and* her friends are visiting us.

He came early *but* couldn't complete the work.

• Some conjunctions are single and some conjunctions are used in pairs. Some of these are:

either – or, neither – nor, not only – but also, though – yet, whether – or etc. these conjunctions which are used in pairs are called Correlative Conjunctions or just Correlatives.

• Some compound expressions are also used as conjunctions and these are called compound conjunctions. Some of these are:

even if, as though, as well as, as if, as soon as, so that, in order that etc.

Conjunctions are divided into two classes:

Coordinating and Subordinating.

• **Coordinating Conjunctions** bring together two independent statements or two statements of equal rank or importance. The main coordinating conjunctions are: *and, but, or, nor, also, either-or, neither-nor*.

e.g.: He is slow *but* steady.

The thieves broke the door *and* entered the house.

You must return the book tomorrow *or* pay the fine.

• **Subordinating conjunctions** bring together two statements or clauses, one of which is dependent on the other. The chief subordinating conjunctions are:

after, because, if, that, though, although, till, before, unless, as, when, where, while.

e.g.: You will pass *if* you work hard.

He didn't speak up *because* he was afraid.

Though he was ill, he attended the meeting.

He came *after* I had left.

Subordinating conjunctions may be classified according to meaning or function:

1. Time:

e.g.: I knew him *before* he came here.

I waited *till* the train arrived.

2. Cause or reason:

e.g.: *Since* you say so I must believe it.

He did not come *because* you did not call him.

3. Purpose:

e.g.: We eat *that* we may live.

He deserved the prize *for* he had worked hard.

4. Result or consequence:

e.g.: He was rude *so* he was punished.

5. Condition:

e.g.: *Unless* you bring your Passport, the tickets cannot be booked.

If you had asked me earlier, I could have helped you.

6. Comparison:

e.g.: She is *as* tall as her sister.

He is richer *than* I am.

7. Concession:

Although he worked hard, he could not get a state rank.

Though he is strong, he is unable to do this work.

Troublesome Rules and Confusing Areas

1. The most common mistake is the placement of the conjunction. The conjunction should be placed just before the clause it introduces.

e.g.: It is raining *because* he has not come. (*incorrect*)

He has not come *because* it is raining. (*correct*)

2. 'Scarcely' is followed by 'when'.

e.g.: *Scarcely* had we entered the house *when* it started raining.

3. 'No sooner' is followed by 'than'.

e.g.: No sooner had she got her results than she got a job.

4. 'Neither' is followed by 'nor'.

e.g.: He is neither intelligent nor hardworking.

5. While using 'not only . . . but also', the verb must agree with the noun or pronoun mentioned second.

e.g.: Not only the students but the teacher were also injured. (*incorrect*)

Not only the students but the teacher was also injured. (*correct*)

Correction of Errors

1. He is sincere and also hardworking.

(*not only - but also*)

2. She asked me whether I had a pen or not.

(*'or not'* can be omitted)

3. He did not come or sent a message. (*neither nor*)

4. He not only broke the glass, but threw it away.

(*not only.... but also*)

5. Both he and I contributed to the fund. (no error)

6. No sooner had the bell rung then the students ran out. (replace 'then' with 'than')

7. She is taller as her sister. (*as tall as*)

8. He worked hard and could not get a state rank. (you can use 'but' instead of 'and', or start the sentence with 'Although')

9. There is a bus strike because she is not coming.

(*she is not coming because there is a bus strike*)

10. He will return the money on the 1st or 2nd.

(*He will return the money either on 1st or 2nd*)



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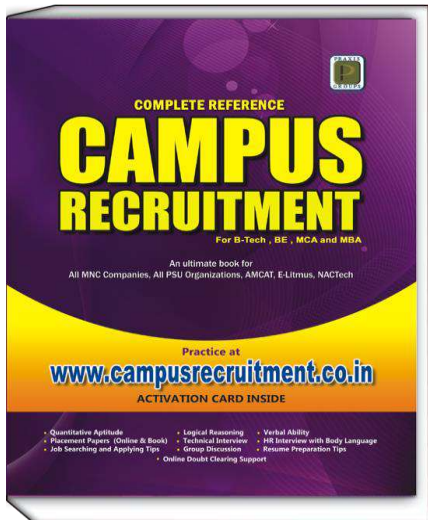
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ANTONYMS

Antonyms are words that have the opposite meaning of a given word. In this section, you are given a word and asked to choose a word, or phrase, which is most nearly opposite in meaning to that word. When you are doing the antonym portion of the Campus recruitment tests, keep in mind the prefixes, suffixes, and roots that you learned while developing your vocabulary. While testing your ability on questions pertaining to Antonyms, the first thing to be observed is your ability to grasp the meaning of the given word and to distinguish between the fine shades of meaning. Unless you know the meaning of the given words, you will not be able to find out or choose the exact antonym from the options given. Mostly antonyms appear in the form of nouns, verbs and adjectives.

Strategies to Solve Questions Based on Antonyms:

1. Check whether the question word and the opposite of the word given under the options are in the same parts of speech.
2. You should have an idea of the roots of the words and know their meanings. For example, in the word *benefactor*, if you know the meaning of been you will be able to guess the meaning of the word, and opt for the best antonym.
3. Look for the best answer and not for the ideal. Eliminate two or three of the options if they are nowhere related to the given word.
4. Do not go for an antonym which is too limited or too broad to be an opposite.
5. When you get confused about the antonym to be chosen, try to think of how you have heard the word used before. You may discover a suitable context to guess the exact antonym.

1. DILAPIDATED

- a) ruined b) condemned c) renovated
d) destroyed e) shabby

Explanation: *Dilapidated* means 'falling apart'; Therefore options-*a* and *d* can be eliminated as they show intentional actions. The only word which means making good to look as new is '*Renovated*'. It stand out as the best antonym. Option-*b* means 'to disapprove' so that is also not suitable.

2. MELODIOUS

- a) mellifluous b) unpleasant c) spiritual
d) comfort e) indefinite

Explanation: In this example, the word '*Melodious*' means 'Mellifluous', means pleasant in sound. The options-*c*, *d* and *e* are irrelevant in this context. The

only antonym is option-*b*—Unpleasant.

3. PROFUSION

- a) deficiency b) certainty c) proliferation
d) largeness e) maximum

Explanation: '*Profusion*' means excess, surplus, fullness, prolificacy. So, options-*c*, *d* and *e* can be eliminated. Certainty, generally means confidence. *Deficiency* means lack or shortage. Hence, option-*a* is correct choice.

CONCEPTUAL EXAMPLES

1) ABUNDANCE

- a) Sufficiency b) Plenty c) Resign
d) Decrease e) Dearth

Explanation: *Abundance* means plentiful or in great quantity. Option-*a* and *b* synonymous to *abundance*. Option-*c*, *d* are irrelevant in the present context. *Dearth*, which means scarcity or lack of something, is the antonym of the given word. Hence, option-*e* is correct.

Ask doubt with Question Id: 5619

2) ABDUCT

- a) Release b) Abbreviate c) Degrade
d) Give Up e) Kidnap

Explanation: The prefix '*ab*' generally denotes 'away from' or 'off'. For example *absent*, *abnormal*, *aversion* etc. The suffix '*duct*' generally means 'to lead'. For example *conduct*, *induct* etc. *Abduct* means 'to carry off by force' or 'lead away by force' or 'kidnap'. Opposite of *abduct* is to release, to let go, to give etc. Option-*d* is not an appropriate antonym of *abduct*. Hence, option-*a* is the best choice.

Ask doubt with Question Id: 5620

3) ABANDON

- a) Continue b) Steal c) Restoration
d) Desert e) Abnormal

Explanation: The root word '*don*' gives meaning as 'to give' or 'to gift'. For example *pardon*, *donation* etc. *Abandon* means 'to leave completely', 'to give up the control of', 'discontinue' or 'withdraw from'. Opposite is to continue or take control of. Hence, option-*a* is the correct choice.

Ask doubt with Question Id: 5621

4) BOLD

- a) Bald b) Hairless c) Brave d) Timid e) Thick

Explanation: *Bold* means confident and courageous. Option-*a*, *b* and *e* are completely irrelevant. Option-*c* is synonym of *bold*. *Timid* means lack of courage or confidence. Hence, it is the correct choice.

Ask doubt with Question Id: 5623

5) BARBAROUS

- a) Sharp b) Naked c) Rough
d) Cruel e) Civilized

Explanation: *Barbarous* means extremely brutal, cruel or uncivilized. Hence, option-*e* is correct choice.

Ask doubt with Question Id: 5624

6) DILIGENT

- a) Stupid b) Hard Working c) Daring
d) Idle e) Intelligent

Explanation: The root word '*dilig*' means to choose, select or like. *Diligence* means constant and earnest effort to accomplish what is undertaken. Antonym of *diligence* is lazy, casual, idle. Hence, option-*d* is correct.

Ask doubt with Question Id: 5625

7) EXTRAVAGANT

- a) Frugal b) Luxurious c) Bright
d) Lavish e) Spend-Thrift

Explanation: The root word '*extra*' as a prefix means beyond or outside of. *Extravagant* means lavish, going beyond what is deserved or justifiable, spendthrift, reckless etc. Option-*b*, *d* and *e* are synonyms of extravagant. Option-*c* is irrelevant. *Frugal* means little, saving, not wasteful. Hence, *frugal* is the antonym of *extravagant*.

Ask doubt with Question Id: 5626

8) AFFIRM

- a) Declare b) Contradict c) Negative
d) Assent e) Assert

Explanation: The root word '*firm*' generally means strong or steadfast. For example, confirm, infirm, affirm etc. Affirm means to state the truth emphatically or publicly. *Assent* means to express approval. *Assert* means to state a fact. So, option-*a*, *d*, and *e* cannot be the antonym. Option-*b-contradict*, which means to deny the truth of a statement.

Ask doubt with Question Id: 5628

9) FRESH

- a) Delicious b) Rest c) Refresh
d) New e) Stale

Explanation: *Stale* means no longer fresh or pleasant to eat. For example, *Stale bread*. Hence, option-*e* is correct.

Ask doubt with Question Id: 5629

10) COMPLIANCE

- a) Agreement b) Compliment c) Refusal
d) Complement e) Regards

Explanation: *Compliance* is the noun form of *comply* which means to agree. *Refusal* means to decline to agree. Hence, option-*c* is the correct choice.

Ask doubt with Question Id: 5630

11) FICKLE

- a) Second b) Scratch c) Little
d) Changing e) Constant

Explanation: *Fickle* means changing. Opposite of changing is being constant, which is option-*e*.

Ask doubt with Question Id: 5631

12) FRANK

- a) Open b) Candid c) Straight- Forward
d) Deceptive e) Stubborn

Explanation: Option-*a*, *b* and *c* are synonyms of *frank*. Option-*e* is irrelevant. *Deceptive* means misleading, bogus, cheating etc. Hence, option-*d* is correct choice.

Ask doubt with Question Id: 5632

13) GENUINE

- a) Genius b) Pure c) Real
d) Generation e) Spurious

Explanation: *Spurious* means fake or false or not genuine. Hence, option-*e* is correct.

Ask doubt with Question Id: 5633

14) HOPE

- a) Sadness b) Meekness c) Humility
d) Despair e) Pride

Explanation: *Despair* means absence of hope. *Meekness* means submissiveness, gentle. So, option-*d* is correct

Ask doubt with Question Id: 5634

15) ATTACK

- a) War b) Offend c) Fight
d) Quarrel e) Defend

Explanation: The antonym of *attack* is to *defend*.

Ask doubt with Question Id: 5635

16) DEFICIT

- a) Surprise b) Surplus c) Budget
d) Finance e) Insufficient

Explanation: *Deficit* means lack or shortage. Opposite of *deficit* is surplus or profit.

Ask doubt with Question Id: 5636

17) HASTE

- a) Hurry b) Waste c) Strictness
d) Delay e) Impure

Explanation: *Haste* means excessive speed, quick or hurry. Opposite is *delay*.

Ask doubt with Question Id: 5637

18) LENIENT

- a) Convenient b) Pleasing c) Happy
d) Glad e) Rigorous

Explanation: *Lenient* is means more merciful or tolerant than expected. Option-*e* - *rigorous* means strict, careful, severe etc. Remaining options are not connected with the question.

Ask doubt with Question Id: 5638



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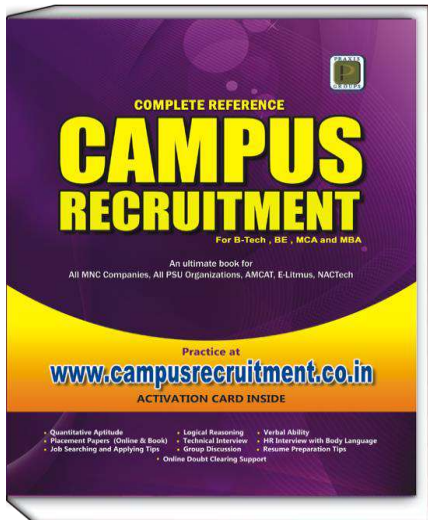
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SYNONYMS

A synonym is a word or expression accepted as a figurative or a symbolic substitute for another word or expression. It has the same or almost the same meaning as that of another word in the same language.

English being the language with the largest number of words, it has many synonyms. A strong grasp of words, their **synonyms** (meanings) and **antonyms** (opposites) goes a long way towards enhancing your ability to comprehend and express clearly.

e.g.: The words *see, look, view, watch, glance* etc more or less have the same meaning so they are synonyms. They may however differ slightly in degree of abstraction.

▪ Type: 1

1. Agenda

- a) Assignment b) Schedule c) Correction d) Annexure

Explanation: *Agenda* means organized plan for matters to be attended to during a meeting. In this context, *schedule* is nearest in meaning though it isn't a clear meaning of agenda. So option-b is correct choice.

2. Effort

- a) Attempt b) Create c) Wonder d) Overtake

Explanation: *Effort* is an action intended to do or accomplish something. So option-a is correct.

▪ Type: 2

Four pairs of words are given below. Each pair consists of two words which have more or less similar meaning. Find the pair which have opposite meanings.

1. a. Induce/ Coax b. Fatal/ Deadly
c. Disparate/ Alike d. Abettor/ Thief

Explanation: Except option-c, all other pair of words have more or less similar meaning. Hence, option-c is correct choice.

2. a. Authentic/ Genuine b. Genius/ Aptitude
c. Ghastly/ Pretty d. Gruesome/ Grim

Explanation: Ghastly means horrifying and pretty means attractive. Hence, option-c is correct choice.

▪ Type: 3

Find the appropriate synonym of the word in bold in the below sentence.

1. He changed his statement so many times that entire his message became **ambiguous**.

- a) clear b) impressive c) unimpressive d) unclear
The correct answer is (d) unclear.

2. There was crazy **pandemonium** as people were trying to leave the rock concert.

- a) Silence b) craziness c) chaos d) order
The correct answer is (c) chaos.

EXERCISE - I

In each of the sentences, one word is given in bold and four options are given. Select the word or phrase nearest in meaning to the word given in bold.

1. The engineers subjected the engine to **exhaustive** tests.

- a) Complicated b) Thorough
c) Exclusive d) Compulsory

Explanation: *Exhaustive* means thorough, complete or in-depth. Hence, option-b is synonym of *exhaustive*.

Ask doubt with Question Id: 8432

2. The inspector was a **vigilant** man.

- a) Intelligent b) Ambitious c) Watchful d) Smart

Explanation: The root word '*vigi*' means watchful, wakeful or alert. For example, *vigilant, invigilation, surveillance, reveille* etc. *Vigilant* means careful or watchful. Hence, option-c is correct choice.

Ask doubt with Question Id: 8433

3. The Professor is one of the most **erudite** in our college.

- a) Boring b) Pleasant c) Learned d) Demanding

Explanation: *Erudite* means well educated or cultured. *Learned* is the synonym of *erudite*.

Ask doubt with Question Id: 8434

4. The world leader are trying to prevent the **proliferation** of nuclear weapons.

- a) Use b) Increase c) Expansion d) Extension

Explanation: *Proliferation* means rapid increase. Option-b is the best suitable synonym for *proliferation* than option-c and d.

Ask doubt with Question Id: 8435

5. The tribunal's order may finally nudge the two warring groups to come to an **amicable** solution.

- a) Just b) Appropriate c) Durable d) Friendly

Explanation: The prefix '*am*' generally denotes friendly, casual or lovable. For example, *amiable, amateur, amicable* etc. *Amicable* means friendly, peaceful, polite etc. Hence, option-d is correct choice. *Durable* means long-lasting or strong.

Ask doubt with Question Id: 8436

6. The poor old man seems **famished**.

- a) Exhausted b) Peevish c) Hungry d) Relaxed

Explanation: *Famished* means being extremely hungry. For example, 'After such a long walk in the mountains, they were tired and famished for food and sleep'.

Ask doubt with Question Id: 8437

7. The police is carrying out the enquiry as **expeditiously** as possible.

- a) Speedily b) Fairly c) Timely d) Justly

Explanation: *Expeditiously* means in an efficient manner or acting with speed. Hence, option-a is correct.

Ask doubt with Question Id: 8438

8. He received **accolades** for his work.

- a) Greeting b) Reprimand c) Criticism d) Award

Explanation: *Accolade* means strong praise or recognition of achievement. Hence, the suitable synonym is *award*. *Reprimand* and *criticism* are antonyms of *accolade*.

Ask doubt with Question Id: 8439

9. She is **parsimonious** by nature.

- a) Cruel b) Haughty c) Miserly d) Spendthrift

Explanation: *Parsimonious* means one who is unwilling to spend money. *Spendthrift* is the one who spends money carelessly. *Cruel* and *haughty* are irrelevant in the present context. *Miserly* means greedy. Therefore, option-c is the synonym of *parsimonious*.

Ask doubt with Question Id: 8440

10. The Principal **reprimanded** the students for their behavior.

- a) Praise b) Rebuke c) Punish d) Reward

Explanation: *Reprimand* means to criticize or express disapproval. *Rebuke* also means harsh criticism. But *praise* and *reward* are antonyms of *reprimand*. *Punish* means to penalize or to handle severely or roughly. For example, '*criminal acts would be punished by up to ten years in prison*'. So, *punish* is not an appropriate synonym of *reprimand*. Hence, option-b is correct.

Ask doubt with Question Id: 8441

11. The player score 80 in his **maiden** performance.

- a) Fresh b) Primary c) Girlish d) First

Explanation: *Maiden* means first or earliest.

Ask doubt with Question Id: 8442

12. There were **intermittent** showers yesterday.

- a) Prolonged b) Sporadic
c) Incoherent d) Intervening

Explanation: *Intermittent* means occurring at regular intervals. *Sporadic* also means the same.

Ask doubt with Question Id: 8443

13. The **veracity** of his statements should be checked.

- a) Misery b) Reliability
c) Truthfulness d) Wisdom

Explanation: The root word '*ver*' denotes truth, real etc. For example, *verify*, *veracious*, *veracity*, *verdict* etc. Hence, option-c is correct.

Ask doubt with Question Id: 8444

14. He runs a **lucrative** business after office hours.

- a) Challenging b) Dangerous
c) Profitable d) Questionable

Explanation: *Lucrative* means profitable or remunerative.

Ask doubt with Question Id: 8445

15. To succeed in an **endeavour** one needs a lot of luck.

- a) Plan b) Enterprise c) Tick d) Effort

Explanation: *Endeavour* means an attempt to achieve a goal. So, option-d is correct.

Ask doubt with Question Id: 8446

16. We should **emulate** our freedom fighters.

- a) Study b) Admire c) Follow d) Imitate

Explanation: *Emulating* means copying or imitating.

Ask doubt with Question Id: 8447

17. These concepts are **obsolete**.

- a) Boring b) Unfashionable
c) Unwanted d) Outdated

Explanation: *Obsolete* means no longer in use. So, *outdated* is the synonym.

Ask doubt with Question Id: 8448

18. The District Collector **apprised** the minister of the situation.

- a) Informed b) Issued c) Assessed d) Summoned

Explanation: *Apprise* means to give information to someone or to inform. Hence, the correct synonym is option-a. *Apprise* and *Appraise* are two different words. *Appraise* means to judge, estimate or assess (option-c).

Ask doubt with Question Id: 8449

19. The minister made the announcement with **aplomb**.

- a) Arrogance b) Poise c) Annoyance d) Authority

Explanation: *Aplomb* means self confidence or composure. *Poise* means self-composure or dignity.

Ask doubt with Question Id: 8450

20. The actress' **charisma** has got her many fans.

- a) Power b) Humility
c) Candour d) Magnetic appeal

Explanation: *Charisma* means great personal appeal. Hence, option-d is correct.

Ask doubt with Question Id: 8451

21. This address given by the applicant is **fictitious**.

- a) Correct b) Rural c) Fake d) Wrong

Explanation: *Fictitious* means not real or imaginary. Synonym is *fake*, *false* etc.

Ask doubt with Question Id: 8452

22. The **impromptu** speech given by the P.M was well received.

- a) Important b) Inspiring c) Impressive d) Off hand
Explanation: *Impromptu* means unprepared. Option-d *off-hand* means without previous thought.

Ask doubt with Question Id: 8453



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ANALOGY

CONCEPTS

In verbal analogies, the student is given one pair of related words. The student must find a pair words from the given choices that has the same relationship to the word as the first pair. Analogy questions test your ability to recognize relationships between words or ideas and to know when these relationships are parallel.

How to Read Analogies: The symbol (:) means 'is to' and the symbol (: :) means 'as'.

Thus, the analogy, *key : lock :: spoon : stir* should be read as *key is to lock as spoon is to stir*.

It means the relationship between *key* and *lock* is the same as the relationship between *spoon* and *stir*.

Tips for doing Analogies:

1. Try to create a logical relationship between the given pair of words.
2. Eliminate the options that do not have a clear relationship to main word.
3. Don't assume any answer until you've read all of the choices.
4. If the meaning of the given pair of words is unknown then try to recollect the context in which you have come across those words.
5. Though you don't know the meanings of given capitalized pair of words, you can still have a chance to find the correct answer using parts of speech.

e.g.: falling (*v*) : gravitation (*n*) :: collapse (*v*) : pressure (*n*)
Sometimes more than one answer choice will have same parts of speech. You need to be very careful because even though the parts of speech of more than one pair remains same, the words may have different meaning.

6. Eliminate the word pairs that expresses the same relationship as the given question but in the opposite order.

e.g.: eye : see :: hear : ear (*incorrect*)
eye : see :: ear : hear (*correct*)

The analogy is an area where, with practice, you can achieve a very good score. First, you must find the relationship between the original pair of words. To help you, listed below are some common types of analogies.

Some Common Types of Analogies:

1. Part to Whole:

e.g.: poem : stanzas :: play : acts

2. Cause and Effect:

e.g.: joke : laughter :: tragedy : sadness

5. Sameness or Synonyms

e.g.: system : method :: faith : trust

6. Oppositeness or Antonyms

e.g.: negligence : careful :: bravery : cowardice

7. Measure

e.g.: fahrenheit : temperature :: decibel : sound

8. Degree:

e.g.: chuckle : laugh :: whimper : cry

9. Thing and what it lacks:

e.g.: atheist : belief :: indigent : money

10. Study:

e.g.: linguistic : language :: human : anthropology -

11. Function/purpose/use:

e.g.: knife : cut :: shovel : dig

12. Person and skill /tools/ work place:

e.g.: author : write :: chef : cook

13. Qualities or Characteristics:

e.g.: president : leads :: captain : directs

- The key issue in analogy problems is picking the proper relationship sentence. With analogies, you are looking for similar relationships, not similar meanings. To answer analogy questions, you must first figure out the relationship between the two words in the given question. Then look for the pair of words among the answer choices that has the same relationship.

- You can also create your own analogies using the list of common types given above. Creating your own list has the advantage of forcing you to think analogously. You should keep in mind that there must be a reasonable and necessary connection between given two words. The connection must be valid, otherwise there would be no point in making the analogy.

For example, what type of reasonable connection could be there between *Bird : Algebra* ? (no relation)

On the other hand, there is a reasonable connection between *Fish : Salmon* since *salmon* is a type of *fish*.

- All analogies will have connections that are reasonable (logical, valid) and necessary or inevitable. Any choices that fail to meet these criteria should be rejected. Even if you cannot figure out the connection between the original pair of words, you can still improve your chances of picking the correct answer by eliminating any choices that do not confirm to the above rule.

Make a Sentence: Creating a sentence that shows the connection between the two words is absolutely essential.



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READING COMPREHENSION

Reading is a skill which has other sub-skills included in it. It is not mere recognition of the words, it also includes being able to understand, comprehend and respond, if questioned about the text. Many languages share the same script: Hindi, Punjabi, Telugu, Kannada. For that matter all European Languages like English, French, Spanish and German have the same script. Being able to read a script does not ensure understanding the script. Another important aspect is familiarity with the content. If you are not in the habit of reading, if you are not aware of what's happening around you, then even the simplest of scripts will seem like Greek and Latin. The most important point is READ, READ and READ.

1. Spend a few minutes a day reading at a faster than comfortable rate (about 2 to 3 times faster than your normal speed). Use your hand or an index card to guide your eyes down the page. Then time yourself reading a few pages at your normal speed.

2. If you have poor concentration when reading, practice reading for only 5 to 10 minutes at a time and gradually increase this time

3. As we read, our eyes move along the line in a series of jerky movements, stopping at each word. Fast readers usually take in 3-4 words in each movement that their eye makes. The more words you can take in with each movement of the eye, the faster your reading will be. Try to avoid focusing on every word, but rather look at groups of 2 to 3 words.

e.g.: The above sentence could be read as:

Try to avoid/ focusing on every word/ but/ rather look at/ groups of 2 to 3 words.

4. Read more! 15 min a day of reading an average size novel equals 18 books a year at an avg reading speed!

5. Spend a few minutes a day reading at a faster than comfortable rate (about 2 to 3 times faster than your normal speed). Use your hand or an index card to guide your eyes down the page. Then time yourself reading a few pages at your normal speed. You'll find that often your normal reading speed will increase.

Being a voracious reader is just not enough. In examinations where reading skills are tested, the ability to read and comprehend fast is needed. Here are some tips to tackle the reading section. In order to improve your reading speed, follow these steps.

One of the most effective ways of reading in order to be able to comprehend quickly is the SQ3R method:

- Scan
- Question
- Read
- Review
- Recite

Scanning provides a rapid overview. Many well written books follow logical outlines that can orient the reader to the subject matter.

Questioning is a natural, instinctive, second step that most winners follow. In the scanning process, certain questions naturally arise. These should be noted in a short list of questions to be answered through reading. The questioning procedure helps the reader stay focused.

- First, determine the main idea from the title, the first paragraph, and the last paragraph.

- Second, determine if a large subject is divided into smaller subjects with some outlining scheme.

- Underline key words or take notes to the side what the purpose of the paragraph is. *i.e.* cause, effect, reason, example, definition, instructions, background info, etc. Don't worry if you can't do that for all and don't spend too much time trying to identify each paragraph.

- Read for Author's Main Idea and Primary Purpose.

- At the end of reading, ask yourself questions like: What was the passage about? What was author's motive in writing all this?

- Don't over read. Skip examples, dates, lengthy names, any details which can be referred in case something is asked explicitly.

- Don't go for choices which hold true only for one part of the author's argument.

- Finally, review as often as necessary to keep focused. Outlining and note-taking often help.

- Once you start to become an effective reader, you will find that you are also becoming a faster reader.

With these tips your reading skills are sure to improve.



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CLOSET - FILL IN THE BLANKS

CONCEPTS

A cloze test, consisting of a portion of text with certain words removed, where the student is asked to replace the missing words from among the given choices.

The sentence completion section tests your vocabulary skills as well as your reading ability. The question contains a paragraph or a sentence expressing a complete idea that can be understood without any additional information. Each blank need to be filled up appropriately retaining the meaning of the sentence and the syntax.

Strategies to solve questions on Sentence Completion.

First, slowly read all the text without filling any of the gaps. Read it until you got a clear understanding of what the text is about.

- 1) First, complete the gaps you are absolutely sure of.
- 2) Next try and find out what the missing words in the remaining gaps are. See which *part of speech* may fit in each gap (article?, pronoun?, noun?, adverb?, adjective?, preposition?, conjunction?, verb?) and pay special attention to the *grammar* around the words in each gap.
3. Read the sentence once again after choosing the words to fill up the blanks.
4. To solve the sentence completion section, you must have a through understanding of the sentence given. This understanding is possible only if you develop your knowledge of the root words, synonyms, antonyms, analogies, idioms, phrases etc.
5. In many cases, several options may fit in but you must select the one that gives the meaning of the sentence most precisely.
6. Understand the message of the sentence by analyzing the principal clause(s) and the sub-ordinate clause(s). Briefly speaking, analyze whether the sentence is a simple sentence or compound sentence or complex sentence.
7. Observe the subject of the sentence, the keywords or the signal words. For example the key words like, 'therefore', 'so', 'because', 'although', 'in addition to', 'further more' etc can help you to make the right option from the options given.
8. Understand the author's tone. It means whether the author is positive or negative in his/her approach to the idea he has presented. Look for negative words like 'no' or 'not'. Negative words can change the direction of the sentence.

9. If you don't spot any signal words or keywords and if you don't know the meaning of the option words, read once again and choose the one that sounds the best, eliminating one or two choices.

A Solved example is given below

(A) ____ of his reputation as a comedian, the director of the film ____ Mr.Bean from acting a very serious role of a priest in his new movie.

Options:

- | | |
|------------------|----------------|
| 1. a) Since | b) Due to |
| c) Because | d) As |
| 2. a) Encouraged | b) Discouraged |
| c) Supported | d) Boosted |

Explanation: Among the given choices, 'because' is the only word that can go with 'of'. Similarly, we can understand that it is difficult for a comedian to act as a priest. So it is natural that the director of the movie 'discouraged' him. Therefore, 'discouraged' is the most suitable word.

EXERCISE-I

(A) A blog is a web page made up of brief, frequently updated entries that are arranged (1) like a journal. The purpose of blogs (2) greatly from links to news, photos, even fiction. Blog posts are (3) to instant messages to the web. Many blogs are (4) "what's on my mind" type musings others are collaborative efforts based on a (5) topic or area of mutual interest.

- | | |
|---------------------|--------------------|
| 1. a) symmetrically | b) chronologically |
| c) interestingly | d) passionately |
| 2. a) depend | b) shift |
| c) vary | d) change |
| 3. a) familiar | b) similar |
| c) unique | d) superior |
| 4. a) personal | b) ephemeral |
| c) temporal | d) local |
| 5. a) vague | b) specific |
| c) controversial | d) contemporary |

(B) My final year at MIT was a year of (6). A new wave of thought (7) through the country in those years. The popular view in those days was that a belief in scientific methods was the only (8) approach to knowledge. If so, I wondered, what about spiritual (9)? I had been taught from my early childhood that knowledge could be (10) only through the inner experience.



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SENTENCE REARRANGEMENT

CONCEPTS

Sentence Rearrangement as the name itself advocates, consist of sentences not arranged in a logical sequence. A choice of arrangement of the sentences is given from which the candidate has to choose the most logical sequence which would be the most appropriate for conveying the message of the passage.

Type of Questions:

Four Sentences: In this type, paragraph consists of four sentences which are jumbled and the student is supposed to choose the correct sequence.

Five Sentences: This type is quite similar to the "four sentence" except instead of four sentences student has to rearrange five sentences.

Six Sentences: This is a typical one of this chapter where six sentences are given in which first and sixth sentences are fixed. The student has to rearrange the four sentences in between the first and sixth.

Tips to Solve:

- **Read as they are:** It is a kind of reading which gives an overall concept to the reader. In this step student has to tick or write the crucial words to make his remembrance more effective. He has to have an idea of passage by this squashed reading technique.

- **Finding either starting or concluding sentences**

Finding either starting or concluding sentences is also necessary to get the answer properly. In this finding procedure students have to keep an eye in the options too. Therefore finding either starting or concluding sentences can be derived as technical method of logical answer.

- **Linking sentences:** This is a technique of mastering in jumbled paragraph. In order to get proper linking sentences students have to identify the main or supplementary ideas which constitute the message being conveyed by the paragraph. If a clear picture of the main paragraph is found, then the link of the sentences will be come out automatically. Once the link is found, then obviously the given options will direct the correct answer.

- Here is the list of words which are used as linking devices:

also, again, as well as, as a rule, besides, furthermore, generally, in addition, likewise, moreover, consequently, similarly, to sum up, hence, otherwise, subsequently, later, therefore, thus, for example, for instance, to illustrate, much like, such as, above all, besides, even though, although, despite, probably, due to, unless, whether, until, yet, first of

all, to begin with, consequently, considering, I mean, in other words, as a result, last of all, in summary, in conclusion.

Abbreviations or Acronyms: If full form and its abbreviation or acronym are present in two different sentences, then the sentence containing the full form will come before the sentence containing abbreviation or acronym.

Personal and Demonstrative Pronouns: If a sentence contains a personal or demonstrative pronouns (i.e. *you, your, he, she, it, they, this, that, these, those* etc) without mentioning the person, place or object it is referring to, the person, place or object must have come in the previous sentence.

Checking vocabulary inventiveness

For this process a candidate has to look into the starting and the concluding words of the sentences that may have an apparent link. In addition to this students have to concentrate in some particular conjunction words that may appear either ending or starting of the sentences, namely, *so, therefore, moreover, meanwhile, nevertheless, notwithstanding* etc.

CONCEPTUAL EXAMPLES

Rearrange the following sentences (A), (B), (C), (D) in the proper sequence to form a meaningful paragraph, then answer the questions given below them.

1) A. In formal speech, syllables are likely to be more deliberately sounded than in informal speech

B. Yet dictionary editors have no choice but to deal with each word as an individual entity.

C. The pronunciation of words is influenced by the situation.

D. Further, the pronunciation of a word is affected by its position in the sentence and by the meaning it carries.

a) ACBD b) ACDB c) ABCD d) CADB

Explanation: First of all, try to identify the starting and ending/ concluding sentences. Sentences B, D can not be the first sentence as they have the linking words like 'yet', 'another' which generally indicates continuation to its previous sentences. Sentence-A is speaking about two kinds of pronunciation. But sentence-C has an introduction about pronunciation. Hence, it forms the first sentence. Sentence-A, D are continuation for C as they explain about how the pronunciation is affected.

Ask doubt with Question Id: 1947

PLACEMENT PAPERS

PLACEMENT PAPER-1

QUANTITATIVE APTITUDE

1) A train running at a speed of 90 km/hr crosses a platform double of its length in 36 sec. What is the length of platform in meters?

- a) 450 b) 200 c) 300
d) Can't be determined e) None of these

2) 'A' can finish a work in 32 days and 'B' can do the same work in half the time taken by 'A'. Then working together what part of the same work they can finish in a day?

- a) $\frac{3}{32}$ b) $\frac{1}{8}$ c) $\frac{5}{32}$ d) $\frac{16}{32}$ e) $\frac{1}{32}$

3) The owner of an electronic shop charges his customer 24% more than the cost price. If a customer paid Rs 10080 for a TV set, then what was the cost price of the TV set?

- a) Rs 8119 b) Rs 8129 c) Rs 8250
d) Rs 8139 e) None of these

4) What would be the simple interest obtained on an amount of Rs 12690 at the rate of 6% per annum for 3 years?

- a) Rs 2423.40 b) Rs 2233.40 c) Rs 2284.20
d) Rs 2525 e) None of these

5) Find the compound interest on Rs 8000 at 5% per annum for 3 years compounded annually?

- a) Rs 1261 b) Rs 6261 c) Rs 9261
d) Rs 8261 e) None of these

6) 6 same type of machines can produce a total of 270 bottles per minute. How many bottles are produced by the 10 machines in four minutes of time?

- a) 648 b) 1800 c) 2700 d) 10800 e) None

7) Find the least perfect square number which is divisible by 8, 15 and 24.

- a) 3600 b) 360 c) 6400 d) 64 e) None

8) A person had a rectangular shaped garden with sides of 16 feet and 9 feet. The garden was changed into a square with the same area as the original rectangular- shaped garden. How many feet in length is each of the sides of the new square shaped garden?

- a) 7 b) 9 c) 12 d) 55 e) 16

9) The average of five consecutive numbers A, B, C, D and E is 48. What is the product of A and E?

- a) 2162 b) 2208 c) 2024 d) 2300 e) None

10) A, B and C enter into a partnership. A contributes Rs. 2400 for 6 months. 'B' contributes Rs.7200 for 2 months and 'C' contributes Rs.3500 for 7 months. If the total profit be Rs.1250, what is A's share in the profit?

- a) 121 b) 112 c) 111 d) 122 e) None

11) At what time between 2 O'clock and 3 O'clock the two hands coincide?

- a) $10\frac{10}{11}$ minutes past 2 O'clock
b) $11\frac{10}{11}$ minutes past 2 O'clock
c) $12\frac{10}{11}$ minutes past 2 O'clock
d) $13\frac{10}{11}$ minutes past 2 O'clock

e) None of these

12) Find the mean proportion of 45 and 405.

- a) 9 b) 15 c) 90 d) 135 e) None

13) Find the cost of running a fence round a square field 49284 m² in the area of Rs.3 per meter.

- a) 2614 b) 2714 c) 2914 d) 2664 e) None

Directions (14 to 17): Following table gives the production of computers of six companies A, B, C, D, E and F over the years.

Production of Computers (in 000's)						
Years→ Company↓	2005	2006	2007	2008	2009	2010
A	125	114	85	95	138	146
B	102	90	72	88	115	145
C	80	116	110	80	84	75
D	68	156	142	60	95	84
E	100	120	126	115	95	80
F	140	110	126	124	90	88

14) What is the ratio of the total production of companies B, C and E together in 2006 to the total production of companies A, C and D together in 2008?

- a) 10 : 11 b) 11 : 10 c) 27 : 31
d) 55 : 56 e) None (Asked in Infosys)

15) What is the approximate percentage decrease in production of computers of company D from 2006 to 2009?

- a) 10% b) 90% c) 40% d) 45% e) 30%

16) What is the average production of computers of company E over the year?

- a) 106 b) 10000 c) 132 d) 106000 e) None of these

17) The production of F in 2010 is the same as the production of B in the year,

- a) 2009 b) 2006 c) 2008 d) 2005 e) None of these

18) The sum of a number and its reciprocal is $\frac{13}{6}$.

Find the numbers?

- a) $\frac{3}{2}, \frac{2}{3}$ b) $\frac{1}{3}, 3$ c) $6, \frac{13}{6}$ d) $\frac{1}{13}, \frac{13}{6}$ e) None



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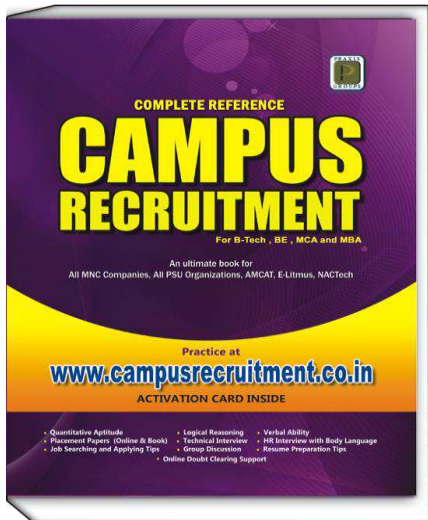
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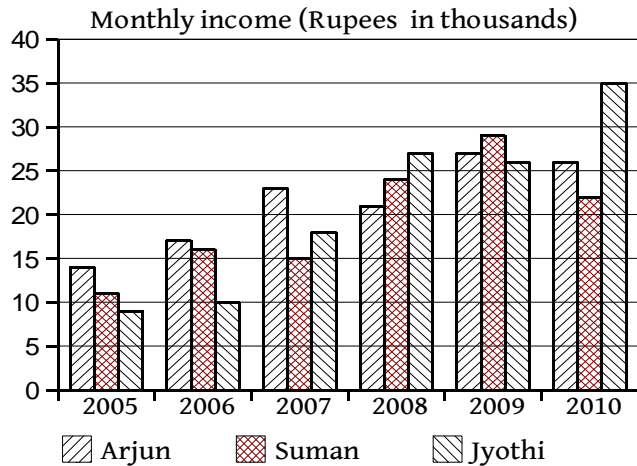
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PLACEMENT PAPER-5

QUANTITATIVE APTITUDE

Directions(1-4): Study the following graph carefully to answer the questions that follow



Monthly income (Rupees in thousands) of three different persons in six different years.

1) What was the difference between the total monthly salary of Arun in all the years together and Suman's monthly income in the year 2007 ?

- a) Rs. 1.24 lakh b) Rs. 1.14 lakh c) Rs. 11.4 lakh
d) Rs. 12.4 lakh e) None

2) What is the ratio of Arun's monthly income in the year 2006, Suman's monthly income in the year 2007 and Jyothi's monthly income in the year 2005?

- a) 6 : 3 : 5 b) 6 : 4 : 5 c) 5 : 6 : 4 d) 5 : 4 : 7 e) None

3) In which year was the difference between Jyothi's and Arun's monthly income the second highest?

- a) 2005 b) 2006 c) 2007 d) 2009 e) 2010

4) The monthly income of Suman in the year 2009 was approximately what percentage of the monthly income of Jyothi in the year 2010?

- a) 72 b) 89 c) 83 d) 67 e) 95

5) How many ways are there to lay four balls, colored red, black, blue and green in a row?

- a) 4 b) 4! c) 4^4 d) $\frac{4!}{4^4}$ e) $4(4!)$

6) There are 20 states in a certain country and every pair of them is connected by a road way. How many road ways are there? (Asked in ABB)

- a) 20! b) 19! c) 18! d) $\frac{20.19}{2}$ e) ${}^{20}C_2$

7) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that the sum is odd if two cards are drawn together.

- a) $\frac{4}{9}$ b) $\frac{5}{9}$ c) $\frac{5}{10}$ d) $\frac{5!}{10!}$ e) $\frac{2}{10}$

8) Which of the statements is true for 31^{11} & 17^{14} ?

- a) 31^{11} is greater b) 31^{11} is lesser c) $31^{11} \leq 17^{14}$
d) $31^{11} \geq 17^{14}$ e) None

9) The average of five numbers is 281. The average of the first two numbers is 280 and the average of last two numbers is 178.5. What is the third number?

- a) 488 b) 336 c) 228 d) 464 e) None

10) At 30 minutes past 4 O'clock, what is the angle between the two hands?

- a) 45° b) 48° c) 50° d) 40° e) 55°

11) Two equal glasses are respectively $\frac{1}{3}$ and $\frac{1}{4}$

full of milk. They are then filled up with water and the contents are mixed in a tumbler. Find the ratio of milk and water in the tumbler. (Asked in Syntel)

- a) 1 : 5 b) 7 : 17 c) 3 : 9 d) 2 : 5 e) 4 : 7

12) A, B & C invested Rs.500, Rs.630 & Rs.700. If A gets Rs. 75 as profit then how much C will get?

- a) $57\frac{3}{4}\%$ b) Rs. 105 c) Rs. 90 d) Rs.126 e) Rs.117

13) How long will a man take to go, walking at 4 km per hour, twice round a circular garden of 70 m radius?

- a) 13 m 2 sec b) 12 m 13 sec c) 13 m 11 sec
d) 12 m 11 sec e) 11 m 13 sec

Directions(14 to 15): Read the following question and the conclusions that follow and answer as

a: If statement-1 alone is sufficient, but statement-2 alone is not sufficient to answer the question.

b: If statement-2 alone is sufficient, but statement-1 alone is not sufficient to answer the question.

c: Both statement-1 and 2 together are sufficient to answer the question, but neither of the statement alone is sufficient to answer the question.

d: If both statements alone are sufficient to answer the question.

e: If statement-1 and 2 together are not sufficient to answer the question asked, and additional data specifics to the problem are needed.

14) Is y is a positive number?

Statement-1: $2x+y > 27$; **Statement-2:** $x-3y < 24$

15) If x is a positive integer less than 30, is 'x' an odd number?

1: When x is divided by 3, the remainder is 2.

2: When x is divided by 5, the remainder is 2.

16) A train of length 330 meters crosses a platform of length 550 meters in 44 seconds. What is the speed of the train?

- a) 5 m/s b) 7.5 m/s c) 12.5 m/s d) 20 m/s e) None



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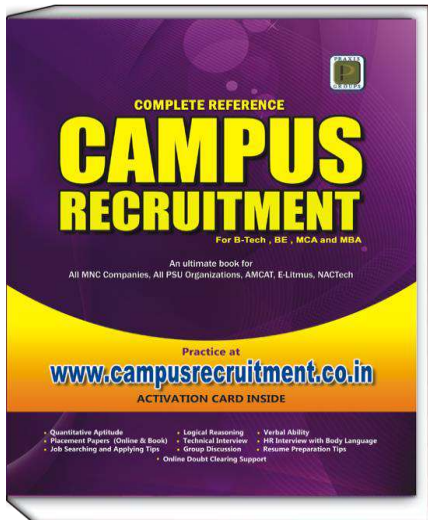
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68)d; Nowhere in the passage it is mentioned that they are of lackadaisical (means – arrogant, apathetic, careless etc.,) or selfish; nor they have any authority, whatsoever. If they really have bureaucratic authority, they would not be middle class people.

Ask doubt using Question Id: 6304

69)a; To hail means to praise and acclaim and this is contrary to what has been proposed in the passage.

Ask doubt using Question Id: 6305

70)a; The very opening sentence of the passage speaks about the ‘semantic conspiracy’ which means linguistic intrigue; a trickery usage of language.

Ask doubt using Question Id: 6306

71)a; The paragraph can start only with the sentence E. The opening words of the sentence of ‘B’ – ‘these two parties’ is a continuation of the last words of the sentence E– ‘two parties’. There are only two options with EB; in the option 4, D follows B; but whom the opening pronoun ‘he’ of D does refer to? F is the further explanation of B. Hence EBFCAD.

Ask doubt using Question Id: 6307

72)a; Excepting B, the rest of the sentences can be the beginners of a paragraph. Excepting in the first answer choice–a, sentence B breaks the sequence of the rest of the choices.

Ask doubt using Question Id: 6308

73)b; It is only in the second option we find the sentence A in continuation with the opening sentence D. Sentence A alone explains, why the fear has such enormous effect on the human beings.

Ask doubt using Question Id: 6309

74)c; In the first, second and fourth answer choices, sentence D breaks the sequence as there is no reference to the opening words of the sentence D ‘this image’ in the preceding sentence; only in choice–c, D is preceded by B.

Ask doubt using Question Id: 6310

75)b; Sentence B can only be a concluding sentence; we find in the answer choice–b, a sequence of the sentences logically leading to the concluding sentence B.

Ask doubt using Question Id: 6311

76)b; To ‘yield’ is to surrender, submit, and obey someone unconditionally. ‘Resist’ which means defy, oppose and refusing to accept is the opposite word.

Ask doubt using Question Id: 6312

77)c; Excepting ‘seldom’ which means – rarely, infrequently and not often, is the antonym.

Ask doubt using Question Id: 6313

78)c; Paucity means scarcity, rarity, shortage and dearth. Abundance, meaning wealth, large quantity– is the opposite word of paucity.

Ask doubt using Question Id: 6314

79)b; Conclusive means – convincing, irrefutable, indisputable and unquestioning.

Ask doubt using Question Id: 6315

80)a; When something is ‘manifested’, it is very clear, visible, evident and noticeable. The opposite word would be ‘conceal’.

Ask doubt using Question Id: 6316

81)c; Impudent, disrespectful, brazen, insolent and ‘rude’ are a few synonyms of the underlined word ‘impertinent’.

Ask doubt using Question Id: 6317

82)c; Deprecating somebody is denouncing, condemning, denigrating and “protesting’.

Ask doubt using Question Id: 6318

83)c; Commodious means ‘spacious’, large, voluminous and extensive.

Ask doubt using Question Id: 6319

84)d; if someone is ‘confounded’ means – he is puzzled, confused, bewildered stunned and ‘baffled’.

Ask doubt using Question Id: 6320

85)a; To be undaunted is to be impervious, undisturbed and ‘fearless’.

Ask doubt using Question Id: 6321

TECHNICAL INTERVIEW

TECHNICAL INTERVIEW

In the present days, most of the companies are conducting the Technical Interview Round in their recruitment process. It is one of the efficient way of filtering the suitable person for the industry. Many students have a wrong notion that it is very hard to clear this round. But it is not true. This round will mainly focus on the basics or fundamentals of the stream. Students need to be thorough and confident in the fundamentals of the subject. Recruiting team will not expect that the student should answer all questions perfectly, but he/she must be reasonably good and confident about the subject. The most important questions for technical interview are given below. These questions will give you the idea about what type and toughness generally the companies are asking.

CIVIL ENGINEERING

Building Materials and Construction

- 1) What is the term used to call the vertical member in the middle of the door/window frame?
- 2) What is the standard or commonly recommended depth between finished level of ground and the general ground level around the building?
- 3) Do you know the number of BIS standard used for building drawing purpose?
- 4) Can you draw a typical sign indicating brick?
- 5) State a few conditions at where eccentricity of building occurs?
- 6) What are the requirements of a material used for damp proofing in building construction?
- 7) At what level damp proofing course on the internal wall is provided if two ground floors at different levels are connected by an internal wall?
- 8) What is the term used to indicate the sides of the openings such as doors or windows?
- 9) What is the maximum thickness of mortar joint width provided in Ashlar fine masonry?
- 10) What is the term used to indicate the rod which is used to dress roughly the hard stone?
- 11) What is the bond that is provided to strengthen the corner of a wall where a modified form of English bond is used?
- 12) What is the duration of immersing brick which are used before they actually placed in position, during construction?
- 13) Does an expansion joint in brick wall is necessary? State its interval along its length?
- 14) What is the minimum depth of concrete at the crown of a jack arch roof?
- 15) What material is used to obtain noiseless flooring?
- 16) What is the approximate thickness of brick course used in Madras Terrace Roof?
- 17) What is the term used to indicate inner surface of an arch?
- 18) What is the commonly adopted bearing length used for wooded lintels?

- 19) Up to what spans the brick lintels are used?
- 20) Can you define Wainscot which is used in paneling of wood masonry wall?
- 21) Can you draw a sketch showing soffit, tread and rise of a typical stair case?
- 22) What is the minimum percentage of the window area is provided with reference to the total inside area of the room?
- 23) What is the commonly used thickness of the plywood facing on flush door?
- 24) What is the term used to indicate the angle formed at the intersection of the two roof slopes?
- 25) Steel trusses are generally adopted because state the reasons?
- 26) What are the factors that influence quality of mosaic tiles/flooring?
- 27) Where the external metal staircase is generally used?
- 28) What is the most commonly adopted values of tread and rise, for Indian conditions?
- 29) What type of lines a combined line is represented by?
- 30) State the significance of GTS bench mark?

Transportation Engineering

- 31) What is the camber provided in case of WBM roads?
- 32) What is the standard interval of providing expansion joints in a CC pavement slab?
- 33) What is the minim grade of concrete recommended in case of truck serving CC pavements?
- 34) Do you know anything about Superpave technology?
- 35) What do you know about CRF: Central Road Fund?
- 36) What is the finding scenario of NHDP?
- 37) What is the funding difference between PMGSY and Bharath Nirman Projects?
- 38) What are the instruments used during reconnaissance survey?



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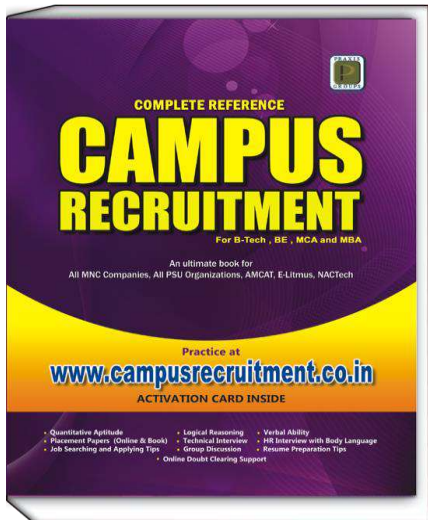
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<p>228) Draw zero sequence networks of loads connections for star ungrounded neutral, star grounded neutral, star grounded neutral with an impedance Z_n and delta connected loads.</p> <p>229) Explain formulation of Y_{bus} using nodal method and singular transformation method.</p> <p>230) Define sparsity. What is the value of sparsity of Y_{bus} for a practical power system?</p> <p>231) What are the assumptions made to develop relation between bus voltages and bus currents in load flow studies?</p> <p>232) Define voltage regulation and efficiency of a transmission line. Explain the effect of load power factor on regulation and efficiency.</p> <p>233) Draw phasor diagrams and write A, B, C and D parameters for nominal T and π circuit of transmission line.</p> <p>234) Derive A, B, C and D parameters for nominal T and π methods.</p> <p>235) Explain how to determine A, B, C and D parameters of a transmission lines practically.</p> <p>236) Explain how to determine +ve, -ve and zero sequence impedances of transformers practically.</p> <p>237) Explain how to determine +ve, -ve and zero sequence impedances of alternators practically.</p> <p>238) Explain phenomenon of current chopping in vacuum circuit breakers. State the properties of contact materials used for vacuum interrupters.</p> <p>239) Define switchgear and differentiate between low voltage switchgear and high voltage switchgear.</p> <p>240) Define coefficient of earthing and state the significance of it in selection of voltage rating of surge arrester.</p> <p>241) Explain about single frequency transient and double frequency transients.</p> <p>242) Explain the working principle of current limiting reactors and explain why we need these reactors in power systems.</p> <p>243) Explain the principle of directional element. Draw and explain impedance relay characteristics with directional element.</p> <p>244) What do you understand about power swings and explain its affects on distance relays.</p> <p>245) Define reach and under-reach of distance relay. Explain the effect of arc resistance in distance relays.</p> <p>246) Draw voltage characteristics of surge arrester and define residual voltage, impulse spark over voltage and power frequency voltage of a surge arrester.</p>	<p>247) Draw the phasor diagrams of synchronous generator feeding constant active power into infinite bus bars as excitation is varied.</p> <p>248) What do you understand about insulation coordination, protective margins and protective ratio?</p> <p>249) Explain the N-R method of load flow studies. Explain the reasons for the order of Jacobian in N-R method using polar coordinates is smaller than in N-R method using rectangular coordinates.</p> <p>250) What is traveling wave? Explain the concept of standing wave and voltage standing wave ratio.</p>
--	--

C Programming

1) Write a program to print?

```
*****
*****
***
**
*
```

2) When should a type cast be used?

3) What are the different data types?

4) What is the output of the below program?

```
#include<stdio.h>
int main(){
char a='A';
printf("size of variable a is %d \n",sizeof(c));
printf("size of A is %d ",sizeof('A'));
return 0;
}
```

5) Does the below program runs successfully?

```
#include<stdio.h>
int main(){
int const a = 1;
a = 2;
}
```

6) What is difference between i++ and ++i?

7) What is the output of the below program?

```
include <stdio.h>
int main()
{
int m=40,n=20,o=20,p=30;
if (m>n && m !=0)
printf("&& Operator:Both conditions are true\n");
if (o>p || p!=20)
printf("|| Operator : Only one condition is true\n");
if (!(m>n && m !=0))
printf("! Operator : Both conditions are true\n");
else
printf("! Operator : Both conditions are true. But,
status is inverted as false\n");
}
```

8) What is the output of the following code?

```
#include<stdio.h>
void main(){
int check=2;
switch(check){
case 1: printf("Infosys");
case 2: printf("Gail");
case 3: printf("L&T");
default: printf("AirIndia");
}
```

```
}
}
```

9) What is the difference between

a. parameter passed by reference

b. parameter passed by value

10) In the code below, which variable has the largest scope?

```
include <stdio.h>
int b;
int main()
{
int c;
return 0;
}
int a;
```

11) Can we convert *int* to *double*? If yes, give an example expression?

12) What is the difference between string and character arrays?

13) Define structure and give an example?

14) What does static variable mean?

15) What is the benefit of using '*const*'?

16) What is recursive function? Write a program of Fibonacci series using recursive function?

17) Give a syntax of declaring array?

18) Write a program to print every element of 2 x 5 x 3 dimensional array?

19) What is a pointer?

20) How do you use a pointer to a function?

21) What do you mean by inline function?

22) What are the different storage classes in C?

23) What is the difference between printf () and sprintf ()?

24) Does there exist any other function which can be used to convert an integer/float to a string?

25) Can a variable be both constant and volatile?

26) Advantages of a macro over a function?

27) Which bit wise operator is suitable for checking whether a particular bit is on or off?

28) When should the volatile modifier be used?

29) *const char *p* , *char const *p*

What is the difference between the above two?

30) What is output of below program?

```
#include <stdio.h>
int main(){
int a=500;
char *ptr=(char *)&a;
printf("%d\n",*ptr);
```



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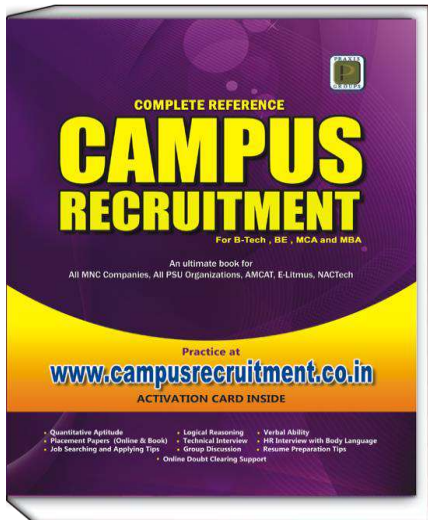
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217) Give me some scenarios where “document” object being used?

218) What is difference between *Prompt* and *Alert* methods in JavaScript?

219) What is XML and give the example of XML?

220) Why XML is used in web technologies?

221) Design XML for the below given scenario
A shopping floor have multiple racks, each rack has multiple shelves, each shelf has multiple products, each product has price and manufacturing date.

222) What is the purpose of DTD and where it is mentioned in the XML document?

223) What DOM stands for? And what is relation between DOM and XML?

224) What are two parsing mechanisms of XML?

225) How do we set and get the properties to Java bean class? Give the example java bean class?

226) What is default port of tomcat web server?

227) In which folder of tomcat do we deploy web applications?

228) Explain the life cycle of the servlet?

229) In how many ways can we track the session?

230) Write a servlet, which displays all the form attributes?

231) What is difference between Session Variable and Application Variable?

232) What is filters and when does filter gets executed?

233) What is deployment descriptor, What is the name given to deployment descriptor file?

234) Name the implicit Object provided by JSP?

235) What is difference between forward and redirect methods?

236) Give the syntax for JSP declaration and JSP expression?

237) How many types of statements are there in JDBC. What are they?

238) What is meant by JDBC driver and why it is used for?

239) Give the code snippet to open connection object using the JDBC?

240) Give the syntax which iterating the Result Set Object?

Software Engineering

241) What CMMI stands for?

242) Mention the different stages in SDLC?

243) Explain how water-fall model works for software development?

244) What does software requirement document consists?

245) Assume you are developing a web application for travel portal, what are the requirements you want to gather?

246) What is difference between white-box testing and black-box testing?

247) What is system testing, When does system testing can be conducted?

248) List some golden rules for designing UI?

249) What is UML? Explain some symbols which are used in UML? List some tools for drawing UML diagrams?

250) What is Use case and What is Test Case? What is difference between both?

251) List some of the risks that software systems may encounter?

Project Interview Questions

The following are some of the commonly asked interview questions on your project work.

- 1) Tell me what you learned from your project?
- 2) Why did you choose this project?
- 3) What were the objectives of the project?
- 4) What would happen if ____?
- 5) What are the limitations of your project?
- 6) If you were to start your project again, is there anything you would like to change?
- 7) What were the best features of your project?
- 8) Is there another possible explanation for your results?
- 9) What further research would you liked to have conducted, and why?
- 10) How could it help people?
- 11) Can it be implemented in real time?
- 12) Working of all individual components.
- 13) What is a project?
- 14) Name five signs that indicate your project may fail.
- 15) Tell us about a project in which you participated and your role in that project.
- 16) Tell us about any creative idea or innovative solution you brought to a project.
- 17) What types of tools are involved in your project?
- 18) What is the team size of your project?

SOFTSKILLS
and
JOB SEARCH/APPLYING TIPS

HR INTERVIEW

The interview is the last step for hiring and probably the most important. Interviews are conducted to assess a candidate's suitability for an organization and the hiring role.

Why an interview is conducted:

The purpose of an interview is to ascertain what a candidate has mentioned in his resume. It is a brief meeting where your technical know-how will be assessed in addition to your communication skills, motivational factors, your attitude, your goals and objectives. An interview is a two way process where an employer gets to know the prospective (to be hired) employee and an employee gains insight of the organizational and the role being offered to him.

What qualities does an interviewer observe?

a) Attitude: The most important factor that determines who gets hired and who doesn't is NOT who is best qualified, who has the most experience or skills, or who has the best resume. It is the attitude! Show positive attitude and your excitement for the job. Do not show arrogance even if you are a college topper.

b) Communication Skills: Regardless of how much of knowledge you possess, unless you know how to express yourself clearly, the interview may not turn out to be in your favor. Powerful communication skills have the ability to compensate for short coming in other areas. A candidate must speak confidently and use clear language with as little jargon as possible. His conversation with the interviewer must reflect his enthusiasm, awareness and his attitude.

c) Confidence: Approaching an interview with confidence is one of the keys of a winning strategy. Your confidence is a reflection of optimism and speaks a lot about how you would handle a challenging professional situation. Confidence is great; overconfidence is a strict no-no.

d) Body language: Good body language is an indicator on good non-verbal communication. Walk into the room with a confident smile and introduce yourself to everyone present with a firm handshake. Maintain a good posture, do not slouch, maintain eye contact, and nod your head when being talked to. Do not yawn, bite your nails, shake your limbs, look around, look down.

e) Leadership skills:

A leader always motivates. A leader directs his team towards success. When you attend an interview, make sure your interviewer knows that you are ready to take initiatives and help the members of your team.

Learnability is another sign of a good leader. Letting the interviewers know your eagerness to learn new things will prove to be a bonus for you.

f) Emotional Maturity: A candidate must be calm and composed during an interview. Sometimes, the interviewer, on purpose may provoke you by asking some unexpected questions. Do not get provoked or angry. Instead, show your maturity by answering the question in a manner that does not offend the interviewer. It is better to be honest and give direct answers instead of speaking as if you agree with all the points that the interviewer says. The given situation should be handled with ease, maturity and composure.

g) Dressing Sense: It is important to dress right for an interview. Your appearance talks loads about your personality. Wear neatly ironed formal clothes with a good pair of shoes. Women should apply minimal make up and avoid too much of jewelry. Both men and women should have well manicured nails and a professional hairstyle. Going shabbily dressed for an interview would cast an impression of your being uninterested towards the meeting.

h) Integrity: Every interviewer appreciates honesty as that is one of the main traits to look for in a candidate. Answer the questions honestly. Do not lie about your professional achievements. Be humble. Do not throw an air of arrogance. If you are appreciated for something, be gracious to say thanks.

i) Flexibility: An employer should be convinced about your ability to adapt to different situations. Show the employers that you are flexible and can adjust to different circumstances. If you are asked for example, your willingness to re-locate far away from your family for a project, mention that you would be happy doing so as your career and organization's interest are foremost priorities. How well you adjust to the situation is a trait employers look for in their employees.

j) Learnability:

Learning is a continuous process. Desire to keep learning shows an employer that you are enthusiastic about what is being offered to you. Learnability is a key to professional as well as organizational growth. You may be the best of candidates, but unless you have a thirst for knowledge, your knowledge repository may become saturated.



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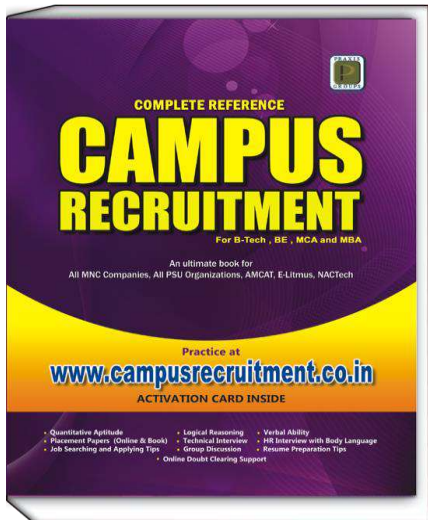
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Mock Interview with Body Language

Right Way:

On entering the interview room,

Student: Good morning (smiling). I am Krishna. Pleased to meet you. (Shake hands with everyone in the interview panel. If a lady is present, wait for her to extend her hand first).

Wait for the interviewer to offer a seat. Sit only when you are asked to and say a polite "Thanks" for the same.



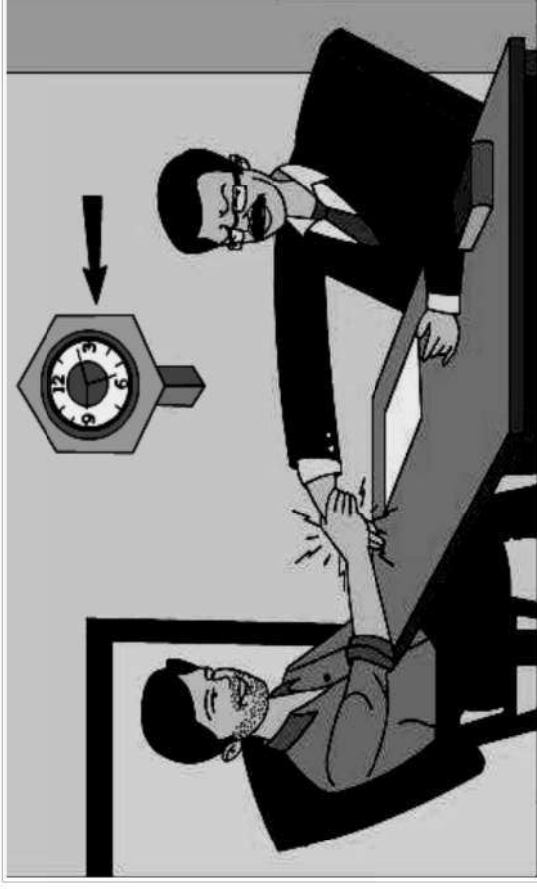
Observation:

- Student is in time to the interview.
- Greeting the interviewer in a good way.
- Giving a firm hand shake to the interviewer.
- From the movement you walk in to the interview room be real.

Wrong Way:

On entering the interview room,

Student: Hi! Good morning. How're you?



Observation:

- Student came late to the interview.
- Greeting the interviewer in an informal way.
- Giving a bone crushing hand shake.
- Student sat down on the chair without asking/giving permission.

* When the interviewer offers you a seat at the start of the job interview, sit upright but not too stiffly in your chair. This indicates that you are comfortable and feeling confident. Hunching down in your chair gives the impression of nervousness and low self-esteem. A sloppy posture indicates a careless attitude and a lack of energy. Sitting on the edge of your chair can come across as being nervous and tense.

1. Tell us about yourself



Good Answer: I am pursuing B.Tech in computer science. The three best attributes that describe me are passionate, professional and perseverant. I have a great liking for my subject and my approach is logical rather than theoretical. I try to analyze various situations where my subjects can be applied. This is a testimonial to the fact that I have won several awards in technical quiz competitions. I am a professional when it comes to work. I have led the project team at my college. I was able to steer my team in the right direction. Our project won many accolades from the faculty. My friends appreciate my leadership abilities. I was the class representative for three consecutive years.

Body Language Observation:

- Student is maintaining active and enthusiastic face expression.
- Good dressing sense.
- Looking very confident.
- Prepare well for the interview. And answer with the relevant details for the questions asked by interviewer.



Bad Answer: My name is Krishna. I am 22 years of age. I have studied B.Tech from MVIT. Hm, I completed inter in the year 2008 with 75%. I passed SSC in 2006 with 88%. I am a native of Amalapuram. My father is a retired bank employee. My mother is a teacher. Um, My brothers are pursuing B.tech in Hyderabad. I love sports. Ah, I won the best batsman award at college. I am a great team player and a good person. (Irrelevant details).

Body Language Observation:

- Facial expressions are not good.
- Avoid using verbal tics like *hm*, *um*, *ah* etc while answering.
- Bad dressing sense and arms are folded.
- Explaining the answer with irrelevant details.



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10. Do you have any questions?



Good Answer:

1. Can you please tell me about the kind of training we would be given to a fresher before we are allocated to our projects?
2. What aspirations do you have for my role in the company?
3. What qualities does someone need for this role ?

Body Language Observation:

- When you are asked this Question, simply don't say, 'I don't have any Questions'. Come prepared with a few good questions about the position and your responsibilities. Also, you can highlight your ability to analyze and think quickly on your feet by posing questions about key issues that emerge during the interview.
- Say 'Thank You' gracefully at the end of the interview for interviewing.



Bad Answer:

1. Do I have to work long hours?
2. What is the leave policy of the company?
3. What are the services offered by the company?
4. Are you married?

Body Language Observation:

- Looking constantly downwards/ upwards makes you appear insincere or submissive.
- Avoid short/ irrelevant/ answers for interview questions.

One important key to success is self-confidence. An important key to self-confidence is preparation.



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Tips to use Naukri.com

Naukri.com is a popular website for searching for jobs. This website is now serving as a database to all the recruiters and HRs who want to recruit candidates. You can get calls from recruiters if you utilize this site effectively. Register yourself with the 'Naukri.com'. You need to follow a few tips for updating your profile.

Profile updating in Naukri.com:

A) Profile Summary:

- Login to your Naukri.com account. Click on 'My Naukri' and then click on 'View and Update Profile'.
- Then the following screen will be displayed. Now Click on 'Edit' at 'Profile Summary'.
- Profile Summary is a short explanation about your skills, competencies and your objectives. If you fail to give an impressive profile summary, the recruiters may not read your full profile for the required job.



B) Resume Uploading:

- Click on 'My Naukri' and then click on 'View and Update Profile'.
- The last tab is 'Resume' as shown in the below screen shot. Click on 'Edit' and upload your latest updated resume and click on 'save'.

Languages Known				
Language	Read	Write	Speak	Proficiency
English	✓	✓	✓	Expert
Hindi	✓	✓	✓	Expert
Telugu	✓	✓	✓	Expert

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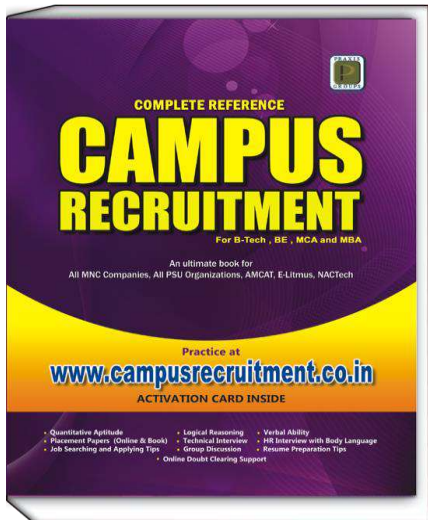
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Tips to use Monster.com

Registering in 'Monster.com' as member:

1. Go to 'www.monster.com', then click on 'Join us' button as shown below,



2. Upon clicking on the 'Join us' button, a screen will be displayed just like as shown in 'naukri.com' web site. Fill all the details correctly and click on 'Submit' button at the bottom to complete the registration process.

Profile updating in Monster.com

The profile updating in Monster.com is almost similar to that of Naukri.com. You can follow the same rules that are explained in Naukri.com to update your profile. Monster.com also has a facility to search the jobs by function, jobs by industry, jobs by location and jobs by company. In addition, Monster.com has a new feature of uploading 'Video Resume'.

What is a Video Resume?

It is the new feature introduced by 'Monster.com'. Job seekers can now upload their Video Resumes in the same way as text resumes. This facility will allow the job seeker to personally market oneself by presenting a resume and a video that speaks directly to employers. The video resume allows prospective employers to see

and hear applicants, and get a feel for how applicants present themselves. It is a resume presented on a video clip of 3 to 5 minutes. This can be said as first part of an interview which is to introduce oneself. The Video Resume will allow recruiters to do a preliminary screening of the candidates without getting involved in the processes of interviews and practically evaluate how they present their experience and skills. Recruiters will be able search for video resumes in the same way as text resumes and also receive the video resumes as job applications.

How to submit a Video Resume:

A. Login to your monster.com account. Click on 'Submit Resume' at the top.

B. Fill all the details correctly. At the end of the page you can see the following screen. Here write a good Resume title as explained in the illustration of 'Profile Updating in Naukri.com'. Click on 'Browse...' to select your resume to upload. Then click 'Submit'.

3. After clicking on the 'Submit' button, you get a page which asks to enter your 'Educational Qualification', 'Work Experience', 'Other information' and 'Optional information'. Under the 'Other information' heading you can observe the option to upload 'Video Resume'.



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RESUME PREPARATION

Your resume is the most important document that the employer would refer to. Hence, it is very important to keep your resume professional and up to date. Include your professional details, academic details total work experience, skills, tools and programming languages known. Do not lie about your skills and experience. Resume should be written honestly and carefully. Do not prepare a very long resume. A short but to the point resume should be prepared. Do not copy the resume from other sources. Write it on your own although you may take reference from sample resumes.

Tips to build an effective resume

- Choose a good resume format.
- Pick up a font that is easy to read. Fonts such as Verdana, Times New Roman and Arial in sizes 10-12 are conducive for reading.
- Use the right keywords in your resume.
- Use effective titles.

Example: Bad title: Software development.

Good title: Developing Java API.

- Divide your resume into sub sections.

Example: One section for details about your work experience, the second section about your academic qualifications, the third about your skill set, the fourth about your personal profile etc.

- The most important points should be placed at the beginning of your resume. This should be uniformly followed in the individual sections as well. The most recent work experience will come first.
- Your contact details including your address telephone number and email ID should be clearly mentioned in the resume.
- Use bullet points and short sentences in your resume. Do not make the resume boring by giving in depth explanation or being repetitive.
- Avoid writing negative sentences.
- Write a few sentences about your professional goals.
- Use your testimonial references for any skill that you would like to highlight.

Example: winning a technical white paper competition at the national level (testimonials included).

- Do not include your age, unless it is specifically asked for.
- Do not create a standard resume for all the jobs to be applied to. Restructure your resume depending on the job for which you are applying.
- Do a spelling and a grammar check before you send your resume.

- Update your resume on a periodic basis.
- Mention dates in order.
- Do not forget the basics, like your name.
- Mention the employers for whom you have worked.
- Mention the companies for whom you have interned (done your projects).
- Do not use heavy vocabulary or too much of jargon(technical words).
- Get your resume reviewed by a professional.

Things to avoid when writing your resume

- Lying about past work experience or qualification.
- Committing spelling and grammatical errors.
- Making the resume colorful in appearance.
- Including too much of information.
- Not using the right keywords.
- Writing an objective that does not match the job.
- Writing old or outdated details.
- Sending a handwritten or poorly photocopied resume
- Writing long sentences and paragraphs.
- Writing about your own goals more than your abilities to match the job expectation.
- Using 'I' in the sentences.
- Writing information that would make an employer feel that you discriminate (Mentioning your age/ marital status/ number of kids/gender etc).
- Writing about hobbies(Unless your hobby would contribute to your candidature, do not include it).
- Writing incomplete information.
- Writing negative things (Like failure in delivering a project).
- Writing please ("Please give me an opportunity to work for you.")

Contents of A Good Resume

a. Personal Details: The most important detail is your name, mentioned in bold. Your contact information including email IDs and telephone numbers should be clearly written.

b. Summary: Writing an objective is a thing of the past. Instead, summarize your experience and skill set in one or two effective sentences. This would immediately grab the hiring manager's attention. E.g. Five years of experience in software quality assurance.

c. Past Work Experience: Include the details of your previous employment and briefly mention the significant projects that you were involved in. Mention the organization name and also the duration of your work. The order should be starting from recent to past.



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GROUP DISCUSSION

Group Discussion is a process of selection rather than elimination. Group Discussion refers to the process where by a topic or a situation is presented to a group of candidates. It is a systematic exchange of ideas and information among a group of people. In a Group Discussion, a topic is given and each member is given about 10-15 minutes to think about the given topic. The members are then allowed to present their views and opinions to the other candidates in the group. The Group Discussion facilitates objective thinking, systematic presentation of ideas, interacting abilities, problem resolution, leadership abilities, ability to take initiatives, ability to work within a team, flexibility and assertiveness skills.

Why GD is a part of the selection process?

The primary reason for conducting the Group Discussion is to evaluate how effectively a candidate would perform as a member of a team. When more than one person is involved in problem solving, ideas have to be brainstormed, collaborated and a conclusion should be reached such that the organizational goals are met along with creating a win win situation for every member of the team. Thus apart from participation and contribution, team behavior and attitude of a person are the traits that a company would be evaluating in the Group Discussion.

The written test evaluates aptitude in Verbal Ability, Quantitative Ability and Reasoning Ability; These areas to judge the the analytical, logical, numerical and language abilities but they do not test the personality traits or group behavior of the individual. The ability to deal with people, individually or in a group, is vital for success in the corporate world. Therefore a group discussion is included in the selection process. A group discussion allows the selectors to judge the individual's performance and behavior in a group. Different aspects of group discussion include communication skills- both verbal and non-verbal, Ability to make decisions and co-operate with people.

Types of Group Discussions

The classification is based on the type of the topics that are chosen for group discussion. The topics could be:

1. Current Affairs-Topics related to current news items related to business, technology, politics, education and social activities etc.

2. Argumentative Issues- A topic is given to the candidates that they have to analyze and critically present their views on the topic.

3. Factual topics- The topics are which may directly or indirectly affect a person in his day to day life.

- Women's reservation bill
- Lokpal bill
- Status of women in India
- Global warming.

4. Controversial topics- Topics in which candidates can take a stance – for or against the given topic thereby leading to a bit of disagreement among the participating members of the group.

For example,

- We are becoming too dependent on computers.
- Video games contribute to youth violence.
- Reservation system should be removed.

5. Abstract subjects- These types of topics generally include imaginary or hypothetical topics. For example,

- What would happen if the Earth would stop rotating?
- What would happen if you were given a chance to rule the country?

6. Case study- instead of a topic a case study will be given in this category. They need to resolve the situation. The objective the case study is to think about the situation from different angles. Generally real life situations are given in case study. A complex and problematic situation and information about that situation is given to the group.

Popular Group Discussion Topics

- 1) Are Advertisements Beneficial or misleading?
- 2) Balance between Professionalism and Family.
- 3) Can Trade help the poor?
- 4) Demographic Dividend in India.
- 5) Depreciation of Indian Rupee.
- 6) Is FDI good for India?
- 7) Privatization will lead to Less Corruption.
- 8) To survive in the civilized world one needs to be hypocrite.
- 9) Growth and integrity are poles apart.
- 10) Cricket Has Spoiled Other Streams Of Indian Sports.
- 11) We will never be corruption free society.
- 12) Indian Primary Education Is Pathetic.
- 13) India needs more entrepreneurs than managers to face new challenges.
- 14) Artificial Intelligence - Will man be ever replaced by machines?
- 15) Role of India in combating terrorism.



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