

## Formula

### Arithmetic :

- Dividend = ( Divisor X Quotient ) + Remainder
- Average =  $\frac{\sum \text{of values}}{\text{no of value}}$

### Algebra :

#### Series

- nth term of the A.P is given by  $T_n = a + (n - 1)d$
- Sum of n terms of A.P is given by  $S_n = \frac{n}{2}(2a + (n - 1)d)$
- nth term of the GP is given by  $T_n = a \cdot r^{(n-1)}$
- Sum of the n term of G.P is given by  $S_n = \frac{a(r^n - 1)}{r - 1}$

#### Important Result :

- $(1 + 2 + 3 + 4 + \dots + n) = \frac{n(n+1)}{2}$
- $(1^2 + 2^2 + 3^2 + \dots + n^2) = \frac{n(n+1)(2n+1)}{6}$
- $(1^3 + 2^3 + 3^3 + \dots + n^3) = \left(\frac{n(n+1)}{2}\right)^2$

### Equation and Factorization :

- $(x + y)^2 = x^2 + 2xy + y^2$
- $(x - y)^2 = x^2 - 2xy + y^2$
- $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$
- $(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$
- $x^2 - y^2 = (x + y)(x - y)$
- $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$
- $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
- If a quadratic equation is given in the question, say  $ax^2 + bx + c = 0$  and the option given is  $(px - r1)(qx - r2)$

9. For the General equation  $ax^2 + bx + c = 0$ , the quadratic formula will be

$$x = \frac{[-b \pm \sqrt{b^2 - 4ac}]}{2a}$$

### Indices :

- $a^m \times a^n = a^{(m+n)}$

- $\frac{a^m}{a^n} = a^{(m-n)}$
- $(a^m)^n = a^{(m \times n)}$
- $(ab)^n = a^n b^n$
- $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
- $a^0 = 1$
- $a^{(-n)} = \frac{1}{a^n}$
- $\sqrt[n]{a} = a^{(1/n)}$
- $(\sqrt[n]{a})^n = a$
- $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$
- $(\sqrt[n]{a})^m = \sqrt[n]{a^m}$

### Probability:

- $P(A) = \frac{\text{Number of outcomes favorable to A}}{\text{Number of all possible outcomes of the experiment}}$
- **$P(A) + P(A') = 1$**
- **If A and B are independent events then,**  
 $P(A \cap B) = P(A) \times P(B)$
- **If A and B are mutually exclusive events then,**  
 $P(A \cap B) = 0$
- **Hence if A' denotes the complement event of A then,**  
 $P(A \cap A') = 0$
- **Conditional Probability :**  $P(A|B)$  denotes the probability that event A will occur given that event B has occurred already. Hence  $P(A|B)$  is given by,

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

where:

$P(A|B)$  = the (conditional) probability that event A will occur given that event B has occurred already

$P(A \cap B)$  = the (unconditional) probability that event A and event B both occur.

- $P(B)$  = the (unconditional) probability that event B occurs

### Permutation and combination:

- $1 \times 2 \times 3 \times 4 \dots \times (n-1) \times n = n !$

- ${}^n P_r = \frac{n!}{(n-r)!}$

- The number of permutations of  $n$  different objects taken  $r$  at a time, where  $0 < r \leq n$  and the objects do not repeat is  $n (n-1) (n-2) \dots (n-r+1)$ , which is denoted by  ${}^n P_r$ .

- **Principal of addition :** If two events  $E_1$  and  $E_2$  can occur independently in  $m$  and  $n$  ways respectively, then either of the two events can occur in  $(m+n)$  ways.
- **Principal of multiplication:** If an event can occur in  $m$  different ways, following which another event can occur in  $n$  different ways, then the total number of occurrence of the events in the order given is  $m \times n$ .
- the number of combinations of  $n$  different objects taken  $r$  at a time, denoted by  $nCr$ .
- ${}^nC_r = \frac{n!}{(n-r)! \cdot r!}$
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### Statistics :

- **Mean** =  $\frac{\sum \text{of all members value}}{\text{No. of member}}$
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### Applied Math:

#### Profit and Loss =>

- Profit = S.P – C.P
- Loss = C.P – S.P
- Profit % =  $\frac{(S.P - C.P)}{C.P} \times 100$
- Loss % =  $\frac{(C.P - S.P)}{C.P} \times 100$

#### Work men Effort =>

- If A can do a piece of work in  $n$  days then A's one day's work =  $\frac{1}{n}$
- If A can finish a work in  $X$  days and B can finish the same work in  $Y$  days then together they can finish the work in  $\frac{XY}{X+Y}$  days

#### Speed =>

- Speed = Distance over time
- Average speed =  $\frac{\text{Total distance}}{\text{Total time}}$

#### Conversions :

Currency:

- 1 Dollar = 100 cents
- Quarter = 25 cents

Length:

- 1 m(metre) = 100 cm(centimetres)
- 1 km(kilometre)=1000 m
- 1 in(inch) = 2.54 cm
- 1 ft(foot) = 12 in
- 1 mile = 1.6 km
- 1 mile = 5280 ft
- 1 yard = 3 ft

- 1 mile = 1760 yd

Weight:

- 1 Kg(Kilogram) = 1000 gm(gram)
- 1 t(tonne) = 1000 Kg
- 1 Pound = 0.45 Kg
- 1 ounce = 28.3495 grams
- 1 Pound = 16 ounces

Volume:

- 1 L(Litre) = 1000 ml(millilitre)
- 1 L = 1 dm<sup>3</sup> (decimetre)
- 1 L = 0.001 m<sup>3</sup>
- 1 gallon = 3.78 L

Quantity:

- 1 Dozen = 12
- 1 gross = 12 Dozen
- 1 great gross = 12 gross
- 1 million = 1000000 = 10<sup>6</sup>
- 1 billion = 1000000000 = 10<sup>9</sup>
- x km/hr = x X 5 over 18 m/sec
- x m/sec = x X 18 over 5 km/hr

**Clock :**

- Angle between the minutes hand and hour hand is given by

$$\theta = \frac{11}{2} M - 30 H$$

**Inequality :**

- If n is positive integer than  

$$n^{(n+1)} > (n+1)^n \quad \text{for } n > 3$$

**Geometry :**

- Sum of the Interior or internal angle of an n-gon = (n - 2) X 180
- Measure of each interior or internal angle of a regular polygon

$$= (n-2) X \frac{180}{n}$$

- Sum of the exterior angles of n-gon is = 360 degree
- The measure of each exterior angle of a regular polygon is =  $\frac{360}{n}$
- Sum of the external angles of the polygon = (n + 2) X 180
- **Pythagorean Theorem**

$$z^2 = x^2 + y^2$$

- **By Pythagorean theorem, for a right angle triangle,**

$$z^2 = x^2 + y^2$$

If  $z^2 > x^2 + y^2$  , the angle formed is an **obtuse angle**.

If  $z^2 < x^2 + y^2$  , the angle formed is an **acute angle**.

- The ratio of the sides of 45-45-90 right angled triangle is  $1 : 1 : \sqrt{2}$  .
- The ratio of the sides of 30-60-90 right angled triangle is  $1 : \sqrt{3} : 2$  .

#### Area/Perimeter :

- Area of Rectangle = length X breadth
- Perimeter of rectangle =  $2 ( \text{length} + \text{breadth} )$
- Area of square =  $(\text{side})^2$
- Perimeter of square =  $4 \times \text{side}$
- Area of triangle =  $\frac{1}{2} \times \text{base} \times \text{height}$
- Area of equilateral triangle =  $\frac{\sqrt{3}}{4} \times (\text{side})^2$
- Area of parallelogram = base X height
- Area of trapezium =  $\frac{1}{2} \times (a + b) \times h$   
where a and b are length of the parallel sides , h is distance between them .
- Circumference of circle =  $2 \pi r$
- Area of circle =  $\pi r^2$
- length of Arc =  $\frac{\theta}{360} \times 2\pi r$
- area of circle =  $\frac{\theta}{360} \times \pi r^2$

#### Volume :

- Volume of cuboid =  $lbh$
- Surface area cuboid =  $2 ( lb + bh + hl )$
- Body Diagonal =  $\sqrt{l^2 + b^2 + h^2}$
- Volume of cube =  $a^3$
- Surface area =  $6 a^2$
- Body diagonal =  $\sqrt{3} a$
- volume of Sphere =  $\frac{4}{3} \pi r^3$
- Surface area of Sphere =  $4 \pi r^2$
- Volume of Cylinder =  $\pi r^2 h$
- Curved surface area of cylinder =  $2\pi rh$
- Total surface area of cylinder =  $2\pi r ( h + r )$
- Slant height of cone =  $\sqrt{h^2 + r^2}$
- Volume of cone =  $\frac{1}{3} \pi r^2 h$
- Curved surface area of cone =  $\pi rl$
- Total surface area of cone =  $\pi r ( r + l )$