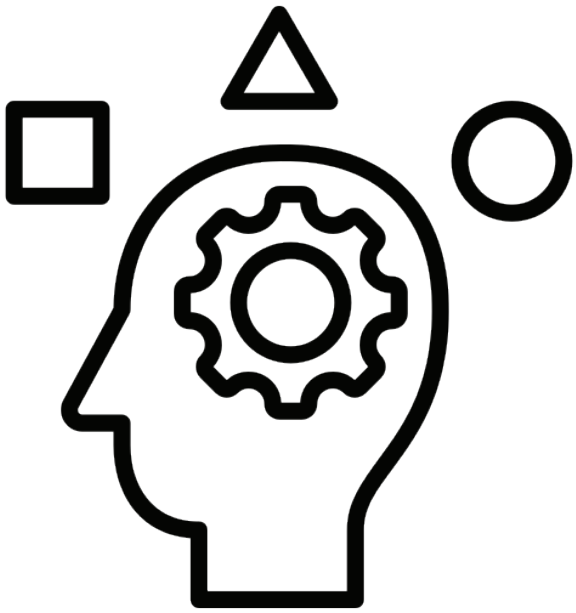
NTA CSIR-UGC NET/JRF

GENERAL APTITUDE



Dr. KAILASH CHOUDHARY

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P R E F A C E

This book with the title **“General Aptitude - Comprehensive Theory and Practice”** focused on important topics according to new trends of various competitive exams such as CSIR - NET, GATE, SET, and DBT exams.

The aptitude section has a major role to play in CSIR NET, GATE, SET, DBT irrespective of your subject stream. General Aptitude covers around 10-15 percent of the entire exam paper and it can make or mar a candidate in these exams. Hence, this becomes more pertinent from the exam’s point of view and can’t be neglected. If you've got these competitive examinations around the corner, this is the book for you.

General Aptitude - Comprehensive Theory and Practice, have been divided into nineteen chapters covering all aspects of aptitude and reasoning, which are generally asked in most competitive exams followed by model questions and previous year questions. The book explains the fundamentals of general aptitude with simplified theory, short tricks, and a multitude of examples and quick exercises. A large number of well-graded examination questions from CSIR NET exams have been solved in the given chapters.

It is one of the best reference guides that will help you get your elementary mathematics right. It is beneficial for all science streams - Mathematical Sciences, Physical Sciences, Chemical Sciences, Life Sciences, Earth Sciences, and Engineering Science.

The book has practice model questions that the candidate can work on in order to boost preparation for the examination.

Kailash Choudhary

I N D E X

General Aptitude

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CHAPTER 1

NUMBER SYSTEM

-: GENERAL APTITUDE :-

A number is an arithmetical value, expressed by a symbol or word, representing a particular quantity or amount and used in counting and making calculations.

1.1 Different Types of Numbers:

1.1.1 Natural Numbers

The counting numbers are called natural numbers. Natural numbers do not include 0 or any negative numbers.
Example: 1, 2, 3, 4… are all-natural numbers.

1.1.2 Whole Numbers

All counting numbers and 0 (zero) together form the set of whole numbers. They do not include negative numbers.
Example: 0, 1, 2, 3, 4… are whole numbers.

1.1.3 Integers

All counting numbers including 0 and the negatives of the counting numbers form the set of integers.
Example: -3, -2, -1, 0, 1, 2, 3… are all integers.
Set of positive integers = {1, 2, 3, 4, 5, 6…}
Set of negative integers = {-1, -2, -3, -4, -5, -6…}
Set of non-negative integers = {0, 1, 2, 3, 4, 5, 6…}

1.1.4 Even Numbers and Odd Numbers

An integer which is exactly divisible by 2 is called an even number. While an integer which cannot be exactly divisible by 2 is called an odd number.
Example: -6, -4, -2, 0, 2, 4, 6, 8, 10… are all **even numbers**.
Zero is considered an even number.
While an integer which cannot be exactly divisible by 2 is called an odd number.
Example: -5, -3, -1, 1, 3, 5, 7, 9, 11… are all **odd numbers**.

1.1.5 Prime Numbers

A natural number other than 1 is a **prime number** if it is divisible by 1 and itself only.
Example: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 and 47 are the prime numbers less than 50.

Test to find whether a given number is a prime:
Step 1:
Select a least positive integer n such that n^2> given number

Step 2:
Test the divisibility of a given number by every prime number less than n.

Step 3:
The given number is prime only if it is not divisible by any of these primes.

Example: Check whether 571 is a prime number
Since $(23)^2 = 529 < 571$ and $(24)^2 = 576 > 571$
So, n = 24
Prime numbers less than 24 are 2, 3, 5, 7, 11, 13, 17, 19, 23.
Since 571 is not divisible by any of these primes, therefore 571 is a prime number.

Example: Check whether 923 is a prime number.
Since $30^2 = 900 < 923$ and $31^2 = 961 > 923$
So, n = 31
Prime numbers less than 31 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
Since 923 is divisible by 13, 923 is not a prime number

1.1.6 Composite Numbers

Natural numbers greater than 1 which are not prime are known as **composite numbers**.
Example: 9 can be divided by 3 (as well as 1 and 9), so 9 is a composite number similarly 12 can be divided by 2, 3, 4 and 6, so it is also a composite number.

Note:
1. The number 1 is neither a prime number nor a composite number.
2. The number 2 is the only even number which is prime

1.1.7 Rational Numbers

A rational number is a number that can be represented as a ratio or fraction in which both the numerator and the denominator are whole numbers.
The number 18 can be said to a rational number because it can be written as the fraction $\frac{18}{1}$.
Likewise, ¾ is also a rational number because it can be written as a fraction.
Every whole number is a rational number, because any whole number can be written as a fraction.

1.1.8 Irrational Numbers

Any number that is not rational is considered as an irrational number. An irrational number can be written as a decimal, but not as a fraction.
An irrational number has endless non-repeating digits to the right of the decimal point.

Some important examples of irrational numbers include:
π = 3.141592…
$\sqrt{2}$ = 1.414213…
Although irrational numbers are not often used in daily life, they do exist on the number line. In fact, between 0 and 1 on the number line, there are an infinite number of irrational numbers

1.1.9 Decimal Numbers

Not every number we face is a whole number. Our decimal system allows us a flexibility in writing the numbers of different values and sizes, using a symbol called the decimal point.
Example: 32.567, 12.87 23.64
As we move right from the decimal point, each place value is divided by 10. While on moving to the left side from the decimal point each place value is multiplied by 10.

1.1.10 Perfect Number:

A perfect number is a natural number, which when you add up all of the factors less than that number will give you that number.
Example: The factors of 28 are 1, 2, 4, 7, and 14.
1 + 2 + 4 + 7 + 14 = 28.
Thus, 28 is a perfect number.

1.1.11 Perfect Square:

A perfect square is a number that can be written as the product of two equal factors.
Example: 25, 36, 49, 64… are all perfect squares.
Important properties of perfect squares:
(a) No perfect square ends with 2, 3, 7, 8.
(b) No perfect square ends with an odd number of zeros.
(c) Perfect squares can be recognized by the fact that all of their prime factors have even multiplicities.

1.1.12 Fractions:

A fraction is used to represent a part of a whole or any number of equal parts. A fraction (examples: 5/11 and 3/7) consists of an integer numerator, displayed above a line, and a non-zero integer denominator, displayed below that line.

Proper Fraction:

A fraction whose numerator is less than the denominator. The value of such fractions is usually less than 1.
Example $\frac{1}{4}, \frac{2}{7}, \frac{17}{20}$.

Improper Fraction:

A fraction whose numerator is equal to or greater than the denominator.
The value of such fractions is usually more than 1.
Example. $\frac{5}{3}, \frac{10}{7}, \frac{40}{19}$.

Mixed Fraction:

An improper fraction (fractions having denominator smaller than numerator) can be expressed as a whole number and a proper fraction. Such fractions are then called mixed fraction.

Steps involved in conversion of improper fraction to mixed fraction

Step 1: Divide the numerator by the denominator.
Step 2: Write down the Quotient (whole number) of the division followed by the fraction having the remainder above the denominator.
Example $5\frac{1}{4}, 3\frac{7}{8}, 22\frac{3}{17}$.

Factorization:

The prime numbers that divide an integer exactly are termed as the prime factors of that Integer.
The factorization of a positive integer is the process of listing of the integer's prime factors, together with their multiplicities.
Example 1: Prime factors of 420 $= 2 \times 2 \times 3 \times 5 \times 7$
$= 2^2 \times 3^1 \times 5^1 \times 7^1$
Where, 2, 3, 5 and 7 are factors having multiplicities 2, 1, 1 and 1 respectively.
Example2: Prime factorization of 900 = 2^2 x 3^2 x 5^2 in which multiplicities of the factors 2, 3, 5 are 2, 2, 2 respectively, which are all even. Thus 900 is a perfect square.
IV. Perfect square (unit digit- 0, 1, 4, 5, 6, 9)

Unit's digit	0	1	4	5	6	9
Ten's digit	0	even	even	2	odd	even

1.2 Factors and Multiples:

If a number, say, 'x' exactly divides another number 'y', we can say that 'x' is a factor of 'y'. Further, 'y' is called a multiple of 'x'.
For example, 4 is a common factor of 8 and 12.

Example 1: If A and B are two natural numbers such that A *x* B = 84, which of the following cannot be the value of A + B?
(1) 21 (2) 25
(3) 45 (4) 85
Explanation:
Checking only the given answer options,
12 x 7 = 84, 12+7 = 21
21 x 4 = 84, 21+4 = 25
84 x 1 = 84, 84+1 = 85
42 x 2 = 84, 42+2 = 44
Since A and B are natural numbers and we can get 44 by addition of a particular set of values, there can be no way of getting 45 by using natural number for A and B.
Therefore, 45 is the number which cannot be obtained in the above question i.e. option (3)
Answer (3)

1.2.1 GCD - Greatest Common Divisor (Highest Common Factor (HCF)):

The GCD or HCF of two or more than two numbers is the greatest number that divides each one of them exactly.
For example, 6 is the highest common factor of 12, 18 and 24.

Method for finding the GCD of two or more numbers:

Step 1: Express each one of the given numbers as the product of prime factors.

Step 2: Choose common factors.

Step 3: Find the product of these common factors. This is the required H.C.F. of given numbers.

Example: Find the GCD of 360 and 240?

Prime factors of 360 = $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 3^2 5^1$

Prime factors of 240 = $2 \times 2 \times 2 \times 2 \times 3 \times 5 = 2^4 3^1 5^1$

Prime factors common to 360 and 240= $2 \times 2 \times 2 \times 3 \times 5 = 120$.

So, the GCD/HCF of 360 and 240 is 120.

1.2.2 Least Common Multiple (LCM):

The LCM of two or more given numbers is the smallest number which is exactly divisible by each one of them.

Method of finding LCM of two or more numbers:

Step 1: Resolve each given number into prime factors.

Step 2: Take out all factors with highest powers that occur in given numbers.

Step 3: Find the product of these factors. This product will be the L.C.M.

Example 1: Find LCM of 360 and 240

Prime factors of 360 = $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 3^2 5^1$.

Prime factors of 240 = $2 \times 2 \times 2 \times 2 \times 3 \times 5 = 2^4 3^1 5^1$.

Product of highest powers of all prime factors of 360 and 240 = $2^4 \times 3^2 \times 5^1 = 720$.

Thus, the LCM of 360 and 240 is 720.

Important Properties of GCD and LCM

i. Product of two numbers = LCM of the numbers × HCF of the numbers

ii. HCF or GCD of given numbers always divides their LCM

iii. HCF or GCD of given fractions = $\frac{GCD\ of\ Numerators}{LCM\ of\ Denominator}$

iv. LCM of given fractions = $\frac{LCM\ of\ Numerators}{GCD\ of\ Denominator}$

Example 2: The GCD of two numbers is 2 and their LCM is 42. If one of the numbers is 6, find the other number?

(1) 12 (2) 13

(3) 14 (4) 16

Explanation:

Let another number be *y*.

We know that, Product of two numbers = Product of their GCD and LCM

i.e. $6 \times y = 2 \times 42$

i.e. $y = \frac{(2 \times 42)}{6}$

i.e. $y = 14$

Answer (3)

Example 3: Find the H.C.F of 108, 360 and 600.

(1) 12 (2) 13

(3) 14 (4) 15

Explanation:

Upon prime factorization of the given numbers,

$108 = 2^2 \times 3^3$,

$360 = (2^3 \times 3^2 \times 5)$

$600 = (2^3 \times 5^2 \times 3)$

Taking out the common factors, we can say,

H.C.F $= (2^2 \times 3)$

$= (4 \times 3)$

$= 12$

Answer (1)

1.3 'BODMAS' Rule:

This rule depicts the correct sequence in which the operations are to be executed, so as to find out the value of the given expression.

Here B - Bracket,
O - of,
D - Division,
M - Multiplication,
A - Addition and
S – Subtraction

Thus, in simplifying an expression, first of all the brackets must be removed, strictly in the order (), {} and ||.

After removing the brackets, we must use the following operations strictly in the order:

(i) Division (ii) Multiplication (iii) Addition (iv) Subtraction.

Example 4: What will be the value of $(48 - 12) \div 4 + 6 \div 2 \times 3$?

(1) 18 (2) 9/4

(3) 24 (4) 4.5

Explanation:

$(48 - 12) \div 4 + 6 \div 2 \times 3$

$= 36 \div 4 + 6 \div 2 \times 3$ (Solving Bracket)

$= 9 + 3 \times 3$ (Solving Division)

$= 9 + 9$ (Solving Multiplication)

$= 18$ (Solving Addition)

Answer (1)

1.4 Test for Divisibility:

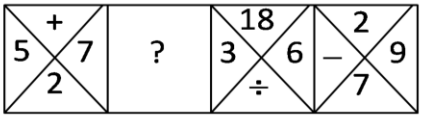
- A number is **divisible by 2** if its last digit is 0 or divisible by 2 (i.e. 0,2,4,6 or 8).
  Example – 48, 786, 987654 are divisible by 2
- A number is **divisible by 3** if the sum of its digits is divisible by 3.
  Example: 534: 5+3+4=12 and 1+2=3 so 534 is divisible by 3.
- A number is **divisible by 4** if the last two digits of the number are divisible by 4 or both are 0.
  Example – 4224 is divisible by 4 since 24 (last two digits are divisible by 4)
- A number is **divisible by 5** if the last digit is 5 or 0.
  Example – 555, 8870, 745 are divisible by 5
- A number is **divisible by 6** if the number is divisible by both 2 and 3.

triangle's positon switched and in the same order in the third figure the position of inner triangle and the square which is outside the triangles gets switched in the fourth figure like in option 3.

Answer: (3)

(CSIR NET/JRF DEC 2016)

6. Find the missing term.



1. 

2. 

3. 

4. 

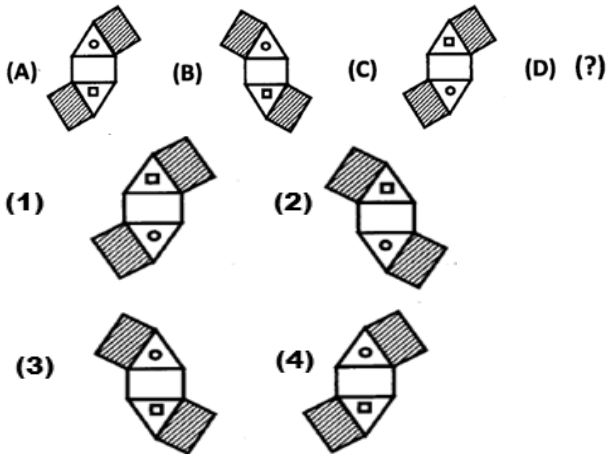
Explanation:

Here Symbol (+ , / and -) is followed by answer.

i.e. + is followed by 7 which is result of 2+5 / is followed by 3 which is result of 18/6 - is followed by 2 which is result of 9 – 7. So on analysing all options, 1 is correct because x is followed by 14 which is the result of 7 x 2

Answer: (1)

7. Find the next figure "D":



Explanation:

As per above figure, (B) is the mirror image of (A)

So we have to find the mirror image of (C)

It's clear that option (2) is the mirror image of (C)

Answer: (2)

(JUNE 2017)

8. Find the missing word: A, AB, _ , ABBABAAB

(1) AABB (2) ABAB

(3) ABBA (4) BAAB

Explanation:

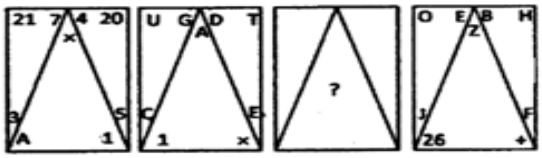
If we see the sequence then it is ABBA, BAAB, ABBA and so on.

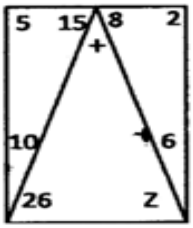
So missing sequence is A, AB, ABBA

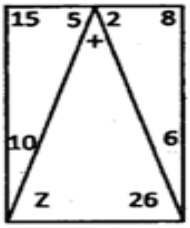
Answer: (3)

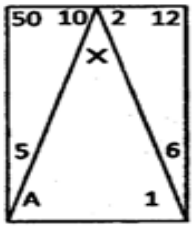
(DECEMBER 2017)

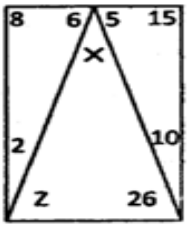
9. Find the missing pattern:



1. 

2. 

3. 

4. 

Explanation:

For first two figures:

21 is place value of = U

7 is place value of = G

4 is place value of = D

20 is place value of = T

3 is place value of = C

5 is place value of = E

Triangle rotates in 90º clock wise.

For last twi figures:

15 is place value of = O

5 is place value of = E

2 is place value of = B

8 is place value of = H

10 is place value of = J

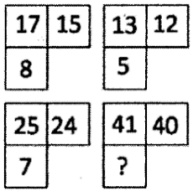
6 is place value of = F

Triangle rotates in 90º Anti clock wise.

Answer: (2)

(DECEMBER 2017)

10. Find the missing number



(1) 4 (2) 9

(3) 3 (4) 6

Explanation:

The number system is based on following patterns:-

$17^2–15^2 = (17 + 15)\ (17–15) = 32 \times 2 = 64 = 8^2$

$13^2 – 12^2 = (13 + 12)\ (13 – 12) = 25 \times 1 = 25 = 5^2$

$25^2–24^2 = (25 + 24)\ (25–24) = 49 \times 1 = 49 = 7^2$

$41^2 – 40^0 = (41 +40)\ (41 –40) = 81 \times 1 = 81 = 9^2$

Answer: (2)

CHAPTER 3

PERCENTAGE

-: GENERAL APTITUDE :-

Percent: The term 'percent' is derived from the Latin word 'Per centum'. It implies "out of every hundred".

The symbol '%' is used to denote percentage. For example, 15% means 15 out of 100. Each ratio can be expressed as a percentage.

For example, $\frac{1}{2}$ can be expressed as a percentage by multiplying by 100

$\frac{1}{2} \times 100 = 50\%$

A given percentage value can be converted to corresponding fraction by dividing by 100

Example: 75% = 75 out of hundred = $\frac{75}{100} = \frac{3}{4}$

Percentage fraction conversion chart:

$\frac{1}{2} = 50\%$	$\frac{5}{6} = 83\frac{1}{3}\%$	$\frac{2}{9} = 22\frac{2}{9}\%$
$\frac{1}{3} = 33\frac{1}{3}\%$	$\frac{1}{7} = 14\frac{2}{7}\%$	$\frac{1}{10} = 10\%$
$\frac{2}{3} = 66\frac{2}{3}\%$	$\frac{2}{7} = 28\frac{4}{7}\%$	$\frac{1}{11} = 9\frac{1}{11}\%$
$\frac{1}{4} = 25\%$	$\frac{3}{7} = 42\frac{6}{7}\%$	$\frac{2}{11} = 18\frac{2}{11}\%$
$\frac{3}{4} = 75\%$	$\frac{1}{8} = 12\frac{1}{2}\%$	$\frac{1}{12} = 8\frac{1}{3}\%$
$\frac{1}{5} = 20\%$	$\frac{3}{8} = 37\frac{1}{2}\%$	$\frac{5}{12} = 41\frac{2}{3}\%$
$\frac{2}{5} = 40\%$	$\frac{5}{8} = 62\frac{1}{2}\%$	$\frac{1}{15} = 6\frac{2}{3}\%$
$\frac{3}{5} = 60\%$	$\frac{7}{8} = 87\frac{1}{2}\%$	$\frac{1}{20} = 5\%$
$\frac{4}{5} = 80\%$	$\frac{1}{9} = 11\frac{1}{9}\%$	$\frac{1}{25} = 4\%$
$\frac{1}{6} = 16\frac{2}{3}\%$		

Formula to calculate percentage value: y% of $x = \left(\frac{y}{100}\right) \times x$

From the above formula, we have the following result: x% of y = y% of x.

Whenever we have two numbers a and b, one number can be expressed as a percentage of the other as follows:

X as a percent of $y = \frac{x}{y} \times 100$, y as a percent of $x = \frac{y}{x} \times 100$.

Percentage increase or decrease:

Percentage increase = $\frac{\text{increase in the quantity}}{\text{original quantity}} \times 100$

Percentage decrease = $\frac{\text{decrease in the quantity}}{\text{original quantity}} \times 100$

Example: If the net profit of a company grew from 50 crore in 2020 to 75 crore in 2021, then find the percentage increase in the net profit from 2020 to 2021.

(1) 10% (2) 50%

(3) 40% (4) 20%

Explanation:

Increase in the net profit = 75 - 50 = 25 crore

This increase is on Rs. 50 crore.

So, Percentage increase = $\frac{\text{increase in profit from 2003 to 2004}}{\text{Net profit in 2003}} \times 100$

$= \frac{25}{30} \times 100 = 50\%$

Answer-(2)

NOTE: When a quantity increases or decreases by some percent, the new value of the quantity can be directly calculated as follows:

If the original quantity is 1.20 and it increases by 25%, then the new quantity = 1.25 x 120 - 150

(Here, 1.25 = 1 +0.25, where 0.25 is equivalent to 25%)

Similarly, if there is a decrease by 25% on 120, then the new quantity is: 0.75 x 120 = 90

(Here, 0.75 +1 -0.25, where 0.25 is equivalent to 25%)

Some Important Conclusions:

(i) **If x is a% more than y, then y is** $\left(\frac{a}{100+a} \times 100\right)\%$ **less than x.**

(ii) **If x is a% more than y, then y is** $\left(\frac{a}{100-a} \times 100\right)\%$ **less than x.**

Example: If in an examination, the marks secured by Priyanka are 20% less than that of Vinita, then marks secured by Vinita are how much percent more than Priyanka's marks?

Explanation: a =20%

According to the above formula

Required percentage=$\left(\frac{a}{100-a} \times 100\right)\% = \frac{20}{80} \times 100 = 25\%$

(iii) **If a number is first increased by a% and then decreased by a% then the net effect is always a decrease which is equal to 'a% of a'** $i.e. \frac{a^2}{100}\%$

Example: The salary of a worker is first increased by 5% and then it is decreased by 5%. What is the change in his salary?

Explanation: Here a = 5%
There will be a net decrease;
Percent decrease$= \frac{a^2}{100}\% = \frac{5^2}{100}\% = 0.25\%$

(iv) If a quantity is first changed (increased or decreased) by a% and then changed (increased or decreased) by b%, then

Net change = $\left[\pm \mathbf{a} \pm \mathbf{b} + \frac{(\pm \mathbf{a})(\pm \mathbf{b})}{\mathbf{100}}\right]\%$

Net change is an increase or a decrease according to the positive or negative sign, respectively of the final result

Example: The price of an article is first increased by 20% and then decreased by 25% due to education in sales. Find the net percent change in the final price of the article.
Explanation: a = 20%, b = 25%
Required percentage change = $\left(20 - 25 + \frac{20\times(-25)}{100}\right)\%$
= (- 5 - 5) % = - 10%
So there is a net decrease of 10% in the final price of the article as the final result is negative.

(v) If the price of a commodity increases or decreases by a%, then the decrease or increase in consumption, so as not to increase or decrease the expenditure is equal to $\left(\frac{\mathbf{a}}{\mathbf{100}\pm\mathbf{a}}\right)\times \mathbf{100}\%$

(vi) If the population of a town is P and it increases (or decreases) at the rate of R% per annum, then

(a) Population after n years $\mathrm{P}\left(1 \pm \frac{\mathrm{R}}{100}\right)^{\mathrm{n}}$

(b) Population after n years $\mathrm{P}\left(1 \pm \frac{\mathrm{R}}{100}\right)^{\mathrm{n}}$

(c) Population n years ago $= \frac{\mathrm{P}}{\left(1\pm\frac{\mathrm{R}}{100}\right)^{\mathrm{n}}}$

('$+$' sign of increment; '$-$'sign for decrement).

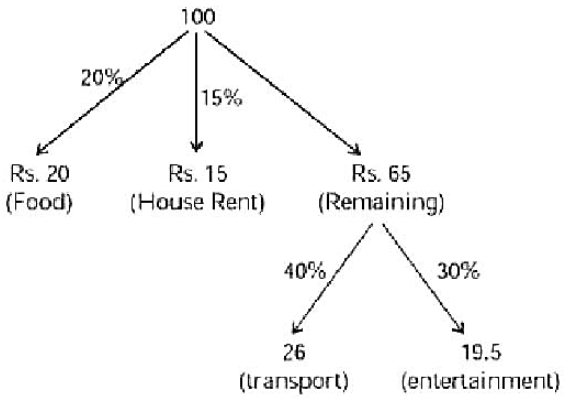
Some tricks to calculate faster:

(i) Splitting the percentage into parts
Example: Find 51% of 128.
Solution: 51% of 128 = (50 +1) % of 128 = 50% of 128 + 1% of 128 = 64 + 1.28 = 65.28

(ii) Interchanging the percentage value and the number
Example: Find 39% of 12.5
Solution: 39% of 12.5 = 12.5% of 39 = $\frac{1}{8}\times 39 = 4.875$

Solved Examples:

1. Nikhil spent 20% of his monthly income on food and 15% on house rent. 40% of remaining he spent on transport and 30% on entertainment. He is left with an amount of Rs.8775 after all the expenditures. What is Nikhil's monthly income?
Explanation: Let the income be Rs.100



Final Saving = 100 – 20 – 15 – 26 – 19.5 = Rs.19.5; But his final saving is Rs.8775
$19.5 \xrightarrow[(\times 450)]{} 8775$
So, Income = Rs.100 $\times$ 450 = Rs. 45000.

2. If the price of a Commodity be raised by 40%, by how much percent must a householder reduce his consumption of that commodity, so as not to increase his expenditure?
Explanation: Here, a = 40%' According to the formula,
Reduction in Consumption
$= \left(\frac{40}{(100+40)}\times 100\right)\% = \frac{40}{140}\times 100$
$= \frac{200}{7}\% = 28\frac{4}{7}\%$

3. The population of a town is 352800. If it increases at the rate of 5% per annum, then what will be its population 2 years hence, also, find the population 2 years ago.
Explanation: P = 352000, R = 5%, n = 2
Population after 2 years
$= \mathrm{P}\left(1+\frac{\mathrm{R}}{100}\right)^{\mathrm{n}} = 352800 \times \left(1+\frac{5}{100}\right)^2$
$= 352800 \times \frac{21}{20}\times\frac{21}{20} = 388962$
Population 2 years ago = $\frac{\mathrm{P}}{\left(1+\frac{\mathrm{R}}{100}\right)^{\mathrm{n}}} = \frac{352800}{\left(1+\frac{5}{100}\right)^2}$
$= 352800 \times \frac{20}{21}\times\frac{20}{21} = 320000$

4. There are 3 contestants P, Q and R in an election. P secured 20% of the votes and secured 70% of the remaining votes. If R secured 4800 votes, by how many votes has the winner won the election?
Explanation. Let the total number of votes be 100.
P secured 20% = 20 votes.
Remaining votes = 100 - 20 = 80
Q secured 70% of 80 = 56 votes.
R secured (80 - 56) = 24 votes.
But R secured 4800 votes.
$24 \xrightarrow[(\times 200)]{} 4800$
So, winner Q won the election by 56 – 24 = 32 votes
$32 \xrightarrow[(\times 200)]{} 6400 \Rightarrow$ 6400 votes

5. Rahul answered 40% of the first 75 questions correctly in an examination consisting of 150 questions. Find the

(CS-DEC 2023)

17. The ratios of girls to boys in two sections in a class are 3:4 and 3:7 respectively. Their ratio in the entire class (when the two sections are combined) is 4:7. Which of the following can be the strength of the girls in the entire class?
(1) 36 (2) 42
(3) 45 (4) 48

Explanation:

Since, ratio of girls and boys is 3:4 and 3:7 respectively.
Then the total number of girls= $3k_1 + 3k_2$, so the total number of girls should be divisible by 3.
Also the final ratio 4:7, suggests the total girls should be of form $4k_3$
Hence the total number of girls is divided by 4.
Hence (2) (3) can't be the answer
Now the total number of boys = $4k_1 + 7k_2$
So when we divide this by 4, the remainder should be 3 k_2, where $k_2 \neq 0$
If we take (4) 48, then the number of boys should be 84.
So if we divide this by 4 the remaining part is 0. So it can't be the answer.
Hence, the answer is 1. 36

Answer (1)

(CS-DEC 2023)

18. Two 1.5 L bottles A and B are each filled with 1 L of water. 2 packets of ORS are dissolved in A and 1 packet in B. Then B is filled completely by pouring from A. The ORS concentrations in bottles A and B will be in the ratio
(1) 5:6 (2) 4:5
(3) 3:2 (4) 2:3

Explanation:

Bottle A: Initially, bottle A contains 1 litter of water, and 2 packets of ORS are dissolved in it. So, the concentration of ORS in bottle A is: Concentration in

$$\mathrm{A} = \frac{2 \text{ packets}}{1 \text{ liter}} = 2\ packets/liter$$

Bottle B: Initially, bottle B contains 1 litter of water, and 1 packet of ORS is dissolved in it. After filling bottle B partially from bottle A, the total volume of liquid in bottle B is 1.5 liters (1 litter original water +0.5 liters from bottle A). Since 2 packets of ORS are dissolved in this 1.5 liters of water, the concentration of ORS in bottle B is: Concentration in

$$\mathrm{B} = \frac{2 \text{ packets}}{1.5 \text{ liters}} = \frac{4}{3}\ packets/liter$$

Now, let's find the ratio of the concentrations of ORS in bottles A and B:

$$Ratio = \frac{\text{Cononstration in } A}{\text{Coscentration in } B} = \frac{2 \text{ parkets/liter}}{3 \text{ packets/iter}} = 2 \times \frac{3}{4}$$
$$= \frac{6}{4} = \frac{3}{2} = 1.5$$

Therefore, the correct ratio of ORS concentrations in bottles A and B is 1.5.

Answer (3).

(LS JULY 2024 I)

19. If $X > Y > 0$, then $X\%$ of Y is
(1) equal to $Y\%$ of X
(2) more than $Y\%$ of X
(3) less than $Y\%$ of X
(4) $(X + Y)\%$ of $(X + Y)$

Explanation:

We need to determine the relationship between X% of Y and Y% of X, given that X > Y > 0.
Step 1: Expressing in Mathematical Form

- X% of Y = $\frac{X}{100} \times Y = \frac{XY}{100}$
- Y% of X = $\frac{Y}{100} \times X = \frac{YX}{100}$

Step 2: Compare the Two Expressions

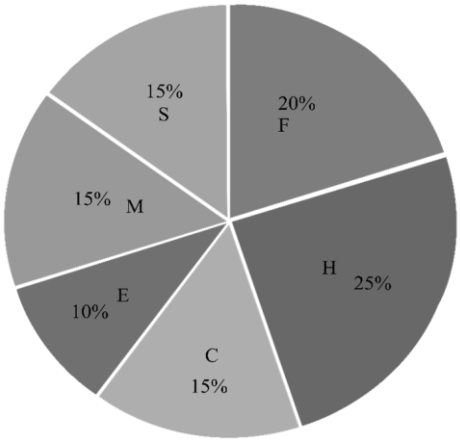
$$\frac{XY}{100} = \frac{YX}{100}$$

Since multiplication is commutative (XY = YX), both expressions are equal.
Conclusion:
The correct answer is:
Option 1: equal to Y% of X

Answer (1)

(LS JULY 2024 I)

20. The total monthly income of a family is split into expenses on food (F), house rent (H), college fees (C), entertainment (E), miscellaneous items (M), and savings (S), as shown in the pie chart.



The family transfers an amount of Rs.1000/- from the head food to the head entertainment, thereby making the expenses on the two heads equal. What is the net expenditure of the family?
(1) Rs.20,000 (2) Rs.50,000
(3) Rs.37,500 (4) Rs.17,000

Explanation:

- Let the total monthly income of the family be x.
- Initially, the expenses on food (F) = 20% of x, and the expenses on entertainment (E) = 10% of x.
- After transferring Rs.1000 from food to entertainment, we have:
  New expenses on food = (20% of x) – Rs.1000
  New expenses on entertainment = (10% of x) + Rs.1000
- Since the expenses on food and entertainment are now equal:

CHAPTER 6

LOAN & INTEREST

-: GENERAL APTITUDE :-

(CSIR NET JUNE 2016)

1. A person paid income tax at the rate of R % for the first Rs 2 lakhs, and the rate of (R+10) % for income exceeding Rs 2 lakhs. If the total tax paid is (R+5) % of the annual income, then what is the annual income?
(1) Rs 2.5 lakhs (2) Rs 3 lakhs
(3) Rs 4 lakhs (4) Rs 5 lakhs

Explanation:

Let x lakhs be the annual income.
The rate is R % for the first Rs.2 lakhs
The rate is (R+10) % for the given exceeding Rs.2 lakhs
Income exceeding Rs 2 lakhs $= (x-2)$ lakhs.
Total tax paid is = (R+5) % of x.
From above data, we obtain
2 x R/100 + (x – 2)(R+10)/100 = x(R+5)/100
2R + (x-2) (R+10) = x(R+5)
2R + xR + 10x – 2R – 20 = xR + 5x
5x = 20
x = 4
Answer (3)

(CSIR NET/JRF JUNE 2016, JUNE 2021)

2. A person paid income tax at the rate of R % for the first Rs 2 lakhs, and at the rate of (R + 10) % for income exceeding Rs. 2 lakhs. If the total tax paid is (R + 5) % of the annual income, then what is the annual income?
(1) Rs 2.5 lakhs (2) Rs 3.0 lakhs
(3) Rs4.0 lakhs (4) Rs5.0 lakhs

Explanation:

Let the total annual income is $x$lakhs.
According to question
R % of 2 + (R + 10) % of *(x* - 2) = (R+ 5) % of *x*

$$\frac{2R}{100}+\frac{(x-2)(R+10)}{100}=\frac{R+5x}{100}$$

2R + xR + 10x – 2R -20 = Rx + 5x
10x − 5x = 20 or x = 4
Answer (3)

(JUNE 2022)

3. A deposit in a bank, which pays interest on its deposits compounded daily, grows to Rs. 80,000 for 500 days and to 88,000 for 1000 days. What would be its value (in Rs.) for 1500 days?
(1) 96,000 (2) 96,450
(3) 96,800 (4) 97,250

Explanation:

Amount becomes 80,000 in 500 days and becomes 88,000 in 1000 days.
For rate of interest-
(88,000-80,000) = R% of 80,000
8000 = $\frac{R\times 80000}{100}$
R = 10%
So, amount at the end of 1500 day will be
88,000 + 10% of 88,000 = 88,000 + 88,00 = 96,800
Answer: (3)

(LS/ES DEC 2025)

4. A person borrowed Rs. 2500/- for 2 years, and Rs. 2000/- for 3 years, with the same simple interest rate. If he paid a total of Rs. 550/- as interest, then the annual rate of interest was:
(1) 10% (2) 2%
(3) 5% (4) 8%

Explanation: (3)

Using Simple Interest (SI) formula: $SI=\frac{P\times R\times T}{100}$
Interest on ₹2500 for 2 years: $SI_1=\frac{2500\times R\times 2}{100}$
Interest on ₹2000 for 3 years: $SI_2=\frac{2000\times R\times 3}{100}$
Total Interest $= 550$

$$\therefore \frac{2500\times R\times 2}{100}+\frac{2000\times R\times 3}{100}=550$$

$$\therefore \frac{5000R+6000R}{100}=550$$

$$\therefore \frac{11000R}{100}=550$$

$$\therefore R=\frac{550}{110}=5$$

(LS JUNE 2026)

5. For a certain sum, the simple interest in 2 years at 8% per annum is Rs. 90 more than the simple interest in 1.5 years at the rate of 10% per annum for the same sum. Find the sum.
(1) Rs. 9,000 (2) Rs. 9,500
(3) Rs. 8,000 (4) Rs. 9,200

Explanation: (1)

Let the sum be Rs. P.
Simple Interest is calculated using:

$$SI=\frac{P\times R\times T}{100}$$

Interest for 2 years at 8% per annum:

$$SI_1=\frac{P\times 8\times 2}{100}=\frac{16P}{100}$$

Interest for 1.5 years at 10% per annum:

$$SI_2=\frac{P\times 10\times 1.5}{100}=\frac{15P}{100}$$

According to the condition, the difference is Rs. 90:

$$\frac{16P}{100}-\frac{15P}{100}=90$$

$\therefore \frac{P}{100} = 90$

$\therefore P = 9000$

Therefore, the sum is Rs. 9,000.

(MS/PS June 2026)

6. A certain sum of money becomes double of itself in 5 years at simple rate of interest.
In how many years will it become 16 times of itself at the same rate of simple interest?
(1) 80 (2) 70
(3) 75 (4) 90

Explanation: (3)

Let the principal be P and the rate of simple interest be R% per annum.

Since the amount becomes double in 5 years,

$\mathrm{P} + \frac{\mathrm{P} \times \mathrm{R} \times 5}{100} = 2\mathrm{P}$

$\Rightarrow \frac{\mathrm{P} \times \mathrm{R} \times 5}{100} = \mathrm{P}$

$\Rightarrow \mathrm{R} = 20\%$

For the amount to become 16 times the principal,

$\mathrm{P} + \frac{\mathrm{P} \times 20 \times \mathrm{T}}{100} = 16\mathrm{P}$

$\Rightarrow 1 + \frac{20\mathrm{T}}{100} = 16$

$\Rightarrow \mathrm{T} = 75 \text{ years}$

Hence, the correct answer is (3) 75 years.

(CS/ES JUNE 2026)

7. Divide Rs. 10,000 into two parts, so that simple interest on the first part for two years at 10% per annum may be equal to the simple interest on the second part for the five years at 1% per annum. Find the values of its two parts.
(1) Rs. 5,000, Rs. 5,000 (2) Rs. 7,000, Rs. 3,000
(3) Rs. 8,000, Rs. 2,000 (4) Rs. 6,000, Rs. 4,000

Explanation: (3)

Let the first part be x. Therefore, the second part is $10000 - x$.

Simple Interest is given by:

$SI = \frac{P \times R \times T}{100}$

According to the condition, the simple interests on both parts are equal:

$\frac{x \times 10 \times 2}{100} = \frac{(10000 - x) \times 1 \times 5}{100}$

$20x = 5(10{,}000 - x)$

$20x = 50{,}000 - 5x$

$25x = 50{,}000$

$x = 2{,}000$

Thus, the two parts are Rs. 2,000 and Rs. 8,000.

CHAPTER 9

PROBLEMS ON WORK

-: GENERAL APTITUDE :-

Work is the quantity of energy transferred from one system to another but for question based on this topic, Work is defined as the amount of job assigned or the amount of job actually done.

Work is always considered as a whole or one.

There exists an analogy between the time-speed-distance problems and work.

Work based problem are more or less related to time speed and distance.

Above mentioned definition of work throws light on three important points.

Work = 1 (It is always measured as a whole) = Distance

Rate at which work is done = speed

Number of days required to do the work = Time

Important Formulae:

9.1. Work from Days

- If X can do a piece of work in *m* days, then X's 1 day's work =*1/m* of the work
- If Y can do a piece of work in *n* days, then Y's 1 day's work =*1/n* of the work
- If X and Y work together then their combined work is = $\frac{1}{m} + \frac{1}{n} = \frac{m+n}{mn}$ of the work

9.2. Days from Work

- If X's 1 day's work =*1/m*, then X can finish the work in *m* days.
- If Y's 1 day's work =*1/n*, then Y can finish the work in *n* days.
- To finish whole work, it requires = $\frac{mn}{m+n}$

Note:

Efficiency α $\frac{1}{day}$

Points to remember:

If M_1 persons can do W_1 works in D_1 days working H_1 hours in a day and M_2 persons can do W_2 works in D_2 days working H_2 hours in a day then we have general formula in the relationship of

$$M_1D_1H_1/W_1 = M_2D_2H_2/W_2$$

We can conclude that

- More men less days and conversely more days less men.
- More men more work and conversely more work more men.
- More days more work and conversely more work more days.

Example 1: If Varun and Raghav can do a job in 10 days and 15 days independently, how many days would they take to complete the same job working simultaneously?

(1) 6 days (2) 9 days

(3) 10 days (4) 12 days

Explanation:

If total work is W, Varun's rate of working = W/10 per day and that of Raghav = W/15 per day.

Thus, when working simultaneously,

Rate of work done per day = W/10 + W/15

i.e., 25W/150 = W/6

Now since work done per day is W/6, total number of days they will require will be 6 Days

Answer (1)

9.3. Ratio

- If X is thrice as good a workman as Y, then:
  Ratio of work done by X and Y = 3:1.
  Ratio of times taken by X and Y to finish a work = 1:3
- If X is *m* times as good a workman as Y, then he will take *(1/m)*th of the time by Y to do the same work.
- X and Y can do a piece of work in 'm' days and 'n' days respectively, then working together, they will take *mn/(m + n)* days to finish the work and in one day, they will finish ((*m + n)/mn*)th part of work.

Example 2: Ram is thrice as efficient as Shyam. If they complete a work in 30 days then find the time required by each to complete work individually.

Explanation:

Let's assume that Ram takes x days to complete Work

So, Shyam will take 3x amount of days to complete work since Ram is thrice as efficient as Shyam.

Total days require to complete work by both = 30 days

We know that if X and Y can do a piece of work in 'm' days and 'n' days respectively, then working together, they will take mn/m + n days to finish the work

$30 = \frac{x*3x}{x+3x}$

(On replacing m with x and n with 3x in above)

So, x = 40 i.e. Ram takes 40 days to complete the work individually

Since Shyam takes 3x amount of days to complete the work individually:
i.e. 3 * 40 = 120 days

Example 3: P, Q and R can completely solve a problem together in 4 hrs. P and R together take 15 hrs less than Q working alone. Q works on the problem for first 2 hrs and then P and R joins him. After another two hours, Q quits. In how many hours is the problem actually solved?
(1) 3 hrs (2) 4 hrs
(3) 6 hrs (4) 8 hrs
Explanation:
Let Q alone can answer the problem in x hours
Then P&R together needs (x-15) hours to solve the problem
In 1 hr, Q can complete 1/x of the question,
In 1 hr, P and R can complete 1/(x-15) of the question
In 1 hr, P, Q and R can complete 1/4th of the question
i.e. We can write,
1/x + 1/(x-15) = 1/4
4(x-15) + 4x = x (x-15)
4x - 60 + 4x = x^2 - 15x
x^2 - 23x + 60 = 0
(x-20) (x-3)=0
x = 20 or 3
Since, (x-15) is positive (Time cannot be negative), x = 20
In 1 hr, Q can complete 1/20 of the question.
In 1 hr, P and R can complete 1/5 of the question
In 1 hr, P, Q and R can complete 1/4 of the question
In the first two hours, 2 x 1/20 = 1/10 of the question is completed by Q
P, Q and R work in next 2 hrs and completes 2 x 1/4 = 1/2 of the question
Remaining part = 1 - 1/10 - 1/2 = 2/5
Let P and R work for n hours and completes this part
n = (2/5)/(1/5) = 2
Total time taken to solve the question = 2+2+2 = 6 hours
Answer (3)

Example 4: A can finish a work in 18 days and B can do same work in half the time taken by A. then working together, what part of same work they can finish in a day
(1) 1/5 (2) 1/6
(3) 1/7 (4) 1/8
Explanation:
Given that A finishes the work in 18 days
Therefore, work done per day by A = 1/18
And B finishes the work in half the time taken by A i.e half of 18 i.e. 9 days
Therefore, work done per day by B = 1/9
To calculate the work done both of them in one day,
1/18 + 1/9
= 27/162 = 1/6
Hence, together they can finish 1/6 work per day.
Answer (2)

Example 5: Rahul completes a work in 6 days. The same work Raju alone can do it in 10 days. If both together can do the work in how many days?
(1) 3.75 days (2) 4 days
(3) 5 days (4) 6 days
Explanation:
Given that Rahul finishes the work in 6 days
Therefore, work done per day by Rahul = 1/6
While Raju finishes the same work in 10 days
Therefore, work done per day by Raju = 1/10
If both of them work together, work done in one day is
= 1/6 + 1/10 = 8/30 = 4/15
Therefore, they together can complete the work in
15/4 = 3.75 days
Answer (1)

Example 6: Geeta and Seeta together can do a piece of work in 8 days. If Geeta alone can do the same work in 12 days, then Seeta alone can do the same work in?
(1) 20 days (2) 16 days
(3) 24 days (4) 28 days
Explanation:
Given that together they can do work in 8 days i.e. 1/8 per day.
Geeta alone can do the same work in 12 days i.e. 1/12 per day.
Therefore, to find the number of days required for the Seeta to complete the work alone will be
1/8 – 1/12 = 4/96
= 1/24
Hence, Seeta alone will require 24 days to complete the work.
Answer (3)

Example 7: Ashok, Balli and Charan can do a piece of work in 24 days, 30 days and 40 days respectively. They began the work together but Charan left 4 days before the completion of the work. In how many days was the work completed?
(1) 11 days (2) 12 days
(3) 13 days (4) 14 days
Explanation:
One day's work of Ashok, Balli and Charan = (1/24 + 1/30 + 1/40) = 1/10
Charan leaves 4 days before completion of the work, which means only Ashok and Balli work during the last 4 days.
Work done by Ashok and Balli together in the last 4 days = 4 (1/24 + 1/30) = 3/10
Remaining Work = 7/10, which was done by Ashok, Balli and Charan in the initial number of days.
Number of days required for the initial work = 7 days.
Thus, the total numbers of days required = 4 + 7 = 11 days.
Answer (1)

Example 8: 12 men can complete a work in 8 days. 16 women can complete the same work in 12 days. 8 men and 8 women started working and worked for 6 days. How many more men are to be added to complete the remaining work in 1 day?
(1) 8 (2) 12
(3) 16 (4) 24

CHAPTER 17

OBSERVATIONAL SKILLS

-: GENERAL APTITUDE :-

This chapter mainly focus on the questions that require keen observation skills and analysis of the given data. Such questions can be easily tackled if they are practiced well. The questions can be simplified with the help of venn diagrams or some charts or anything that simplifies the data for analysis.

17.1. Sets:

Collection of well-defined objects is called Sets.

Example:

i. Set of odd numbers 1 , 3 , 5 , 7 , 9 , 11
ii. Set of vowels in the alphabets of English
iii. Set of rivers in India
iv. Set of Life Science books in IFAS Library
v. Set of multiples of 4 (i.e. 4 , 8 , 12 , 16 , ...)

17.1.1. Universal Set:

If all the given sets are subsets of a set U, then the set U is called Universal Set.

Example 1:

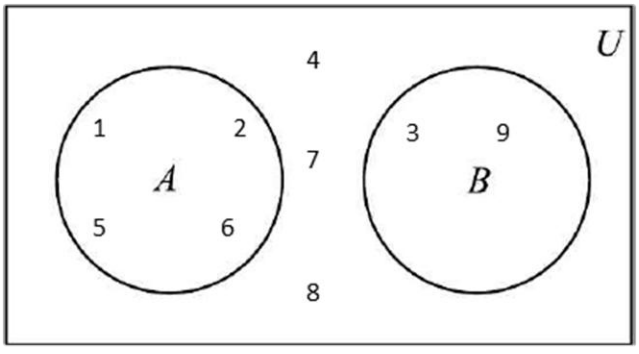
Draw a Venn diagram to represent the following sets:
U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {1, 2, 5, 6}, B = {3, 9}

Explanation:

Step 1: Draw a rectangle and label it U to represent the universal set.

Step 2: Draw circles within the rectangle to represent the other sets. Label the circles and write the relevant elements in each circle.

Step 3: Write the remaining elements outside the circles but within the rectangle.

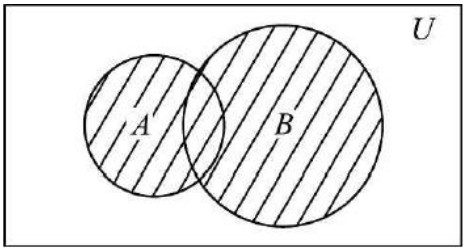


17.1.2 Operations on Sets

I. Union of Sets (A U B):

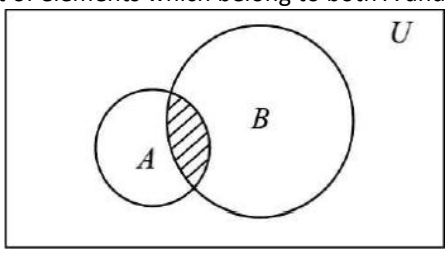
Let A and B be two given Sets. Then the union of A and B is the set of all those elements which belongs to either A or B or both.

n(A U B) = n(A) + n(B) - n(A ∩ B)



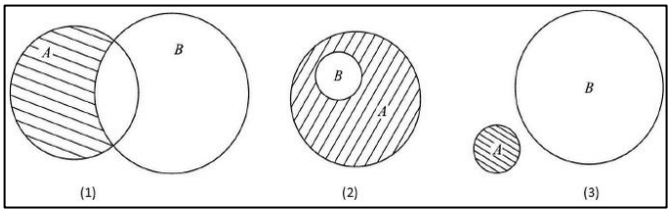
II. Intersection of Sets (A ∩ B):

Let A and B be two given Sets. Then the intersection of A and B is the set of elements which belong to both A and B.



III. Differences of Sets (A - B):

Let A and B be two given Sets.The difference of Set A and B is the Set of elements which are in A but not in B.

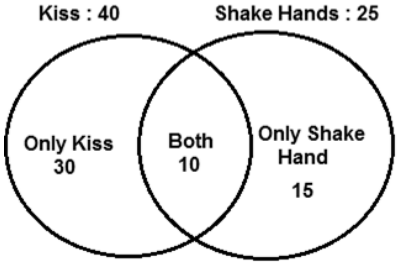


Example 2:

At the birthday party of Virat, a baby boy, 40 persons chose to kiss him and 25 chose to shake hands with him. 10 persons chose to both kiss him and shake hands with him. How many persons turned out at the party?

(1) 35 (2) 75
(3) 55 (4) 25

Explanation:



Represent the data in the form of venn diagram.

It is clear that the number of people at the party were 30 + 10 + 15 = 55.

Answer: (3)

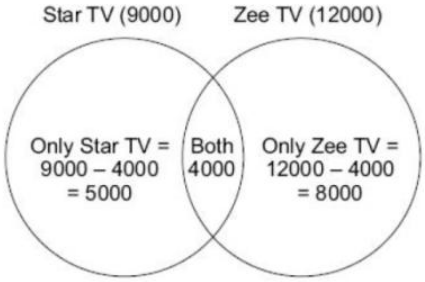
Example 3:

There are 20000 people living in PalamVihar, Gurgaon. Out of them 9000 subscribe to Star TV Network and 12000 to Zee TV Network. If 4000 subscribe to both, how many do not subscribe to any of the two?

(1) 3000 (2) 2000

(3) 1000 (4) 4000

Explanation:



The required answer would be:

= 20000 – (5000 + 4000 + 8000)

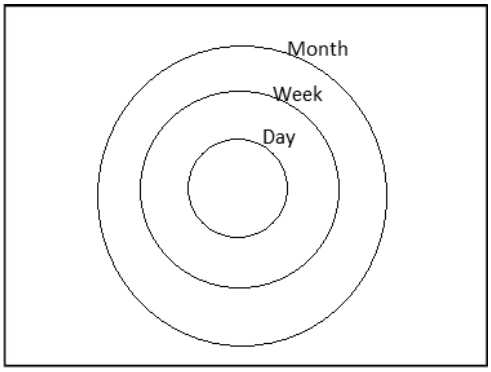
= 20000 – 17000

= 3000.

Answer: (1)

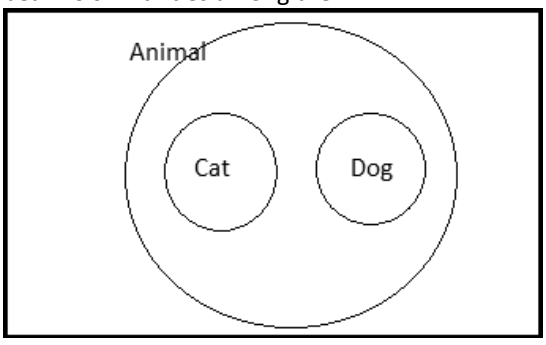
17.1.3 Possible Cases of Venn diagram:

1. There will be a series of sub cases one under another.



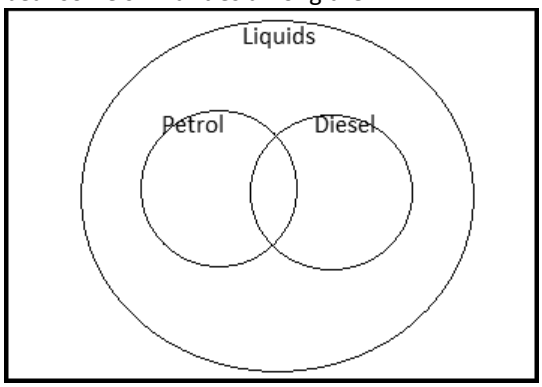
We know that day is a part of the week and week is the part of the month.

2. One main category, under it two sub categories and both bear no similarities among them.



Here, in animals we have many species of which cat and dog are two different kind of species, having nothing in common.

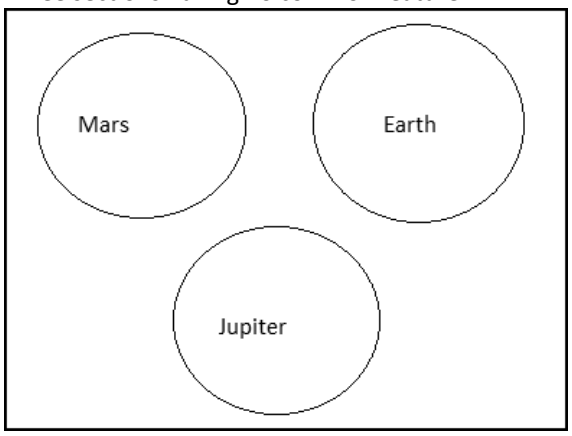
3. One main category, under it two sub categories and both bear some similarities among them.



Liquids > Petrol, diesel.

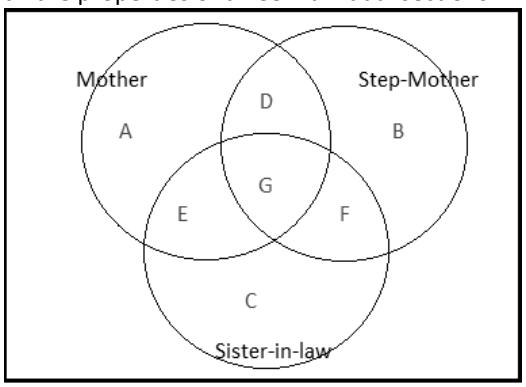
Here both are flammables in nature, thus bear similarity.

4. Three sections having no common feature.



We know that Mars, Earth and Jupiter are three independent entities having nothing in common.

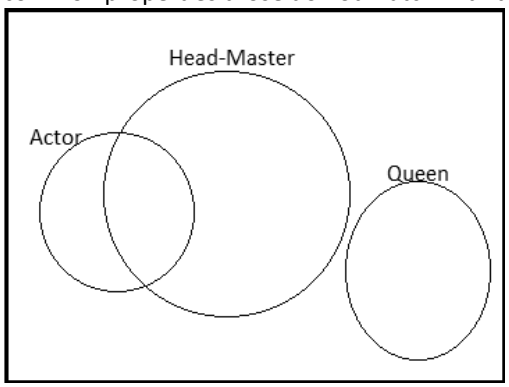
5. There is a chance of finding a common place that satisfies all the properties of three individual sections.



A women can be:

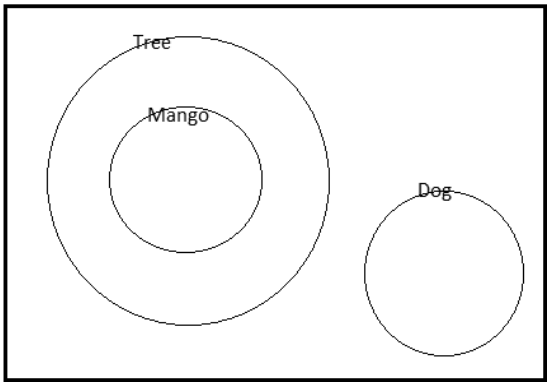
- Mother (A) , Step-Mother (B) and Sister-in-law (C)
- A women at the same time can be Mother and Step-Mother (D)
- A women at the same time can be Mother and Sister-in-law (E)
- A women at the same time can be Step-Mother and Sister-in-law (F)
- A women at the same time can be Mother , Step-Mother and Sister-in-law (G)

6. Among three different sections, two may have some common properties those do not match with third one.



From the above, actor and headmaster is showing masculinity, thus bearing some common properties which is just opposite to Queen.

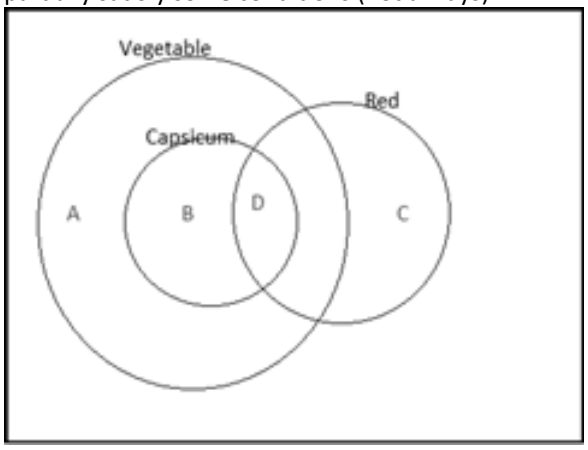
7. Cases in which out of three sections, two are inter related as parent child relationship, whereas third one has no relation with them.



Tree > Mango Tree

We all know Mango tree is coming under tree category but animal Dog has nothing to do with these 2 words.

8. One category may have one sub category. They both partially satisfy some conditions (not always).

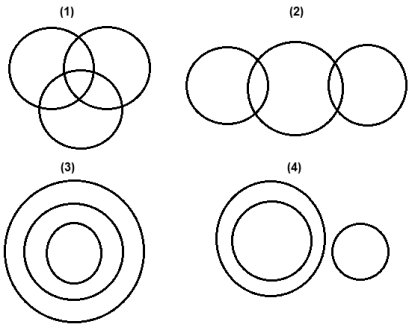


Vegetable>Capsicum>Red.

Some capsicums are red and so as some other vegetables.

Example 4:

Which of the following diagrams correctly represents the relationship among tennis fans, cricket players and Students?



Explanation:

From the relationship given in the question, we observe that each of the objects carries something in common to one another. A Tennis fan can be a cricket player as well as student. Hence Diagram (1) represents this relationship.

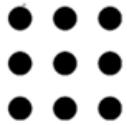
Answer: (1)

17.2. Connecting Lines:

17.2.1 3 X 3 Dots

Example 5:

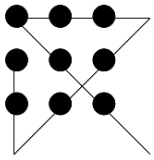
How many lines will be required to connect all the dots in picture? It is not allowed to lift your pen from the paper, to backtrack over a line, or to go through a dot twice.



(1) 3 (2) 4

(3) 5 (4) 6

Explanation:

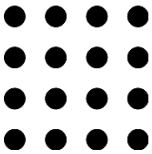


Answer: (2)

17.2.2. 4 x 4 Dots:

Example 6:

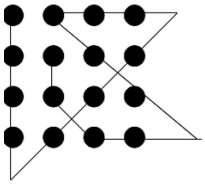
How many lines will be required to connect all the dots in below picture? It is not allowed to lift your pen from the paper, to backtrack over a line, or to go through a dot twice.



(1) 6 (2) 7

(3) 8 (4) 9

Explanation:

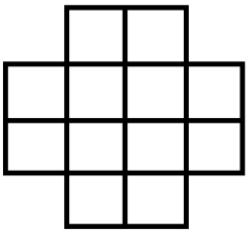


Answer: (2)

17.3. Number of Squares

Example 7:

How many squares can you find in the given picture?



(1) 15 (2) 16

(3) 17 (4) 18

Explanation:

Small squares: 12

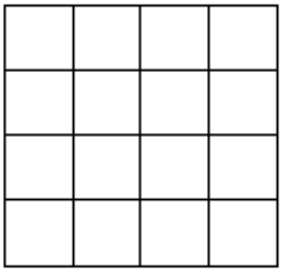
Bigger squares: 5

Therefore, total numbers of squares are 12+5= 17

Answer: (3)

Example 8:

How many squares are in the figure below?



(1) 29 (2) 30

(3) 31 (4) 32

Explanation:

Assuming smallest square side is 1 meters, then

Total numbers of squares with side 1 meter are 16

Total number of squares with side 2 meters is 9

Total numbers of squares with side 3 meters are 4

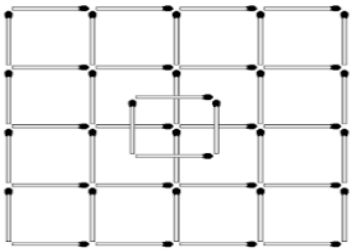
Total number of squares with side 4 meters is 1

Summing, 16+9+4+1 = 30

Answer: (2)

Example 9:

Count number of squares in picture below?



(1) 33 (2) 34

(3) 35 (4) 36

Explanation:

4: 1/2 X 1/2 matchsticks square

17: 1 X 1 matchsticks square

9: 2 X 2 matchsticks square

4: 3 X 3 matchsticks square

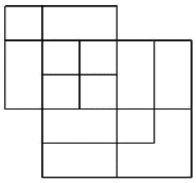
1: 4 X 4 matchsticks square

Total squares: 4+17+9+4+1=35

Answer: (3)

Example 10:

Count number of squares in picture below?



(1) 16 (2) 17

(3) 18 (4) 19

Explanation:

Consider smallest square is of side 1cms then

Number of squares with side 1cms: 6

Number of squares with side 2cms: 8

Number of squares with side 3cms: 2

Number of squares with side 4cms: 1

Thus, Total number of squares = 17

Answer: (2)

17.4. Climb and Fall

Example 11: One monkey climbs 6 metres and fall 3 metres in alternate minutes then time taken to climb a tree 60 meters high?

(1) 37 (2) 38

(3) 39 (4) 40

Explanation:

Total Height = 60mts

The monkey climbs 6 meters in one minute and then falls down 3 meters in the second minute, the distance that it covers in 2 minutes is 3 meters.

Thus for climbing 54 meters, the monkey will require time = $54 \times \frac{2}{3}$ = 36 minutes.

We have counted only for 54 meters as it will climb the remaining six meters in one minute.

Thus the total time required to climb the 60 meters wall = 36 + 1 = 37 minutes.

Answer: (1)

Example 12:

A frog is at the bottom of the well which is 20 meters deep. Every day the frog jumps 5 meters upwards and fall 4 meters down. How many days it will take for the frog to reach the top?

(1) 15 (2) 16

(3) 17 (4) 18

Explanation:

The frog jumps every day 5-4=1m

So the distance covered first day=1m

Second day=2m

Third day =3m and so on.

But on 15th day =15m

And on 16th day=20m

Answer: (2)

Example 13:

A man fills a basket with eggs in such a way that the number of eggs added on each successive day is the same as the number already present in the basket. This way the basket gets completely filled in 24 days. After how many days the basket was 1 / 4th full?

(1) 6 (2) 12

(3) 17 (4) 22

Explanation:

Given: Number of eggs added on each successive day = number of eggs already present in the basket

I.e. number of eggs in the basket on a particular day is double the number of eggs on the previous day.

Given: Basket gets completely filled on 24th day

As we know that number of eggs on the 24th day is double the number of eggs on 23rd day.

So basket will be 1/2th full on 23rd

Number of eggs on the 23th day is double the number of eggs on 22th day.

So basket will be 1/4th full on 22nd day.

Answer: (4)

17.5. Mirror Images

Mirror image in simple words is nothing but that image that we see when we look into the mirror. A mirror image is reflected duplicate of an object that appears identical but reversed (Lateral Inversion).

In simple words - when we see a reversed object in mirror, right part of the object appears in the left and vice-versa, but the upper and lower part remains constant.

There are few images that always have the same reflection (not reversed) as they are in mirror.They are as following:

In Alphabet: A, H, I, M, O, T, U, V, W, X, Y - (11)

In Numerical Digits: 0, 8 - (2)

In Geometry: □, △, ○, ◇..... etc.

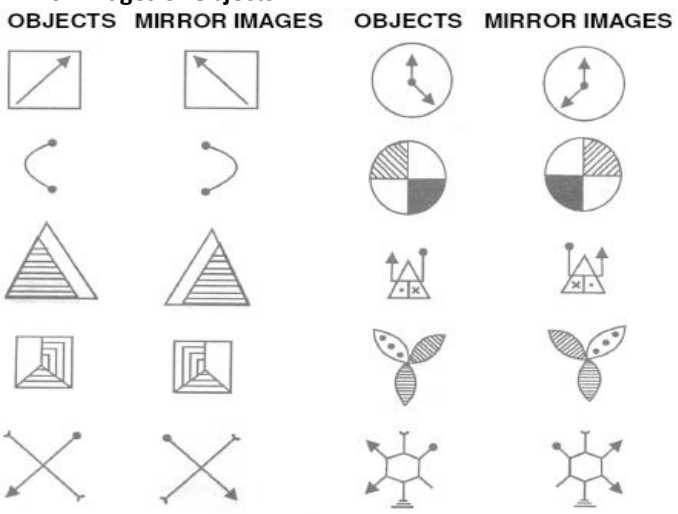
Mirror images of alphabets:

A	A	N	И	a	ɐ	n	n
B	B	O	O	b	d	o	o
C	Ↄ	P	ꟼ	c	ɔ	p	q
D	ᗡ	Q	Ꝺ	d	b	q	p
E	Ǝ	R	Я	e	e	r	ɹ
F	Ⅎ	S	Ƨ	f	ɟ	s	s
G	⅁	T	T	g	ƃ	t	ʇ
H	H	U	U	h	ɥ	u	u
I	I	V	V	i	i	v	v
J	ſ	W	W	j	ɾ	w	w
K	ꓘ	X	X	k	ʞ	x	x
L	⅃	Y	Y	l	l	y	ʏ
M	M	Z	Z	m	m	z	z

Mirror images of Numbers:

0	0	6	9
1	ɩ	7	ㄥ
2	ᄅ	8	8
3	Ɛ	9	6
4	ㄣ	10	0ɩ
5	ƽ		

Mirror images of Objects:



17.6. Water Image:

The reflection of an object as seen in water is called its water image. It is the inverted imageobtained by turning the object upside down.

Water-Images of capital letters:

Letters	A	B	C	D	E	F	G	H	I	J	K	L	M
Water-Image	∀	B	C	D	E	Ⅎ	Ꭾ	H	I	ſ	K	Γ	W
Letters	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Water-Image	И	O	ꟼ	Ꝺ	Я	Ƨ	⊥	∩	Λ	M	X	⅄	Z

Water-Images of small letters:

Letters	a	b	c	d	e	f	g	h	i	j	k	l	m
Water-Image	ɐ	q	ɔ	p	ǝ	ɟ	ƃ	ɥ	ı	ɾ	ʞ	l	ɯ
Letters	n	o	p	q	r	s	t	u	v	w	x	y	z
Water-Image	u	o	b	d	ɹ	s	ʇ	n	ʌ	ʍ	x	ʎ	z

Water-Images of numbers:

Numbers	0	1	2	3	4	5	6	7	8	9
Water-Image	0	ɩ	ᄅ	Ɛ	ㄣ	ƽ	9	ㄥ	8	6

Example 14:

Choose the correct mirror image of: **JUDGEMENT**

(A) **TNEMEGDUJ** (B) **TJUDGEMEN**

(C) TИƎMƎGDUL (D) **DJUGEMNET**

Answer: (C)

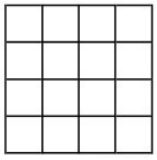
MODEL PAPERS

CHAPTER 20

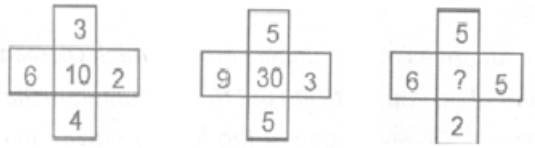
-: GENERAL APTITUDE :-

20.1: Model Paper 1

1. Pointing to a person, Rahul said, "He is the only brother of my father's mother's daughter." How is the person related to Rahul?
   (1) Brother (2) Father
   (3) Uncle (4) Son
2. Sharad is shorter than Arun but taller than Varun. Tarun is shorter than Rohan but taller than Sharad. Arun is taller than Tarun but shorter than Rohan While standing in descending order according to their height, who will be in the middle?
   (1) Sharad (2) Arun
   (3) Varun (4) Tarun
3. A train 240 m long passed a pole on the platform in 12 seconds. The platform has a total length of 560 m, how much time the train will take to pass the entire platform?
   (1) 40 sec (2) 50 sec
   (3) 60 sec (4) 70 sec
4. In the sequence of numbers 5, 8, 13, X, 34, 55, 89…. The value of X is
   (1) 20 (2) 21
   (3) 23 (4) 29
5. If $-7 \geq x \geq 7$ and $0 \leq y \leq 12$, the greatest possible value of y - x is
   (1) -19 (2) -17
   (3) 17 (4) 19
6. Peterson can fill up a tank in 20 minutes and Anderson can fill the same tank in 15 minutes, how long will it take for both of them together to fill up the tank?
   (1) 5 ½ minutes (2) 7 minutes
   (3) 8 4/7 minutes (4) 9 2/7 minutes
7. How many rectangles (which are not squares) are there in the following figure?



   (1) 56 (2) 70
   (3) 86 (4) 100
8. During a summer vacation of 20 friends from a hostel, each wrote a letter to each of all others. The total number of letters written was
   (1) 20 (2) 400
   (3) 200 (4) 380
9. $(25 \div 5 + 3 - 2 \times 4) + (16 \times 4 - 3) =$
   (1) 61 (2) 22
   (3) 41/24 (4) 16
10. Two times a two-digit number is 9 times the number obtained by reversing the digits and the sum of the digits is 9. The number is
    (1) 72 (2) 54
    (3) 63 (4) 81
11. There are 5 boys and 3 girls in a family. They are photographed in a group of 2 boys and 1 girl. The number of different ways in which photographs can be taken will be
    (1) 360 (2) 180
    (3) 60 (4) 30
12. In how many different ways does the letter of the word "ROADROLLER" can be arranged, so that vowels always come together?
    (1) 1440 (2) 720
    (3) 360 (4) 120
13. If two sides of an isosceles triangle are 9 cm and 25 cm respectively. What would be the length of its third side?
    (1) 9 cm (2) 25 cm
    (3) 34 cm (4) $\sqrt{(25 \times 25 - 9 \times 9)\ \text{cm}}$
14. A toy has a marked price of Rs. 600. The shopkeeper gains a profit of 20% after selling the toy at marked price. What should be the cost price of the toy?
    (1) Rs. 300 (2) Rs. 400
    (3) Rs. 450 (4) Rs. 500
15. Which number will replace the question mark?



    (1) 15 (2) 20
    (3) 25 (4) 40
16. A drawer contains 6 red socks and 4 blue socks. What is the probability that if 2 socks are picked (without looking) from the drawer, both of the socks will be red?
    (1) 2/15 (2) 4/15
    (3) 1/3 (4) 2/5
17. Today is Monday. After 61 days, it will be
    (1) Tuesday (2) Monday
    (3) Sunday (4) Saturday
18. The perimeter of an equilateral triangle is 36 meters. What is the height of the triangle?

(1) 6 (2) 6√3
(3) 7 (4) 7√3

19. In the following three statements.
I. Manya is older than Vijay.
II. Vinit is older than Manya.
III. Vijay is older than Vinit.
If the first two statements are true, the third statement is
(1) True (2) False
(3) uncertain (4) none of these

20. Varun travels 7 km to the north. Then again he turns to the right and walks 3 km. Then again he turns to his right moves 7 km forward. How many kilometres away is he from the starting point?
(1) 10 km
(2) 3 km
(3) 20 km
(4) 6 km Pointing to a person.

20.2 Model Paper 2

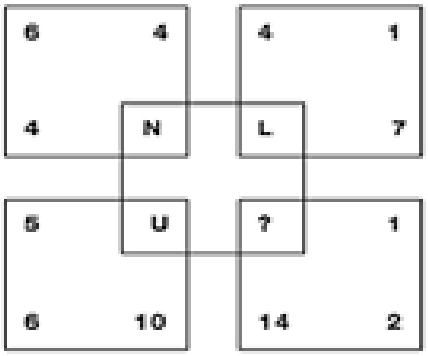
1. If a + b + c + d + e = 10 (all positive numbers), then the maximum value of a x b x c x d x e is
(1) 12 (2) 48
(3) 32 (4) 72
2. If A and B are two integers such that A x B = 84, which of the following cannot be the value of A + B?
(1) 21 (2) 25
(3) 45 (4) 85
3. When 233 is divided by 10, the remainder will be
(1) 2 (2) 3
(3) 4 (4) 8
4. It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?
(1) Monday (2) Friday
(3) Sunday (4) Tuesday
5. The total number of 8 digit numbers that can be formed by using digit 5 five times and digit 3 three times will be
(1) 3360 (2) 168
(3) 120 (4) 56
6. Dhoni has to select the Indian team consisting 4 bowlers, 6 batsmen and 1 wicket keeper for the finals among 6 bowlers, 8 batsmen and 3 wicket keepers. How many possible combinations can Dhoni have?
(1) 1260 (2) 1008
(3) 928 (4) 726
7. If a bicycle wheel makes 5000 revolutions in moving 11 km, then the diameter of the wheel is:
(1) 110 cm (2) 70 cm
(3) 120 cm (4) 100 cm
8. If the radius of a circle is doubled, the area is increased:
(1) 100% (2) 200%
(3) 300% (4) 400%
9. A large cucumber weights 2 kg with 96 % of its weight being water. It is allowed to stand in the sun and some of the water evaporates so that now only 80% of its weight is water. The weight of the cucumber after exposure to sun will be
(1) 200 g (2) 300 g
(3) 400 g (4) 560 g
10. Find the next number in the series
7, 7, 8, 11, 9, 13, 10, 17, 11,…
(1) 12 (2) 18
(3) 19 (4) 21
11. When you invest the money in the bank, you get 20% returns on your investment annually, but also pay a 20% tax on the gain. What would be the approximate net gain made by you (as percentage of the capital) at the end of 5 years?
(1) 40 (2) 64
(3) 80 (4) 100
12. The average temperature of the town in the first four days of a month was 58 degrees. The average for the second, third, fourth and fifth days was 60 degrees. The temperatures of the first and fifth days were in the ratio 7:8, then what is the temperature on the fifth day?
(1) 62 degrees (2) 64 degrees
(3) 66 degrees (4) None of these
13. A and B can do a work is 8 days B and C can do the same work in 12 days. A, B and C together can finish it in 6 days, A and C together will do it in:
(1) 4 days (2) 6 days
(3) 8 days (4) 12 days
14. A man on tour travels first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour is:
(1) 35.55 km/hr (2) 36 km/hr
(3) 71.11 km/hr (4) 71 km/hr
15. Two trains 140 m and 160 m long run at the speed of 60 km/hr and 40 km/hr respectively in opposite directions on parallel tracks. The time (in sec) which they take cross each other is:
(1) 9 sec (2) 9.6 sec
(3) 10 sec (4) 10.8 sec
16. Find the missing number



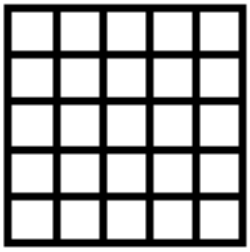
(1) 32 (2) 22
(3) 18 (4) 27
17. What will be the value of (48 - 12) ÷ 4 + 6 ÷ 2 × 3?
(1) 18 (2) 9/4
(3) 24 (4) 4.5
18. A horse and a carriage together cost Rs. 8000. If by selling the horse at a profit of 10% and the carriage at a loss of 10%, a total profit of 2.5% is made, then what is the cost price of the horse?
(1) Rs. 3000 (2) Rs. 3500
(3) Rs. 4000 (4) Rs. 5000

20.5 Model Paper 5

1. Six years ago in a state park the deer out-numbered the foxes by 80. Since then, the number of deer has doubled and the number of foxes has increased by 20. If there are now a total of 240 deer and foxes in the park, how many foxes were there six years ago?
   (1) 10 (2) 20
   (3) 30 (4) 40
2. The sum of three consecutive multiples of 7 is 777. Then the middle of them is
   (1) 252 (2) 259
   (3) 265 (4) 272
3. The difference between the compound interest and the simple interest on a certain sum for 2 years at 10% per annum is Rs 300. Then the sum is
   (1) Rs. 25,000 (2) Rs. 30,000
   (3) Rs. 35,000 (4) Rs. 20,000
4. Vessel A contains milk and water in the ratio 4:5 and vessel B contains the same in the ratio 5:1. In what proportion should quantities be taken from A and B to form a mixture in which milk and water are in the proportion 5:4?
   (1) 4:5 (2) 2:5
   (3) 5:3 (4) 5:1
5. When Jinal purchases an item that costs Rs. 1000 or less, she pays with cash. When jinal buys an item that costs between Rs. 1000 and Rs. 5000 she pays with her debit card. If jinal purchases an item that costs Rs. 5000 or greater, she uses a check to pay. If jinal recently paid for a certain item using a debit card, which of the following statements could be true?
   (1) The item cost Rs. 6000.
   (2) If the item had cost Rs. 900 more, she would have paid with cash.
   (3) The item cost at least Rs. 5000.
   (4) The item cost more than Rs. 1000.
6. You are given 120 adjectives using which you have to form sentences containing at least one adjective, without repeating the adjectives, following the condition that the number of adjectives (from this set) should not be equal in any two sentences. Now, the maximum number of sentences you can form is
   (1) 10 (2) 13
   (3) 15 (4) 100
7. January 1, 1994 was a Sunday, what day of the week lies on January 15, 1999?
   (1) Monday (2) Tuesday
   (3) Friday (4) Saturday
8. A man wants to reach a window on the top of a building having height 60 feet. The distance from the foot of the ladder to the wall of the building is 11 feet. How long should the ladder be in order to reach the window?
   (1) 61 (2) 69
   (3) 51 (4) 59
9. $(32)^{2.6} \times (32)^{?} = 328$
   (1) 2.9 (2) 2.75
   (3) 4.5 (4) 5.4
10. Which letter replaces the question mark?



   (1) P (2) S
   (3) T (4) Q
11. If n is a natural number, then n (2n+ 1) (n + 1) should be certainly divisible by
   (1) 2 but not 3 (2) 3 but not 2
   (3) both 2 and 3 (4) neither 2 nor 3
12. The number of circles passing through three non-collinear points in a plane is
   (1) 1 (2) 2
   (3) 3 (4) 4
13. How many rectangles (which are not squares) are there in the following figure?



   (1) 25 (2) 55
   (3) 170 (4) 225
14. A cone and a hemisphere have equal bases and equal volumes. Find the ratio of their heights.
   (1) 1:2 (2) 2:1
   (3) 3:1 (4) 3:4
15. Shruti saved Rs.550 in buying a Suit on sale. If she spent Rs.5500 for the Suit, the discount she got was about:
   (1) 8% (2) 9%
   (3) 10% (4) 11%
16. 8, 24, 12, 36, 18, 54, (....)
   (1) 27 (2) 108
   (3) 68 (4) 72
17. The ratio between the perimeter and the breadth of a rectangle is 5: 1. If the area of the rectangle is 216 sq. cm, what is the length of the rectangle?
   (1) 16 cm (2) 18 cm
   (3) 24 cm (4) None of these
18. A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is:
   (1) 45 km/hr (2) 50 km/hr
   (3) 54 km/hr (4) 55 km/hr