SQUARES

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$
$11^2 = 121$
$12^2 = 144$
$13^2 = 169$
$14^2 = 196$
$15^2 = 225$
$16^2 = 256$
$17^2 = 289$
$18^2 = 324$
$19^2 = 361$
$20^2 = 400$
$21^2 = 441$
$22^2 = 484$
$23^2 = 529$
$24^2 = 576$
$25^2 = 625$
$26^2 = 676$

TABLE

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100
11	22	33	44	55	66	77	88	99	110
12	24	36	48	60	72	84	96	108	120
13	26	39	52	65	78	91	104	117	130
14	28	42	56	70	84	98	112	126	140
15	30	45	60	75	90	105	120	135	150
16	32	48	64	80	96	112	128	144	160
17	34	51	68	85	102	119	136	153	170
18	36	54	72	90	108	126	144	162	180
19	38	57	76	95	114	133	152	171	190
20	40	60	80	100	120	140	160	180	200
21	42	63	84	105	126	147	168	189	210
22	44	66	88	110	132	154	176	198	220
23	46	69	92	115	138	161	184	207	230
24	48	72	96	120	144	168	192	216	240
25	50	75	100	125	150	175	200	225	250

DIVISIBILITY:

2 - Any even number or numbers which end with 0.
3 - Sum of the digits if divisible by 3.
4 - Last two digits are 00 or divisible by 4.
5 - Last digit should be 5 or 0.
6 - If divisible by 2 and 3.
8 - Last three digits are 000 or divisible by 8.
9 - Sum of the digits if divisible by 9.
10 - Last digit of the number should be 0.
11 - Difference of alternate digits either 0 or divisible by 11.

$\sqrt{2} = 1.414$
$\sqrt{3} = 1.732$

FORMULAE : ARITHMATIC

1. 0 is an even number
2. 1 is neither prime nor compound.
3. i) Natural numbers → N – 1, 2, 3 .... all the positive integers. [not 0]
   ii) Integers → I – All positive and negative number including 0, 0, ±1, ±2, ...
   iii) Rational Numbers, Q → Numbers in the form $^m/_n$ where $n \neq 0$, $-2, -\frac{2}{3}, 3$ ....
   iv) Irrational Numbers, → Which are not in the form $^m/_n$, $\sqrt{2}, \sqrt{2/3}, 2 \pm \sqrt{3}, \sqrt{5}/2$ ....
   v) Real Numbers., R → All rational and irrational numbers, $2, \sqrt{2}, 0.2$ ....
4. Product of two numbers/fractions = their L.C.M × H.C.F
5. Dividend = Divisor × Quotient + Remainder
6. i) Proper fractions : Fractions less than 1, i.e. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$ ....
   ii) Improper fractions : Fractions greater than 1, i.e. $3/2, 4/3, 5/2$ ....
7. i) L.C.M. of the fractions = L.C.M. of the numerators/H.C.F. of the denominators.
   ii) H.C.F. of the fractions = H.C.F. of the numerators/L.C.M. of the denominators.
8. $x\% = \frac{x}{100}$, $\frac{x}{y} = \left(\frac{100x}{y}\right)\%$
9. i) Simple Interest = Principal × Time in years × Annual Rate/100 $= \frac{PTR}{100}$.
   ii) Amount = Principal + Interest
10. i) Velocity or Speed = Distance ÷ Time
    ii) Distance = Velocity × Time
    iii) Relative speed of a boat downstream = Speed of boat + Speed of current
    iv) Relative speed of a boat upstream = Speed of boat – Speed of current
11. i) Simple Average = Sum of the quantities ÷ No. of quantities
    ii) Weighted Average = $f_1x_1 + f_2x_2 + f_3x_3 \cdots \div f_1 + f_2 + f_3 \cdots$.
12. i) Profit % = $\frac{\text{Profit}}{\text{C.P.}} \times 100$ ii) Loss % = $\frac{\text{Loss}}{\text{C.P.}} \times 100$
    iii) On Profit, SP = CP + Profit iv) On Loss, SP = CP – Loss
    v) S.P. at a profit of x% = CP + CP × $\frac{x}{100}$
    vi) S.P. at a loss of x% = C.P. – C.P × $x/100$.
13. Compound Interest : i) $A = P\left[1 + \frac{r}{100}\right]^n$, n = no. of years, r = rate, A = Amount.
    ii) When rates for successive years are different, $A = P\left(1 + \frac{r_1}{100}\right)\left(1 + \frac{r_2}{100}\right) \cdots$.
    iii) When Int. is compounded ½ yearly, $A = P\left[1 + \frac{r}{2 \times 100}\right]^{n \times 2}$.
    iv) For r% depreciation, Value after n yrs = Present Value $\left(1 - \frac{r}{100}\right)^n$

FORMULAE : ALGEBRA

1. $(a+b)^2 = a^2 + 2ab + b^2$,
2. $(a-b)^2 = a^2 - 2ab + b^2$;
3. (i) $(a+b)^2 = (a-b)^2 + 4ab$
   (ii) $4ab = (a+b)^2 - (a-b)^2$
4. (i) $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
   (ii) $a^2+b^2+c^2 = (a+b+c)^2 - 2(ab+bc+ca)$
   (iii) $ab+bc+ca = \frac{(a+b+c)^2 - (a^2+b^2+c^2)}{2}$
5. $a^2+b^2+c^2-ab-bc-ca = \frac{1}{2}\{(a-b)^2 + (b-c)^2 + (c-a)^2\}$
6. (i) $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3 = a^3 + b^3 + 3ab(a+b)$
   (ii) $a^3+b^3 = (a+b)^3 - 3ab(a+b)$
7. (i) $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3 = a^3 - b^3 - 3ab(a-b)$
   (ii) $a^3-b^3 = (a-b)^3 + 3ab(a-b)$
8. (i) $(a+b+c)^3 = a^3+b^3+c^3 + 3(a+b)(b+c)(c+a)$
   (ii) $a^3+b^3+c^3 = (a+b+c)^3 - 3(a+b)(b+c)(c+a)$
9. (i) $a^2-b^2 = (a+b)(a-b)$
   (ii) $a^3+b^3 = (a+b)(a^2-ab+b^2)$
   (iii) $a^2+b^2 = \frac{(a+b)^2 + (a-b)^2}{2}$
   (iv) $a^3-b^3 = (a-b)(a^2+ab+b^2)$
   (v) $a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$
   $= \frac{1}{2}(a+b+c)\{(a-b)^2 + (b-c)^2 + (c-a)^2\}$
10. (i) $-(b-c)(c-a)(a-b) = a^2(b-c) + b^2(c-a) + c^2(a-b)$.
    $= bc(b-c) + ca(c-a) + ab(a-b)$
    $= a(b^2-c^2) + b(c^2-a^2) + c(a^2-b^2)$
    (ii) $(b+c)(c+a)(a+b) = a^2(b+c) + b^2(c+a) + c^2(a+b) + 2abc$
    $= bc(b+c) + ca(c+a) + ab(a+b) + 2abc$
    $= a(b^2+c^2) + b(c^2+a^2) + c(a^2+b^2) + 2abc$
    $= (a+b+c)(ab+bc+ca) - abc$.
    (iii) $(a+b+c)(ab+bc+ca) = a^2(b+c) + b^2(c+a) + c^2(a+b) + 3abc$
    $= bc(b+c) + ca(c+a) + ab(a+b) + 3abc$
    $= a(b^2+c^2) + b(c^2+a^2) + c(a^2+b^2) + 3abc$
    $= (b+c)(c+a)(a+b) + abc$
11. (i) $a^m \times a^n = a^{m+n}$
    (ii) $a^m \div a^n = a^{m-n}$
    (iii) $(a^m)^n = a^{mn}$
    (iv) $a^0 = 1$ (when $a \neq 0$)
    (v) $a^{-n} = \frac{1}{a^n}$
    (vi) $(ab)^m = a^m \cdot b^m$
    (vii) $\sqrt{a} = a^{1/2}$
    (viii) $\sqrt[n]{a} = a^{1/n}$
    (ix) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$
    (x) $\sqrt[n]{a^m} = a^{\frac{m}{n}}$

12. i) Equation of a straight line → $ax+by+c=0$
ii) Equation of the x-axis is $y=0$
iii) Equation of the y-axis is $x=0$
iv) Eqn. of a st. line parallel to x-axis is $y=a$
v) Eqn. of a st. line parallel to y-axis is $x=a$

13. i) General form of quadratic equation is $ax^2+bx+c=0$, where $a\neq 0$
ii) The roots of the quadratic eqn. $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$, two in number.
iii) Nature of the roots ;-
a) Roots are Real and Equal if $b^2-4ac=0$ i.e. $b^2=4ac$.
b) Roots are Real but Unequal if b^2-4ac is positive.
c) Roots are Real and Rational if b^2-4ac is a perfect square.
d) Roots are Real and Irrational if b^2-4ac is not a perfect square.
e) Roots are Imaginary if b^2-4ac is negative.

14. If $a:b :: c:d$, then
(i) $ad=bc$ Cross-multiplied (ii) $b/a=d/c$ ... Inverendo.
(iii) $a/c=b/d$ ... Alternando. (iv) $\frac{a+b}{b}=\frac{c+d}{d}$ ... Componendo.
(v) $\frac{a-b}{b}=\frac{c-d}{d}$ ... Dividendo. (vi) $\frac{a}{a-b}=\frac{c}{c-d}$ ... Convertendo.
(vii) $\frac{a+b}{a-b}=\frac{c+d}{c-d}$ ... Componendo and Dividendo.

15. If $a:b :: b:d$, i.e. in Continued proportion
(i) $a/b=b/c$ i.e. $b^2=ac$
(ii) $a/c=a^2/b^2$

16. If $a:b :: c:d$, i.e. $a/b=c/d$
i) Each ratio $=\frac{a+c}{b+d}=\frac{a+c+e+g\cdots}{b+d+f+h\cdots}$ (Addendo)
ii) Each ratio $=\frac{a-c}{b-d}$.

17. Logarithms : $a^n=b \Rightarrow \log_a b=n$, $a>0$ and $a\neq 1$
i) $\log_a 1=0$, $\log_a a=1$ ii) $\log_a m^n=n\log_a m$
iii) $\log_a mn=\log_a m+\log_a n$ iv) $\log_a \frac{m}{n}=\log_a m-\log_a n$
v) $\log_m m\times\log_m n=1$

18. Commutative law → a) $x+y=y+x$ b) $xy=yx$
Associative Law → a) $(x+y)+z=x+(y+z)$ b) $(xy)z=x(yz)$
Additive Identity → $x+0=x=0+x$; Distributive Law → $x(y\pm z)=xy\pm xz$
Multiplicative Identity → $x\times 1=x=1\times x$
Additive Inverse → $x+(-x)=0=(-x)+x$

FORMULAE : MENSURATION

1. i) Area of a **Triangle** $= \frac{1}{2} \times \text{base} \times \text{altitude}$
$= \sqrt{s(s-a)(s-b)(s-c)}$, where $s = \frac{a+b+c}{2}$ [Heron's formula]

ii) Area of an equilateral triangle $= \frac{\sqrt{3}}{4} a^2$, where a = side

iii) Height of an Equilateral triangle $= \frac{\sqrt{3}}{2} a$.

iv) In a right-angled triangle, $(\text{hypotenuse})^2 = (\text{Base})^2 + (\text{Perpendicular})^2$

2. i) Area of the **Rectangle** = Length × Breadth

ii) Diagonal of the Rectangle $= \sqrt{l^2+b^2}$

iii) Perimeter of the Rectangle $= 2(l+b)$

v) Ar. Isosceles triangle $= \frac{1}{2} b \sqrt{\left(a^2 - \frac{b^2}{4}\right)}$

3. i) Area of a **Square** $= a^2$, where a = Side.

ii) Diagonal of a Square $= a\sqrt{2}$

iii) Perimeter of a Square $= 4a$

4. i) Area of a **Rhombus** $= \frac{1}{2}$ (Product of two diagonals)

ii) Area of a **Parallelogram** = Base × Height

iii) Area of a **Trapezium** $= \frac{1}{2}$ × (Sum of two parallel sides) × Height

iv) Area of the four walls of a room $= 2(l+b)h$.

5. i) Area of the **circle** $= \pi r^2$, r = radius.

ii) Perimeter/Circumference of the circle $= 2\pi r$.

iii) Area of the circular ring $= \pi(R^2 - r^2)$. R = Outer radius.

iv) Circumference of the circular ring $= 2\pi(R-r)$.

6. i) Total surface area of the **cuboid** $= 2(ab + bc + ca)$, Sides - a, b, c

ii) Volume of the cuboid $= abc$

iii) Diagonal of the rectangular parallelopiped $= \sqrt{a^2+b^2+c^2}$

7. i) Total surface area of the **cube** $= 6a^2$; Side - a

ii) Volume of the cube $= a^3$

iii) Diagonal of the cube $= a\sqrt{3}$

8. i) Volume of a **cylinder** $= \pi r^2 h$; Radius - r, height - h

ii) Area of the curved surface of a cylinder $= 2\pi rh$

iii) Total surface area of a cylinder $= 2\pi r(h+r)$

iv) Volume of a hollow cylinder $= \pi(R^2 - r^2)h$

9. i) Volume of the **sphere** $= 4/3\ \pi r^3$

ii) Total surface area of the sphere $= 4\pi r^2$

iii) Volume of the hemisphere $= 2/3\ \pi r^3$

iv) Surface area of the hemisphere $= 3\pi r^2$

10. i) Volume of the Right Circular cone $= \frac{1}{3}\pi r^2 h$, h = height
ii) Area of the curved surface $= \pi rl = \pi r\sqrt{h^2+r^2}$, l = Slant height
iii) Total surface area $= \pi r(r+l)$

GEOMETRY

1. i) Sum of the interior angles of a convex polygon of n sides $= (2n-4)\times 90°$
ii) Sum of the exterior angles of a convex polygon of any sides $= 360°$
iii) Each interior angle of polygon $= \frac{(2n-4)\,90°}{n}$.
iv) Each exterior angle of polygon $= 360°/n$.
v) Interior angle + Exterior angle $= 180°$

POLYGON	TRIANGLE	RECTANGLE	PENTAGON	HEXAGON	SEPTAGON	OCTAGON	NONAGON	DECAGON
NO. OF SIDES	3	4	5	6	7	8	9	10
SUM OF INT. ANGLES	180°	360°	540°	720°	900°	1080°	1260°	1440°
EACH INT. ANGLE	60°	90°	108°	120°	128.6°	135°	140°	144°
SUM OF EXT. ANGLES	360°	360°	360°	360°	360°	360°	360°	360°
EACH EXT. ANGLE	120°	90°	72°	60°	51.4°	45°	40°	36°

MENSURATION +

PRISM — Area of lateral surface – Perimeter of base × height
Area of the total surface – Area of lateral surface + 2 × Area of base
Volume of a prism – Area of the base × height

PYRAMID – Area of lateral surface – $\frac{1}{2}$ × Perimeter of base × slant height
Area of the Total surface – Area of (Lateral Surface + Base)
Volume of the pyramid – $\frac{1}{3}$ Area of base × height (vertical)

TRIGONOMETRY

1. Some People Have, Curling Brown Hair, They are Proud and Brave.

$\sin\theta = \frac{P}{H} = \frac{\text{Perp}}{\text{Hyp.}}$ $\quad \cos\theta = \frac{B}{H} = \frac{\text{Base}}{\text{Hyp.}}$ $\quad \tan\theta = \frac{P}{B} = \frac{\text{Perp}}{\text{Base}}$

$\text{Cosec}\,\theta = \text{Hyp/Perp} = \frac{H}{P}$ $\quad \sec\theta = \text{Hyp/Base} = \frac{H}{B}$ $\quad \cot\theta = \text{Base/Perp} = \frac{B}{P}$

2. i) A Radian, $1^c = 57°17'44.8''$ (nearly)
   ii) $\pi^c = \pi$ Radian $= 180°$

3. i) $\sin\theta = 1/\text{Cosec}\,\theta$ ii) $\text{Cosec}\,\theta = 1/\sin\theta$ ix) $\tan\theta = \frac{\sin\theta}{\cos\theta}$
   iii) $\cos\theta = 1/\sec\theta$ iv) $\sec\theta = 1/\cos\theta$ x) $\cot\theta = \frac{\cos\theta}{\sin\theta}$
   v) $\tan\theta = 1/\cot\theta$ vi) $\cot\theta = 1/\tan\theta$
   vii) $\sin^2\theta + \cos^2\theta = 1$ viii) $\sec^2\theta = 1 + \tan^2\theta$
   ix) $\text{Cosec}^2\theta = 1 + \cot^2\theta$.

4.

Angles →	0°	30°	45°	60°	90°
Sin —	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
Cos —	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
tan —	0	$1/\sqrt{3}$	1	$\sqrt{3}$	∞

5. i) $\sin(90°-\theta) = \cos\theta$ ii) $\cos(90°-\theta) = \sin\theta$
   iii) $\text{Cosec}(90°-\theta) = \sec\theta$ iv) $\sec(90°-\theta) = \text{Cosec}\,\theta$
   v) $\tan(90°-\theta) = \cot\theta$ vi) $\cot(90°-\theta) = \tan\theta$

Sin+	All+
tan+	Cos+

6. i) $\sin(90°+\theta) = \cos\theta$ ii) $\cos(90°+\theta) = -\sin\theta$
   iii) $\text{Cosec}(90°+\theta) = \sec\theta$ iv) $\sec(90°+\theta) = -\text{Cosec}\,\theta$
   v) $\tan(90°+\theta) = -\cot\theta$ vi) $\cot(90°+\theta) = -\tan\theta$

7. i) $\sin(180°-\theta) = \sin\theta$ ii) $\cos(180°-\theta) = -\cos\theta$
   iii) $\text{Cosec}(180°-\theta) = \text{Cosec}\,\theta$ iv) $\sec(180°-\theta) = -\sec\theta$
   v) $\tan(180°-\theta) = -\tan\theta$ vi) $\cot(180°-\theta) = -\cot\theta$

8. From Pythagoras theorem,
   $3^2 + 4^2 = 5^2$ And its multiples, like—
   $6^2 + 8^2 = 10^2$
   $9^2 + 12^2 = 15^2$ and so on, are Pythegorian triples.

   $5^2 + 12^2 = 13^2$
   $8^2 + 15^2 = 17^2$
   $21^2 + 10^2 = 26^2$
   $15^2 + 20^2 = 25^2$

$1^3 = 1$	$9^3 = 729$
$2^3 = 8$	$10^3 = 1000$
$3^3 = 27$	$11^3 = 1331$
$4^3 = 64$	$12^3 = 1728$
$5^3 = 125$	$15^3 = 3375$
$6^3 = 216$	
$7^3 = 343$	
$8^3 = 512$	

1. The distance between two given points (x_1, y_1) and (x_2, y_2)
$$= \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

2. The distance of any point (x, y) from origin $(0, 0)$
$$= \sqrt{x^2+y^2}$$

3. The co-ordinates of a point $P(x, y)$ which divides the line joining points (x_1, y_1) and (x_2, y_2) in ratio $m:n$; $P_x = \frac{mx_2 + nx_1}{m+n}$ Externally: $P_x = \frac{mx_2 - nx_1}{m-n}$

[Internally] $P_y = \frac{my_2 + ny_1}{m+n}$. $P_y = \frac{my_2 - ny_1}{m-n}$

4. The co-ordinates of the mid-point of the line joining points (x_1, y_1) and (x_2, y_2)
$$P(x, y) = \frac{x_1 + x_2}{2} \text{ and } \frac{y_1 + y_2}{2}$$

5. The co-ordinates of the Centroid of ΔABC having vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$;
$$G(x, y) = \frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}$$

6. i) Slope (Gradient) = Vertical rise/horizontal distance
ii) Slope $m = \tan\theta$; if inclination is θ.
iii) Slope of x-axis, $m = \tan 0° = 0$
iv) Slope of y-axis, $m = \tan 90° = \infty$
v) slope is +ve, when it makes an acute angle in anticlockwise direction.
vi) Slope is -ve, when it makes an acute angle in clockwise direction.
vii) Slope of a line passing through (x_1, y_1) and (x_2, y_2)
$$m = \tan\theta = y_2 - y_1 / x_2 - x_1.$$
viii) For Parallel lines, $m_1 = m_2$ i.e. slopes are equal.
ix) For Perpendicular lines, $m_1 \cdot m_2 = -1$
x) Slope of every line parallel to x-axis is zero.

7. If three points A, B and C are collinear, then Slope of AB = Slope of BC.

8. Equation of a line: i) $y = mx + c$ [Slope - Intercept form]
ii) $y - y_1 = m(x - x_1)$ [Point (given) - Slope form]
iii) $m = y_2 - y_1 / x_2 - x_1$ [Two-Points form; then to use eqn. no. ii]
iv) Equation of x-axis is $y = 0$
v) Equation of y-axis is $x = 0$
vi) Eqn. of a line parallel to x-axis at a distance 'a' from it is $y = a$
vii) Eqn. of a line parallel to y-axis at a distance 'b' from it is $x = b$

LOGARITHM

1. $a^n = b \Rightarrow \log_a b = n$ $[a>0, a\neq 1]$
2. $\log_a 1 = 0$, $\log_a a = 1$
3. $\log_a mn = \log_a m + \log_a n$
4. $\log_a \frac{m}{n} = \log_a m - \log_a n$
5. $\log_a m^n = n \log_a m$
6. $a^{\log_a x} = x$
7. $\log_a m = \log_b m \times \log_a b$
8. $\log_b m = \frac{\log_a m}{\log_a b}$ $\left[\begin{matrix} m>0 \\ a,b>0 \\ a\neq 1\ b\neq 1\end{matrix}\right]$
9. $\log_b a \times \log_a b = 1$
10. $\log_b a = \frac{1}{\log_a b}$
11. If $\log_a x = \log_a y \Rightarrow x = y$

MENSURATION

1. Area of a Sector $= \pi r^2 \times \frac{\theta}{360}$
2. Perimeter of a Sector $= 2r + 2\pi r \times \frac{\theta}{360}$
3. Radius of Incircle, $r = \frac{\Delta}{s}$ $\left[s = \frac{a+b+c}{2}\right]$ For Equilateral Traingle, $r = \frac{1}{3}\cdot\frac{\sqrt{3}}{2}a = \frac{\sqrt{3}}{6}a$
4. Radius of circumcircle, $R = \frac{abc}{4\Delta R^2}$ For Equilateral Triangle, $R = \frac{2}{3}\cdot h \Rightarrow \frac{2}{3}\cdot\frac{\sqrt{3}}{2}a \Rightarrow \frac{\sqrt{3}}{3}a$ $\therefore R = 2r$

STATISTICS

Arithmetic Mean :—

i) Direct Method : $\bar{x} = \frac{\Sigma fx}{N}$ Where, x = Mid Value of class interval, f = frequency of class interval, $N = \Sigma f$, total frequency

ii) Short Cut Method :

$\bar{x} = A + \frac{\Sigma fd}{N}$ Where, A = Assumed Mean, $d = x - A$

iii) Step Deviation Method :

$\bar{x} = A + \frac{\Sigma fu}{N} \times i$ Where, i = Length of class interval, $u = \frac{x-A}{i}$

Median :

i) For Ungrouped data —

When N is odd, Median $= \frac{N+1}{2}$ th figure serially

When N is even, Median $= \frac{1}{2}\left[\frac{N}{2}\text{th. term} + \frac{N}{2}+1\text{ th. term}\right]$

ii) For Grouped data –

$$\text{Median} = l + \frac{N/2 - F}{f_m} \times i$$

iii) $$\text{Mode} = l + \frac{f_m - f_1}{2f_m - f_1 - f_2} \times i$$

Where, l = Lower class boundary of the median class
N = Total frequency
F = Cumulative frequency, preceding to median class
f_m = Frequency of the median class
i = Length of the median class.

Where, l = Lower class boundary of the modal class
f_m = Frequency of the modal class
f_1 = Frequency just preceding the modal class
f_2 = Frequency just succeeding the modal class
i = Length / Width of the modal class

iv) Mean – Mode = 3(Mean – Median)

ARITHMETIC PROGRESSION

First term = a, Common Difference = d, Sum = S

i) nth term, $t_n = a + (n-1)d$

$a_n - a_m = (n-m)d$

ii) $S_n = \frac{n}{2}(a+l)$

$= \frac{n}{2}\{2a + (n-1)d\}$

iii) Sum of the first n natural nos. $= 1 + 2 + 3 + 4 + \cdots + n$

$= \frac{n(n+1)}{2}$

iv) n-th term from the end $= a + (m-n)d$ $= l - (n-1)d$

GEOMETRICAL PROGRESSION

a, ar, ar^2 ---- First term $= a$, Common ratio $= r$

i) nth term, $a_n = ar^{n-1}$

ii) n-th term from the end of G.P. having m terms $= ar^{m-n}$

iii) n-th term from the end having last term $l = l\left(\frac{1}{r}\right)^{n-1}$

iv) If $|r| < 1$, $S_n = a\frac{1-r^n}{1-r}$

If $r \leq -1$ or $r > 1$, $S_n = a\frac{r^n - 1}{r-1}$

If $r = 1$, $S_n = n.a$

v) If l = last term, $l = ar^{n-1}$

$$S_n = \frac{a - lr}{1-r} = \frac{lr - a}{r-1}$$