10TH STD MATHS
TN BOARD
1-8 CHAPTER FULL FORMULAE COLLECTION

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Formulae

Unit - 1

1) $n(A) = p$, $n(B) = q$, $n(A\times B) = pq$

2) Total number of relation : 2^{pq}

3) Total number of functions : q^{p} $f \to$ functional relation

4) $f \circ g \neq g \circ f$ not commutative

$f\circ(g\circ h) = (f\circ g)\circ h$ always associative.

Distributive property of cartesian product

(i) $A\times(B\cup C) = (A\times B)\cup(A\times C)$

(ii) $A\times(B\cap C) = (A\times B)\cap(A\times C)$

vertical line test = function

Horizontal "   one-one fn.

Unit - 2

Theorem 1 : Euclid's division lemma

$$a = bq + r \ , \quad 0 \le r < b$$

Theorem 3 :

GCD of (a,b) = GCD of $(a-b, b)$

congruence modulo :

$$a \equiv b \pmod n$$

Arithmetic Progression

General form : a , $a+d$, $a+2d$, $a+3d$, ... $a+(n-1)d$

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

common difference = $d = t_2 - t_1$, $d = t_n - t_{n-1}$

Number of terms : $n = \left[\dfrac{l-a}{d}\right] + 1$

Sum of three consecutive terms = $a-d, a, a+d$ $(d = d)$

Sum of Four consecutive terms = $a-3d, a-d, a+d, a+3d$ $(d = 2d)$

condition for three numbers = $2b = a + c$

Sum to n terms : a, n, d

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

a, l, d

$$n = \left[\frac{l-a}{d}\right]+1 \quad , \quad S_n = \frac{n}{2}[a+l]$$

Geometric progression :

General form : $a, ar, ar^2, \ldots\ldots ar^{n-1}$

n^{th} term = $t_n = ar^{n-1}$

common ratio = $r = \frac{t_2}{t_1}$, $r = \frac{t_n}{t_{n-1}}$

Product of three consecutive terms = $\frac{a}{r}, a, ar$

product of four consecutive terms

$$= \frac{a}{r^3}, \frac{a}{r}, ar, ar^3, \ldots$$

Sum to n terms :

$r = 1$, $S_n = na$ $(a+a+a+\ldots+a)$

$r > 1$, $S_n = \frac{a(r^n-1)}{r-1}$

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

no of terms = $t_n = ar^{n-1}$

Sum of infinite terms = $S_n = \frac{a}{1-r}$, $-1 < r < 1$

condition for three numbers = $b^2 = ac$

Special Series :

$t_{17} = S_{17} - S_{16}$.

Sum of first n natural numbers

$$1+2+3+\ldots+n = \frac{n(n+1)}{2}$$

Sum of first n odd natural numbers

$$1+3+5+\ldots(2n-1) = n^2$$

Sum of squares of first n natural numbers

$$1^2+2^2+3^2+\ldots+n^2 = \frac{n(n+1)(2n+1)}{6}$$

Sum of cubes of first n natural numbers.

$$1^3+2^3+3^3+\ldots+n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

Unit - 3

1. $0 = 1 \rightarrow$ inconsistent (contradiction) $\rightarrow$ no solution

2. $0 = 0 \rightarrow$ identity $\rightarrow$ Infinitely number of solutions.

3. Square root of polynomials.
   (i) Factorization method
   (ii) Division method

4. Roots of Quadratic equation.

$$ax^2+bx+c=0 \quad , \quad x^2+\frac{b}{a}x+\frac{c}{a}=0$$

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

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \quad a_{ij}$$

5). LCM & GCD

$$f(x) \times g(x) = LCM[f(x) \times g(x)] \times GCD[f(x) \times g(x)]$$

6). Operations of rational expressions

$\frac{p(x)}{q(x)}, \frac{r(x)}{s(x)} \rightarrow$ two rational expression

$$q(x) \neq 0 \quad , \quad s(x) \neq 0$$

product : $\frac{p(x)}{q(x)} \times \frac{r(x)}{s(x)} = \frac{p(x) \times r(x)}{q(x) \times s(x)}$

Division : $\frac{p(x)}{q(x)} \div \frac{r(x)}{s(x)} = \frac{p(x)}{q(x)} \times \frac{s(x)}{r(x)} = \frac{p(x) \times s(x)}{q(x) \times r(x)}$

Formation of Quadratic equation

$$x^2 - (\text{sum of roots})\,x + \text{product of roots} = 0$$

values of discriminant $\Delta = b^2-4ac$	Nature of roots
$\Delta > 0$	Real and unequal roots
$\Delta = 0$	Real and equal roots
$\Delta < 0$	no real root

$\alpha, \beta \rightarrow$ roots $\rightarrow ax^2+bx+c=0$

Sum of the roots $(\alpha+\beta) = \frac{-b}{a}$

product of roots $(\alpha\beta) = \frac{c}{a}$

$$x^2-(\alpha+\beta)x+\alpha\beta=0$$

$A, B, C \rightarrow m \times n$ matrices $p, q \rightarrow$ non-zero scalar

1) $A+B = B+A$: Addition is always commutative

2) $AB \neq BA$: multiplication not commutative

3) $A+(B+C) = (A+B)+C$ = matrix addition is always associative

4) $AB(C) = A(BC)$: multiplication associative

5) $pq(A) = p(qA)$ = Associative property of scalar multiplication

6) $IA = A$: Scalar identity property is unit matrix

7) $p(A+B) = pA+pB$ Distributive property of scalar and two matrices

8) $A(B+C) = AB+AC$ Right distributive property

9) $(p+q)A = pA+qA$ Distributive property of two scalars with a matrix

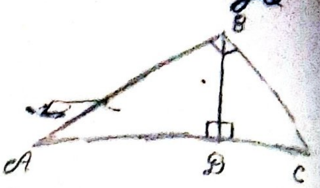
$(A+B)C = AC+BC$ Left distributive property.

4. Geometry

congruent triangles : Same shape and same size.

Similar triangles : Same shape but not same size.

1. Right angled triangle divides into two triangle

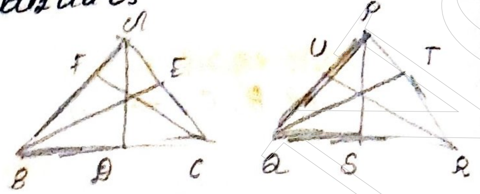


$\Delta ADB \sim \Delta BDC$, $\Delta ABC \sim \Delta ADB$.

$\Delta ABC \sim \Delta BDC$.

2. ratio of corresponding sides equal to the ratio of corresponding altitudes

$\Delta ABC \sim \Delta PQR$



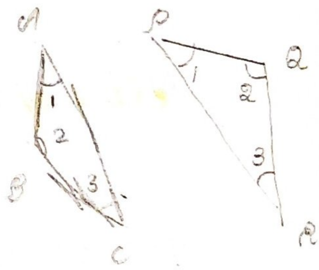
$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP} = \frac{AD}{PS} = \frac{BE}{QT} = \frac{CF}{RU}$$

3. Ratio of corresponding sides equal to the ratio of the corresponding perimeter

$\Delta ABC \sim \Delta DEF$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{AB+BC+CA}{DE+EF+FD}$$

4. Ratio of area of 2 similar triangles equal to ratio of squares of corresponding sides.



$$\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta PQR)} = \frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{AC^2}{PR^2}$$

5. 2 triangles $\rightarrow$ common vertex ratio between their areas equal to ratio between length of bases.

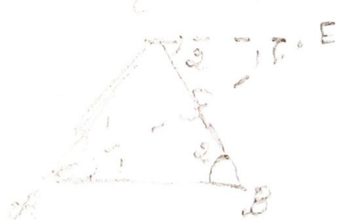
$$\frac{\text{Area}(\Delta ABD)}{\text{Area}(\Delta BDC)} = \frac{AD}{BC}$$

BPT

$$\frac{AD}{DB} = \frac{AE}{EC}$$

ABT

$$\frac{AB}{AC} = \frac{BD}{CD}$$



Pythagoras (Baudhyana) Theorem :

$$AB^2 + AC^2 = BC^2$$

 5. COORDINATE GEOMETRY.

Distance:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Mid point:

$$m = \left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right]$$

Heron's formula

$2s = a + b + c$

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

Section:

Area of $\Delta = \frac{1}{2} \times b \times$ altitude

Internal:

$$\left[\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right]$$

External:

$$\left[\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m-n}\right]$$

Centroid:

$$G = \left[\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right]$$

Area of a triangle:

$$= \frac{1}{2}\{(x_1 y_1 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3)\} \text{ sq. units}$$

$$= \frac{1}{2}\{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\} \text{ sq. units}$$

collinear → Area of triangle = 0 sq. units

Area of a Quadrilateral:

$$= \frac{1}{2}\{(x_1 y_2 + x_2 y_3 + x_3 y_4 + x_4 y_3) - (x_2 y_1 + x_3 y_2 + x_4 y_3 + x_1 y_4)\} \text{ sq. units}$$

$$= \frac{1}{2}\{(x_1 - x_3)(y_2 - y_4) - (x_2 - x_4)(y_1 - y_3)\}$$

Inclination of x axis

parallel to x axis = $0°$

$m = 0$

y axis

parallel to y axis = $90°$

$m = \infty$

Slope of a straight line

$m = \frac{y_2 - y_1}{x_2 - x_1}$

parallel $m_1 = m_2$

perpendicular

$m_1 \times m_2 = -1$

Slope - Intercept form

$y = mx + c$

(x, y) x = Abscissae, y = ordinate

point - slope form

$y - y_1 = m(x - x_1)$

Intercept form

$\frac{x}{a} + \frac{y}{b} = 1$

Two point form

$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$

$ax + by + c = 0$

$m = \frac{-\text{coefficient of } x}{\text{coefficient of } y} = \frac{-a}{b}$

$\boxed{m = \tan\theta}$

$\tan(2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}$

Hipparchus → Father

6. TRIGONOMETRY

invent Barthalaomaeus pitcus

$2\tan\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$; $\cot\theta = \frac{\cos\theta}{\sin\theta}$

$\text{cosec}\,\theta = \frac{1}{\sin\theta}$ $\sec\theta = \frac{1}{\cos\theta}$

$\sin\theta = \frac{\text{opposite side}}{\text{Hypotenuse}}$ $\cos\theta = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$

$\sin(90° - \theta) = \cos\theta$

$\cos(90° - \theta) = \sin\theta$

$\tan(90° - \theta) = \cot\theta$

$\text{cosec}(90° - \theta) = \sec\theta$

$\sec(90° - \theta) = \text{cosec}\,\theta$

$\cot(90° - \theta) = \tan\theta$

Trigonometric identities :

1. $\sin^2\theta + \cos^2\theta = 1$
2. $\sec^2\theta - \tan^2\theta = 1$
3. $\text{cosec}^2\theta - \cot^2\theta = 1$

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

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

$\tan 30° = \frac{1}{\sqrt{3}}$, $\tan 45° = 1$, $\tan 60° = \sqrt{3}$

7. MENSURATION

$\pi = \frac{22}{7}$

3 cone = 1 cy
2 cone = 1 cyl

cuboid

cube

cylinder

Hollow cylinder

cone

Sphere

Hemi sphere

Hollow sphere

Hollow Hemisphere

Frustum

ungro

dat

grou

da

	Curved Surface area	Total Surface area	volume
cuboid	$2h(l+b)$	$2(lb+bh+lh)$	$l\times b\times h$
cube	$4a^2$	$6a^2$	a^3
cylinder	$2\pi rh$	$2\pi r(h+r)$	πr^2h
Hollow cylinder	$2\pi(R+r)h$	$2\pi(R+r)(R-r+h)$	$\pi(R^2-r^2)h$
cone	πrl $\quad l=\sqrt{h^2+r^2}$	$\pi r(l+r)$	$\frac{1}{3}\pi r^2h$
sphere	$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Hemi sphere	$2\pi r^2$ volume of material used	$3\pi r^2$	only $\frac{2}{3}\pi r^3$
Hollow sphere	$4\pi R^2$	$4\pi(R^2+r^2)$	$\frac{4}{3}\pi(R^3-r^3)$
Hollow Hemisphere	$2\pi(R^2+r^2)$	$\pi(3R^2+r^2)$	$\frac{2}{3}\pi(R^3-r^3)$
Frustum	$\pi(R+r)l$	$\pi(R+r)l+\pi R^2+\pi r^2$	$\frac{\pi h}{3}(R^2+r^2+Rr)$

Imp. $l=\sqrt{h^2+(R-r)^2}$ $\quad h=\frac{h_1+h_2}{2}$

2 cone = 1 sphere

$2\pi r\times\frac{h_1+h_2}{2}$ $\quad$ 3 cone = 1 cyl $\quad$ $\pi r^2\times\frac{h_1+h_2}{2}$

$$\frac{\text{Area of the Sector}}{\text{Area of the circle}}=\frac{\text{Arc length of the sector}}{\text{circumference of the circle}}$$

Area of sector = CSA of cone $\quad$ Arc length = Base circumference

$\pi rl=\frac{\theta}{360°}\times\pi rl$

$1\,m^3=1000\,l$

$1000\,cm^3=l$

8. STATISTICS

Mean $\bar{x}=\dfrac{\text{Sum of all observations}}{\text{Total number of observations}}$

Ungrouped data	$\bar{x}=\frac{\Sigma x}{n}$	-	-
Grouped data	$\bar{x}=\frac{\Sigma xf}{\Sigma f}$	$\bar{x}=A+\frac{\Sigma fd}{\Sigma f}$ $\quad d=x-A$	$\bar{x}=A+c\times\frac{\Sigma fd}{\Sigma f}$ $\quad d=\frac{x-A}{c}$

$P(A\cup B)+P(A\cap B)=P(A)+P(B)$

$P(A)+P(B)-P(A\cap B)=P(A\cup B)$

Range = $L - S$

co-efficient of Range = $\frac{L-S}{L+S}$

$$\sigma^2 = \frac{\Sigma(x-\bar{x})^2}{n} = \frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2 \qquad \frac{\Sigma d^2}{n}$$

variance - mean of square of devn

mean :

	Direct method	Mean method	Assumed mean method	Step deviation method
ungrouped data	$\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left[\frac{\Sigma x}{n}\right]^2}$	$\sigma = \sqrt{\frac{\Sigma d^2}{n}}$ $d = x - \bar{x}$	$\sigma = \sqrt{\frac{\Sigma d^2}{n} - \left[\frac{\Sigma d}{n}\right]^2}$ $d = x - A$	$\sigma = c \times \sqrt{\frac{\Sigma d^2}{n} - \left[\frac{\Sigma d}{n}\right]^2}$ $d = \frac{x-A}{c}$
grouped data	-	$\sigma = \sqrt{\frac{\Sigma fd^2}{\Sigma f}}$ $N = \Sigma f$ $d = x - \bar{x}$	$\sigma = \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2}$	$\sigma = c \times \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2}$

σ natural $\sigma = \sqrt{\frac{n^2-1}{12}}$

C.V = $\frac{\sigma}{\bar{x}} \times 100$ relative measure of σ.

C.V is less → data → consistent more stable

C.V is more → data → inconsistent

$E \subseteq S$

PROBABILITY

one of A and B occur : $A \cup B$

Both A and B simultaneously occur : $A \cap B$

$P(E) = \frac{n(E)}{n(S)}$ $\qquad 0 \le P(E) \le 1$ $\qquad$ or = union $\qquad$ and - intersection

$P(E) + P(\bar{E}) = 1$ $\qquad P(\bar{E}) = 1 - P(E)$

either A nor B $= P(\bar{A} \cap \bar{B})$ $\qquad A \cap \bar{A} = \phi$ $\qquad A \cup \bar{A} = S$

mutually exclusive $\quad P(A \cup B) = P(A) + P(B)$ atmost atleast

neither : $P(\overline{A \cap B})$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$

p(only A) $P(A \cap \bar{B}) = P(A) - P(A \cap B)$

p(only B) $P(\bar{A} \cap B) = P(B) - P(A \cap B)$ $\qquad$ pg.no 329, Ex 8:32

De morgan's law

$P(A \cap \bar{B}) \cup (\bar{A} \cap B)$ like $P(A \cup B)$

$(A \cup B)' = A' \cap B'$ $\qquad P(A \cap \bar{B}) + P(\bar{A} \cap B)$ $\qquad P(A) + P(B)$

$\overline{(A \cup B)} = \bar{A} \cap \bar{B}$

sq. units

	CSA (or) LSA	TSA	Volume
Right circular cylinder	$l \times b$ $2\pi r h$	$2\pi r(h+r)$ $2\pi rh + 2\pi r^2$	$\pi r^2 h$ cu. units
Hollow Cylinder	$2\pi(R+r)h$ $2\pi Rh + 2\pi rh$	$2\pi(R+r)(R-r+h)$ $+ 2\pi(R^2-r^2)$	$\pi(R^2-r^2)h$ $\pi R^2h - \pi r^2 h$
Right Circular Cone	$\frac{2\pi r}{2\pi l} \times \pi l^2$ $\pi r l$ $l=\sqrt{h^2+r^2}$	$\pi rl + \pi r^2$ $\pi r(l+r)$	$\frac{1}{3}\pi r^2 h$
Sphere ($h = 2r$) Hollow Sphere	$2\pi rh = 2\pi r(2r)$ $4\pi r^2$ $4\pi R^2$	$4\pi(R^2+r^2)$ $4\pi r^2$	Hollow Sphere $\frac{4}{3}\pi(R^3-r^3)$ Solid hemisphere : $\frac{2}{3}\pi r^3$
Hemisphere	$\frac{\text{Sphere}}{2} = \frac{4\pi r^2}{2}$ $2\pi r^2$	$2\pi r^2 + \pi r^2$ $3\pi r^2$	$\frac{2}{3}\pi r^3$
Hollow Hemisphere	$2\pi R^2 + 2\pi r^2$ $2\pi(R^2+r^2)$	$2\pi(R^2+r^2)+\pi(R^2-r^2)$ $\pi(3R^2+r^2)$ $3\pi R^2 + \pi r^2$ $\pi(3R^2+r^2)$	$\frac{2}{3}\pi(R^3-r^3)$
Frustum	$\frac{1}{2}(2\pi R + 2\pi r)l$ $\pi(R+r)l$ $l = \sqrt{h^2+(R-r)^2}$	$\pi(R+r)l + \pi R^2 + \pi r^2$	$\frac{\pi h}{3}(R^2+Rr+r^2)$

Standard deviation

Ungrouped data :

Mean method $= \sqrt{\frac{\Sigma d^2}{n}}$ (or) $\sqrt{\frac{\Sigma x^2}{n} - \left[\frac{\Sigma x}{n}\right]^2}$

$[d = x - \bar{x}]$

Assumed mean method $= \sqrt{\frac{\Sigma d^2}{n} - \left[\frac{\Sigma d}{n}\right]^2}$ $[d = x - A]$

Step deviation method $= C \times \sqrt{\frac{\Sigma d^2}{n} - \left[\frac{\Sigma d}{n}\right]^2}$ $\left[d = \frac{x - A}{c}\right]$

grouped data

Mean method $= \sqrt{\frac{\Sigma fd^2}{\Sigma f\,(N)}}$

Assumed mean method $= \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left[\frac{\Sigma fd}{\Sigma f}\right]^2}$

Step deviation method $= C \times \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left[\frac{\Sigma fd}{\Sigma f}\right]^2}$

Algebraic Identities

$$(x+y)^2 = x^2 + 2xy + y^2$$

$$(x-y)^2 = x^2 - 2xy + y^2$$

$$x^2 - y^2 = (x+y)(x-y)$$

$$(x+y)^3 = x^3 + 3xy(x+y) + y^3$$
$$x^3 + 3x^2y + 3x^2y + y^3$$

$$(x^{\circ}-y)^3 = x^3 - 3xy(x-y) + y^3$$
$$x^3 - 3x^2y + 3xy^2 - y^2$$

$$x^3 + y^3 = (x+y)(x^2 - xy + y^2)$$

$$x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

Law of Exponents

$$a^m \times a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(ab)^m = a^m \times b^m$$

$$a^0 = 1$$

$$a^m = \frac{1}{a^{-m}}$$

$$a^{-m} = \frac{1}{a^m}$$

$$a^{m^n} = a^{mn}$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$
$11^2 = 121$
$12^2 = 144$
$13^2 = 169$
$14^2 = 196$
$15^2 = 225$
$16^2 = 256$
$17^2 = 289$
$18^2 = 324$
$19^2 = 361$
$20^2 = 400$

$\sqrt{2} = 1.414$

$\sqrt{3} = 1.732$

$\sqrt{5} = 2.236$

$\sqrt{6} = 2.45$

$\sqrt{10} = 3.16$