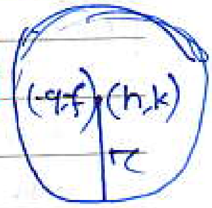
Subject : chapter 4 (circle)   Date :

$\boxed{h=-g \quad k=-f}$

① $\boxed{x^2+y^2+2gx+2fy+c=0} \equiv \boxed{\sqrt{(x-h)^2+(y-k)^2}=r}$

② centre, $c \equiv (-g,-f)$
$\equiv (h,k)$

constant, $\boxed{c=h^2+k^2-r^2}$

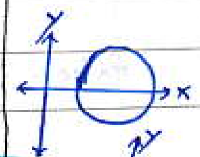


③ radious, $r=\sqrt{g^2+f^2-c}$
$/+(-c)$

constant এর formula [illegible]
$r=\sqrt{h^2+k^2-c}$

x axis chord

④ x-axis distance betn two points $=\boxed{2\sqrt{g^2-c}}$
$/+(-c)$



intercept

CHORD INTERCEPTS ALONG AXIS

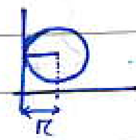
⑤ y axis distance betn two point, $=\boxed{2\sqrt{f^2-c}}$
$/+(-c)$

y axis chord

⑥ radius of a circle touching x axis $= r = |f|$

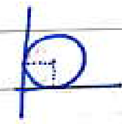
$\cdots g^2=c$

⑦ radious of a circle touching y axis $= r = |g|$



$\cdots\cdots f^2=c$

⑧ radious of a circle touching two axis $= r = |f| = |g|$



⑨ For a circle to become a circle :
- coefficient of x^2 & y^2 will be same (1)
- " " xy or any other variables not included in ① formula will be zero/null
- (g^2+f^2-c) must be greater or equal to zero. $(g^2+f^2-c \geq 0)$

x axis chord $= 2\sqrt{g^2-c}$
y axis chord $= 2\sqrt{f^2-c}$

⑩ When a circle touches x axis, $\boxed{g^2=c}$

$(-g,-f)$

⑪ When a circle touches y axis, $\boxed{f^2=c}$

⑫ When a centre touches a line $ax+by+c=0$, it becomes $ah+bk+c=0$

②

Subject :

Date :

(13)

(*) How to bring centre (h,k) and radious from a circle equation

$\boxed{18(11)}$

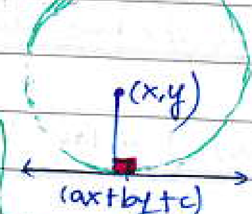
$x^2+y^2-2x+4y-31 \longrightarrow$ a circle eq^n

$\Rightarrow (x^2-2x+1)+(y^2+4y+4) = 1+4+31$

$\Rightarrow \underbrace{(x-1)^2}_{h}+\underbrace{(y+2)^2}_{k} = \underbrace{6^2}_{\text{radious}} \longrightarrow r^2=(x-h)^2+(y-k)^2$

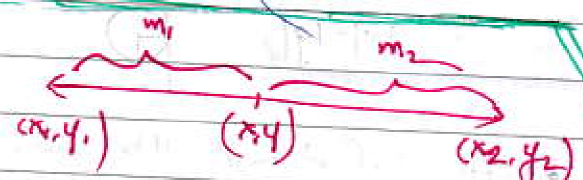
(14) Distance of a point (whose cordinates are given) perpendicular to a line (whose equation is given.)

$$d = r = \pm\frac{ax+by+c}{\sqrt{a^2+b^2}}$$



[Equation এ x & y এর value ব্যবহার না, বরং we put the values from the point (center) coordinates. Formula তে center হবে we'd have use of (ah+bk+c) as the line equation in the formula equation]

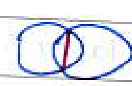
(15)



$$x = \frac{(m_1 \times x_2)+(m_2 \times x_1)}{m_1+m_2}$$

$$y = \frac{(m_1 \times y_2)+(m_2 \times y_1)}{m_1+m_2}$$

(16) Equation of the line of common chord of two circles when the equation of the two circles are given. S_1, S_2



$$\boxed{S_1 - S_2 = 0 = L}$$

(common chord eq^n)

Subject : Date :

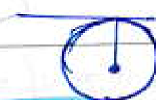
S = Circle equation

L = line equation

(17) Equation of a circle (S) passing through the intersection of a line (L) and another circle (S_1) both of whose equations are given. $L=0$, $S_1=0$, $S=0$

$$\underbrace{S_1 + kL = 0}_{S=0} \quad [k = \text{constant}]$$

(18) Equation of a tangent of a circle given the co-ordinates of the point of contact (x_1, y_1).



$$xx_1 + yy_1 + g(x+x_1) + f(y+y_1) + c = 0$$

$$(x^2 + y^2 + 2xg + 2yf + c = 0) \rightarrow \text{circle equation}$$

(19) Length of a tangent of a circle given the coordinates of the point of contact (x_1, y_1).

$$L_1 = \sqrt{x_1^2 + y_1^2 + 2x_1 g + 2y_1 f + c}$$

(20) Constant of a tangent given the radius of the circle and slope of the tangent.

$$c = \pm r\sqrt{1+m^2}$$

Equation of a tangent of a circle given the radius and slope of the circle & tangent

$$y = mx \pm r\sqrt{1+m^2}$$

Subject : Date :

(21) Equation of a straight line passing through the origin is

$$y = mx$$

If the equation of a tangent is $y = mx$, then putting it in the given equation of a circle, we will find a quadratic equation where,

$$b^2 - 4ac = 0$$

(22) Equation of a straight line given the co-ordinates of two points on it $(x_1, y_1), (x_2, y_2)$

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

(23) Equation of two perpendicular straight lines given the two slopes.

$$m_1 \times m_2 = -1$$

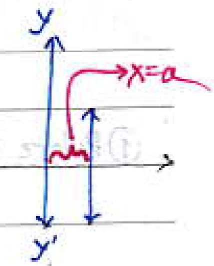
(24) Eq^n of a perpendicular and parallel straight lines to a given line.

$-ay + bx + k$

$$ax + by + c \begin{cases} \rightarrow bx - ay + k \text{ (perpendicular)} \\ \rightarrow ax + by + k \text{ (parallel)} \end{cases}$$

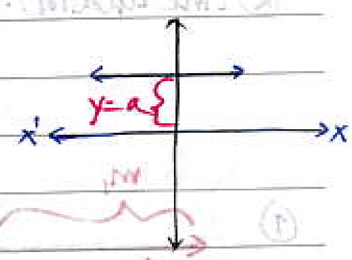
(25) Equation of a straight line parallel to y axis is

$$\begin{cases} x = a & (a \text{ is a constant}) \\ \text{or, } \boxed{x - a = 0} \end{cases}$$

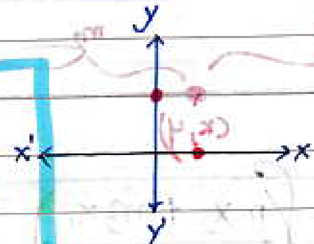


(26) Equation of a straight line parallel to x axis is

$$\begin{cases} y = a & (a \text{ is a constant}) \\ \text{or, } \boxed{y - a = 0} \end{cases}$$



(27) A point on x-axis means $y=0$
A point on y-axis means $x=0$

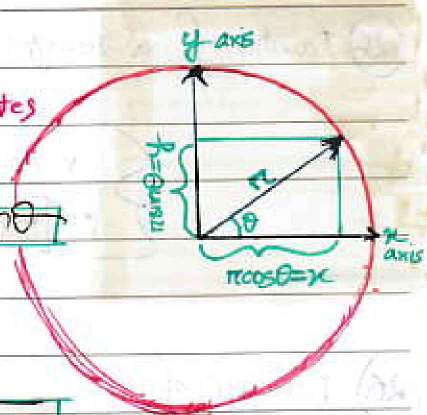


(28) Two points / x coordinates of points of the diameter are given as (x_1, y_1) and (x_2, y_2). The circle equation:

$$\boxed{(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0}$$

⑥ Subject: Chapter 3 Straight lines   Date:

chapter 3.1



① Polar Equations:

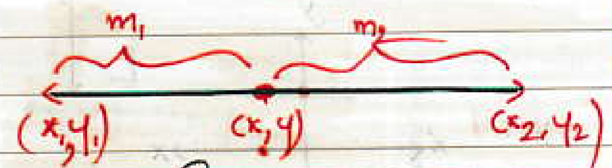
Polar coordinates — cartesian coordinates

- $\boxed{P(x,y) = P(r,\theta)}$
- $\boxed{x = r\cos\theta}$ & $\boxed{y = r\sin\theta}$
- $\boxed{r = \sqrt{x^2+y^2}}$
- $\boxed{\tan\theta = \frac{y}{x}}$

② Line Equation: $\boxed{PQ = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}}$

Chapter 3.2

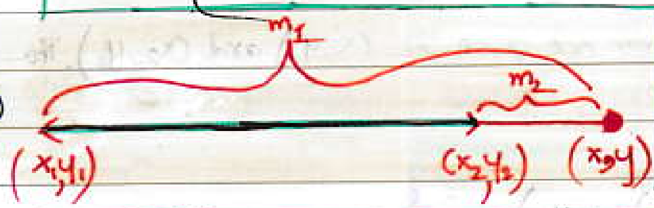
①



Internal intersecting point of a straight line.

$$\boxed{(x,y) = \left\{\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}\right), \left(\frac{m_1y_2+m_2y_1}{m_1+m_2}\right)\right\}}$$

②



External intersecting point of a straight line.

$$\boxed{(x,y) = \left\{\left(\frac{m_1x_2-m_2x_1}{m_1-m_2}\right), \left(\frac{m_1y_2-m_2y_1}{m_1-m_2}\right)\right\}}$$

(K : I)

③ Centroid (G) $(x,y) = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3} \right)$ page 12 / (2:1)

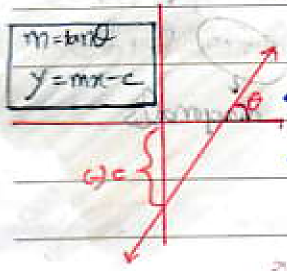
Chapter 3.3

① Slope related / Gradient :

- $m = \tan\theta = \frac{\Delta y}{\Delta x} = \frac{y_2-y_1}{x_2-x_1}$ $\quad m = \frac{y-y_1}{x-x_1}$
- line equation from points, $\frac{y-y_1}{x-x_1} = \frac{y_1-y_2}{x_1-x_2}$

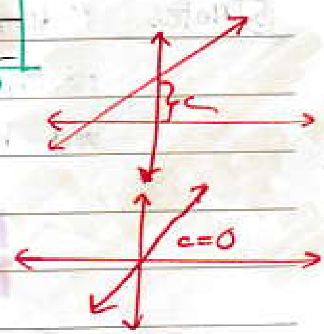
$m = \tan\theta$

$y = mx - c$



- General St. line slope ; $\boxed{y = mx + c}$ $ax + by + c = 0$
- " " " $[c = y \text{ intercept}]$

when passing through origin, $\boxed{y = mx}$



- Perpendicular slope/Gradient, $\boxed{m_1 \times m_2 = -1}$ $\tan\theta \times \tan\theta = -1$
- Parallel, slope/Gradient , $\boxed{m_1 = m_2}$ $\tan\theta = \tan\theta$

Similar

② Area related : • ΔArea of three given points : $(x_1,y_1), (x_2,y_2), (x_3,y_3)$.

clockwise

$$\text{Area} = \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

Determinant 1

calc → determ

$+ - +$
$- + -$
$+ - +$

- When passes through same line, $\boxed{\Delta \text{Area} = 0}$

③ Trigonometry : $\boxed{\cos\alpha \cos\beta + \sin\alpha \sin\beta = \cos(\alpha - \beta)}$

⑧

Subject : ~~page 13~~

Date :

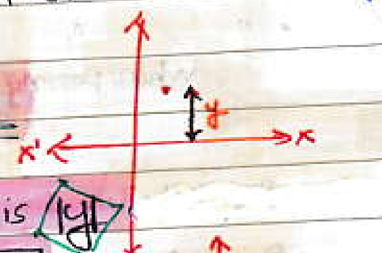
~~4) Extra Area Related: Area given 4 points $(x_1,y_1)(x_2,y_2)(x_3,y_3)(x_4,y_4)$.~~

~~$$\text{Area} = \frac{1}{2}\left\{ \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix} + \begin{vmatrix} x_2 & y_2 \\ x_3 & y_3 \end{vmatrix} + \begin{vmatrix} x_3 & y_3 \\ x_4 & y_4 \end{vmatrix} + \begin{vmatrix} x_4 & y_4 \\ x_1 & y_1 \end{vmatrix} \right\}$$~~

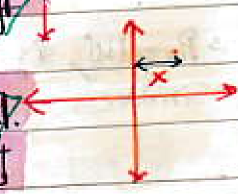
5) **Note:** Midpoints of diagonals of a parallelogram, square, rhombus, rectangles are the points where two of the lines intersect and have same co-ordinates.

diagonals

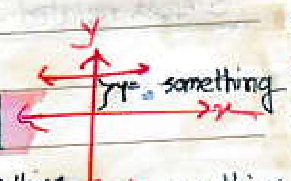
Chapter 3.4



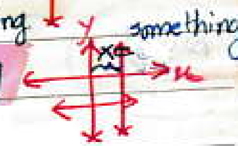
- Distance of a point from x axis is $\boxed{|y|}$
  x axis is $\boxed{y=0}$



- Distance of a point from y axis is $\boxed{|x|}$.
  y axis is $\boxed{x=0}$

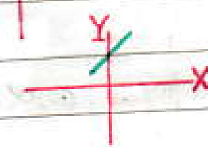


- Equation of a straight line parallel to x axis is $\boxed{y=\ }$
  something



- Equation of a straight line parallel to y axis is $\boxed{x=\ }$

- Equation of a point on x axis is $\boxed{y=0}$



- Equation of a point on y axis is $\boxed{x=0}$

Subject :

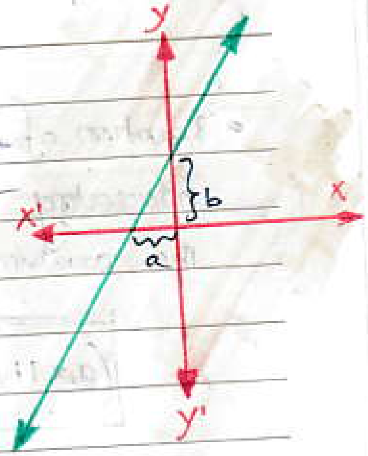
Date :

Chapter 3.5

- Equation of a straight line along with the intercepts.

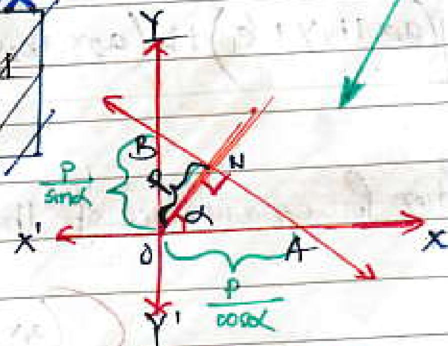
$$\boxed{\frac{x}{a}+\frac{y}{b}=1}$$

where a is x intercept
b is y intercept



- $\cancel{\frac{x}{p/\cos\alpha}+\frac{y}{p/\sin\alpha}=1}$

$$\boxed{x\cos\alpha+y\sin\alpha=P}$$



Point Fact

This is the equation of the straight line AB.
P is the distances between point N and O. It has to be given.

- For two straight line equation in the form $(ax+by+c)$, if denotes the same straight line

$ax+by+c$

$$\boxed{\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}}$$

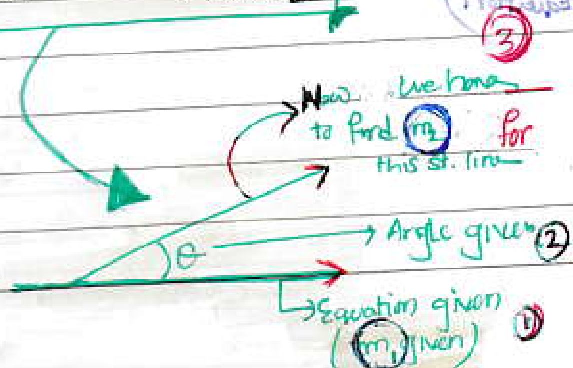
Chapter 3.6

- $$\boxed{\tan\theta=\pm\frac{m_1-m_2}{1+m_1m_2}}$$

$$\tan(A-B)=\frac{\tan A-\tan B}{1+\tan A\tan B}$$

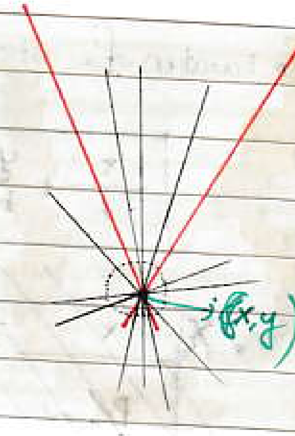
$$\begin{bmatrix} m_1=\tan A \\ m_2=\tan B \end{bmatrix}$$

$$\tan(A-B)=\tan\theta$$



- Equation of lines passing through the intersecting point of two straight lines given the equations of them two.

$$\boxed{(a_1x+b_1y+c_1)+k(a_2x+b_2y+c_2)=0}$$

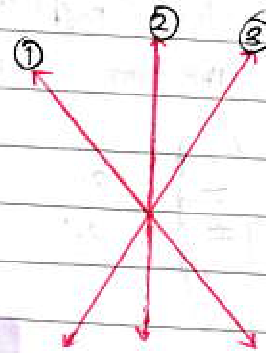


- condition for concurrence of three lines given their equation.

$$\begin{cases} (a_1x+b_1y+c_1=0) \\ (a_2x+b_2y+c_2=0) \\ (a_3x+b_3y+c_3=0) \end{cases}$$

Determinant 2

$$\boxed{\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}=0}$$



- Post Test (Parallel, Perpendicular)
- Post Test (Parallel Line Equation)

Subject : Date :

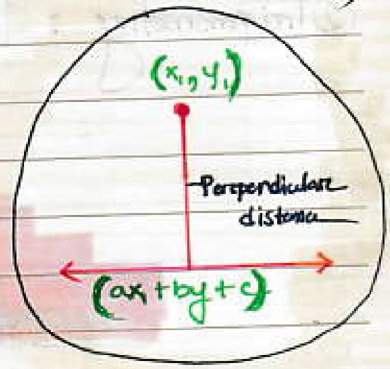
Chapter 3.8 / 3.7

$(ax+by+c)$

- Perpendicular distance of a point (x_1, y_1) and a line (equation is given) is

distance cannot be negative

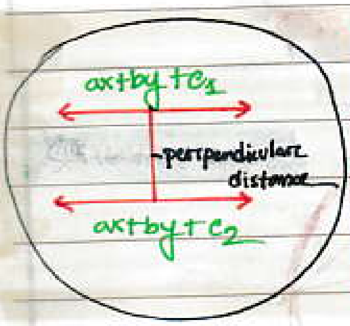
$$\boxed{d = \pm \frac{ax_1+by_1+c}{\sqrt{a^2+b^2}} = \left| \frac{ax_1+by_1+c}{\sqrt{a^2+b^2}} \right|}$$



- Perpendicular distance between two parallel lines (equations are given)

$(ax+by+c_1)$

$(ax+by+c_2)$

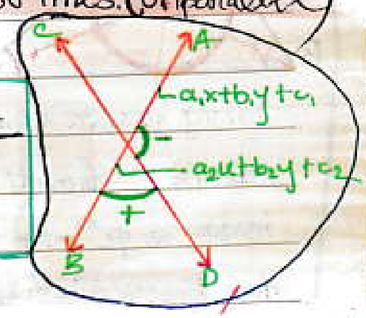


$$\boxed{d = \pm \frac{c_1 - c_2}{\sqrt{a^2+b^2}} = \left| \frac{c_1 - c_2}{\sqrt{a^2+b^2}} \right|}$$

Post Test : Perpendicular Bisector line equation

- Equation of the bisector of angles between two lines. (unparallel)

$$\boxed{\frac{a_1x+b_1y+c_1}{\sqrt{a_1^2+b_1^2}} = \pm \frac{a_2x+b_2y+c_2}{\sqrt{a_2^2+b_2^2}}}$$



- c_1 & c_2 are of same sign

$$\boxed{\frac{a_1x+b_1y+c_1}{\sqrt{a^2+b^2}} = \frac{a_2x+b_2y+c_2}{\sqrt{a^2+b^2}}}$$

- c_1 & c_2 are of opposite sign

$$\boxed{\frac{a_1x+b_1y+c_1}{\sqrt{a^2+b^2}} = -\frac{a_2x+b_2y+c_2}{\sqrt{a^2+b^2}}}$$

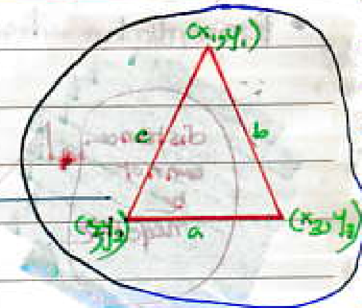
Please Check Page 13 / PTO For more

centroid, $(x,y) =$ [redacted] $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

Subject : Date :

- Incentre : $\boxed{(x,y) = \left(\frac{ax_1+bx_2+cx_3}{a+b+c}, \frac{ay_1+by_2+cy_3}{a+b+c}\right)}$

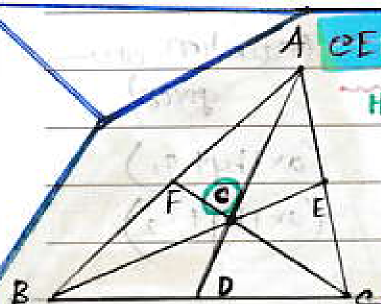
② Trigonometry : $\boxed{\sin 2\theta = 2\sin\theta\cos\theta}$



CIRCLE TYPES

circumcentre, centroid, incentre, orthocentre

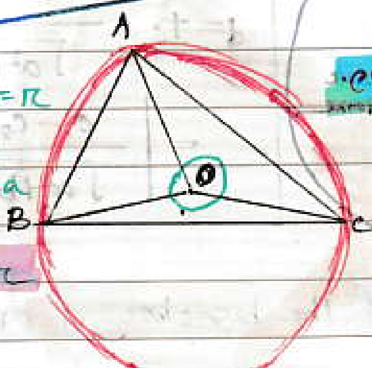
CENTROID



Here $AC : CD = 2 : 1$

Here C is the centroid of the circle

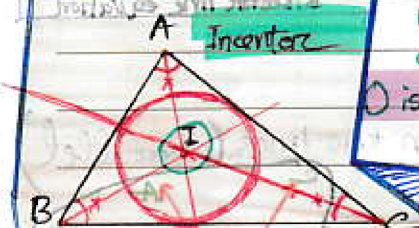
CIRCUMCENTER



$OA = OB = OC = r$

Taking r as the radius, we draw a circle. Here O is the circumcenter

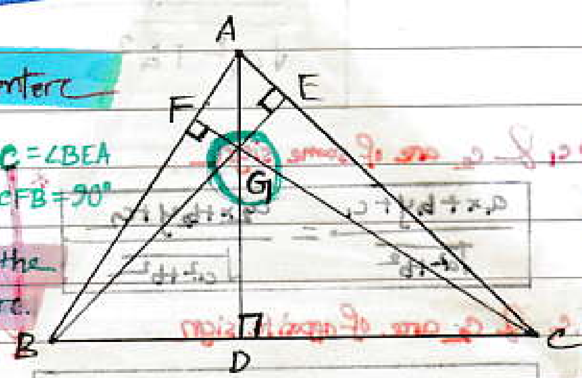
Incenter



Taking bisector of angles in a triangle and forming a circle inside we get an in-circle

Here I is the incenter.

Orthocenter



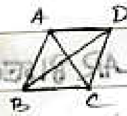
Here, $\angle ADC = \angle BEA = \angle CFB = 90°$

Here G is the orthocenter.

Subject : Date :

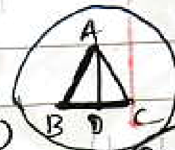
Post Test

- Area of a rhombus $= \frac{1}{2} \times AC \times BD$ (Two diagonals)

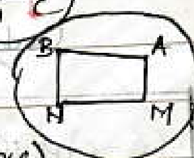


- $\sin 2\theta = (2\sin\theta\cos\theta)$
  $\cos 2\theta = (\cos^2\theta - \sin^2\theta)$
  $\cos(A-B) = (\cos A\cos B + \sin A\sin B)$

- Area of Triangle $= \frac{1}{2} \times BC \times AD$ (base)(height)



- Area of Trapezium $= \frac{1}{2} \times (AM + BN) \times MN$
  $AM + BN$ → (Two parallel sides addition); MN → (distance)



- Area of a triangle $= \frac{1}{2}\begin{vmatrix} a_1 & a_2 & a_3 & a_1 \\ b_1 & b_2 & b_3 & b_1 \end{vmatrix}$ [clockwise]

  $= \frac{1}{2}\left\{ \left| a_1b_2 + a_2b_3 + a_3b_1 - a_2b_1 - a_3b_2 - a_1b_3 \right| \right\}$

  clockwise

  where, (a_1,b_1), (a_2,b_2) and (a_3,b_3) are coordinates of three vertices.

note

- $ax+by+c$
  - → $-ay+bx+k$ $(bx-ay+k)$ (perpendicular)
  - → $ax+by+k$ (parallel)

  $(a \to b \to c)$

BASED ON 3.7 3RD EQUATION

Two Equation $\frac{a_1x+b_1y+c_1}{\sqrt{a^2+b^2}} = \frac{a_2x+b_2y+c_2}{\sqrt{a^2+b^2}}$

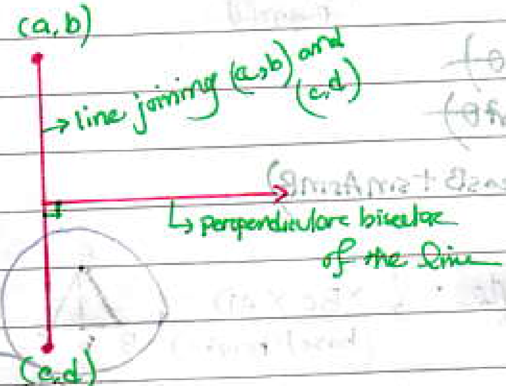
The two lines are

- $a_1x + b_1y + c_1 = 0$
  $a_2x + b_2y + c_2 = 0$
  - → $a_1a_2 + b_1b_2 > 0$ → obtuse'd bisector
  - → $a_1a_2 + b_1b_2 = 0$ → perpendicular-ed "
  - → $a_1a_2 + b_1b_2 < 0$ → acute'd "

Subject : Chap #3 Additional Notes

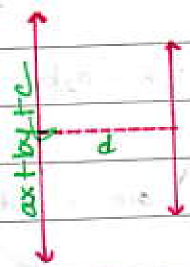
Date :

- **EQUATION OF PERPENDICULAR BISECTOR OF Line Joining (a,b) & (c,d)**



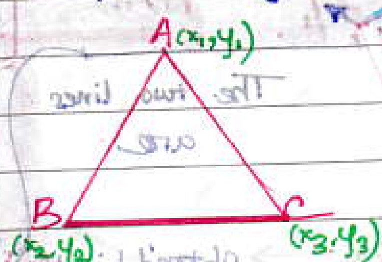
$$\boxed{(a-c)x+(b-d)y=\frac{1}{2}(a^2+b^2-c^2-d^2)}$$

- **EQUATION OF A line parallel to $ax+by+c=0$ at a distance d**



$$\boxed{ax+by+c\pm d\sqrt{a^2+b^2}}$$

- **Obtuse/Acute given the 3 vertex coordinates**



A is obtuse if

$$(x_1-x_2)(x_1-x_3)+(y_1-y_2)(y_1-y_3)>0$$

A is acute if

$$(x_1-x_2)(x_1-x_3)+(y_1-y_2)(y_1-y_3)<0$$

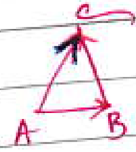
reminds me of diameter equation

Chapter 4

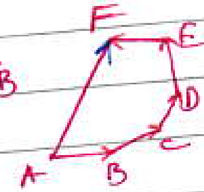
(16) Subject: Chapter 2: Vectors

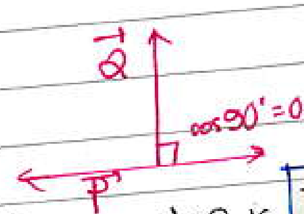
Date:

✓ Triangle law: $\vec{AB} + \vec{BC} = \vec{AC}$



✓ Polygon law: $\vec{AB} + \vec{BC} + \vec{CD} + \vec{DE} = \vec{AE}$





Dot Products

(1) Two vectors $\vec{P}$ & $\vec{Q}$ being [redacted] perpendicular to each other, their equation is $\boxed{\vec{P} \cdot \vec{Q} = 0}$

(2) Dot product of two vectors:

$$\boxed{\vec{A} \cdot \vec{B} = AB\cos\theta}$$

→ Turns it into scalar magnitude

(3) cos 90° = 0

$$\boxed{\hat{i}\cdot\hat{j} = \hat{j}\cdot\hat{k} = \hat{k}\cdot\hat{i} = \hat{j}\cdot\hat{i} = \hat{k}\cdot\hat{j} = \hat{i}\cdot\hat{k} = 0}$$

cos 0 = 1

$$\boxed{\hat{i}\cdot\hat{i} = \hat{j}\cdot\hat{j} = \hat{k}\cdot\hat{k} = 1}$$

scalar → $\boxed{1 \rightarrow 0}$

entropy = 0

(4) $\cancel{\vec{A} = x_A\hat{i} + y_A\hat{j} + z_A\hat{k}}$

$\cancel{\vec{B} = x_B\hat{i} + y_B\hat{j} + z_B\hat{k}}$

$\cancel{\vec{A}\cdot\vec{B} = x_A x_B + y_A y_B + z_A z_B}$

$\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$

$\vec{B} = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$

$\vec{A}\vec{B} = A_x \cdot B_x + A_y \cdot B_y + A_z \cdot B_z$

$\vec{A}\vec{B} = AB\cos\theta$

(5) Projection (scalar):

Projection of $\vec{A}$ along $\vec{B}$ = $\boxed{|\vec{A}|\cos\theta = \dfrac{\vec{A}\cdot\vec{B}}{|\vec{B}|}}$

Projection of $\vec{B}$ along $\vec{A}$ = $\boxed{B\cos\theta = \dfrac{\vec{A}\cdot\vec{B}}{A}}$

Subject :

udvash Date :

$$\boxed{\cos\theta = \frac{A_x \text{ or } A_y \text{ or } A_z}{|\vec{A}|}}$$

⑥ Angle বের করার জন্য we use dot multiplication.

$$\vec{A}\cdot\vec{B} = AB\cos\theta \Rightarrow \cos\theta = \frac{\vec{A}\,\vec{B}}{AB} \Rightarrow \boxed{\theta = \cos^{-1}\frac{\vec{A}\,\vec{B}}{|\vec{A}||\vec{B}|}}$$

③ Cross Products

$\longleftrightarrow$ $\longleftrightarrow$ $\theta = 0°$, $\sin 0 = 0$

① Two vectors being parallel to eachothers. $\boxed{\vec{P}\times\vec{Q} = 0}$

② Cross product of two vectors:

$$\boxed{\vec{A}\times\vec{B} = AB\sin\theta\,\hat{\eta}}$$

$\sin 0 = 0$

③ $\boxed{\hat{i}\times\hat{i} = \hat{j}\times\hat{j} = \hat{k}\times\hat{k} = 0}$

$\sin 90 = 1$

$$\hat{i}\times\hat{j} = \hat{k} \; ; \; \hat{j}\times\hat{i} = -\hat{k}$$
$$\hat{j}\times\hat{k} = \hat{i} \; ; \; \hat{k}\times\hat{j} = -\hat{i}$$
$$\hat{k}\times\hat{i} = \hat{j} \; ; \; \hat{i}\times\hat{k} = -\hat{j}$$

Vector ⟶ 0

④ $\vec{A} = x_A\hat{i} + y_A\hat{j} + z_A\hat{k}$ (A_x, A_y, A_z)

$\vec{B} = x_B\hat{i} + y_B\hat{j} + z_B\hat{k}$ (B_x, B_y, B_z)

$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ x_A & y_A & z_A \\ x_B & y_B & z_B \end{vmatrix}$$

η = eta

⑤ Component / Resolved part (Vector) $\boxed{\vec{A}\vec{B} = AB\cos\theta}$

$$\text{Component of } \vec{A} = \boxed{A\cos\theta\,.\,\hat{b} = \frac{\vec{A}\,\vec{B}}{B}\,.\,\hat{b}}$$

যার বরাবর যে
টা b এর direction
দেয়।

$$\text{Component of } \vec{B} = \boxed{|\vec{B}|\cos\theta\,.\,\hat{a} = \frac{\vec{A}\cdot\vec{B}}{|\vec{A}|}\,\hat{a}}$$

18

Subject :

Date :

unit vector, $\hat{n}$

*** ④ • Unit vector parallel to a vector $= \boxed{\dfrac{\vec{A}}{|\vec{A}|}} = \dfrac{\vec{A}}{A}$

• Unit vector parallel to two vectors $= \dfrac{\vec{A}+\vec{B}}{|\vec{A}+\vec{B}|} = \boxed{\dfrac{\vec{A}+\vec{B}}{|\vec{A}+\vec{B}|}}$

the resultant of

same meaning

• Unit vector parallel to a vector $= \boxed{\dfrac{\vec{PQ}}{|\vec{PQ}|}} = \dfrac{\vec{PQ}}{PQ}$

• Unit vector perpendiculare ~~to~~ two vectors $= \boxed{\dfrac{\vec{A}\times\vec{B}}{|\vec{A}\times\vec{B}|}}$

on the plane consisting

• Parallel to yz plane $=$ perpendiculare to x axis

Parallel to xy plane $=$ perpendiculare to z axis

Parallel to xz plane $=$ perpendiculare to y axis

mathematics

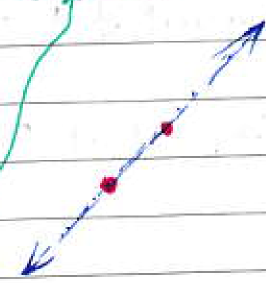
⑤ Vector Equation of a line passing through a point and a vector. parallel to

$$\boxed{\vec{r} = \vec{a} + \lambda\vec{b}}$$

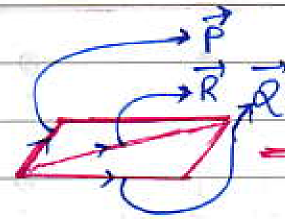
⑥ Vector Equation of a line passing through two points $\vec{a}$ & $\vec{b}$

$$\vec{r} = (1-\lambda)\vec{a} + \lambda b$$

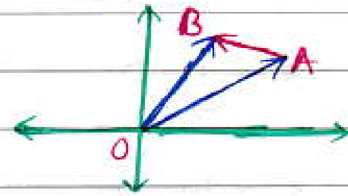
$$\boxed{\vec{r} = \vec{a} + \lambda(\vec{b} - \vec{a})}$$



7 Extras



- $\boxed{\vec{R} = \vec{P} + \vec{Q}}$



- $\boxed{\vec{AB} = \vec{OB} - \vec{OA}}$

- Area Parallelogram $= \boxed{|\vec{P} \times \vec{Q}|}$

- Area Triangle $= \boxed{\frac{1}{2} |\vec{P} \times \vec{Q}|}$

8 When three vectors, $\vec{A}, \vec{B}$ and $\vec{C}$ are co-planer,

$$\vec{A}(\vec{B} \times \vec{C}) = 0 \ ; \quad \vec{B}(\vec{C} \times \vec{A}) = 0 \ ; \quad \vec{C}(\vec{A} \times \vec{B}) = 0$$

$$\vec{x}.(\vec{y} \times \vec{z}) \quad \text{or,} \quad \vec{y}.(\vec{z} \times \vec{x}) \quad \text{or,} \quad \vec{z}(\vec{x} \times \vec{y})$$

9 $\vec{P} = 5\hat{i} + 5\hat{j} + 5\hat{k}$

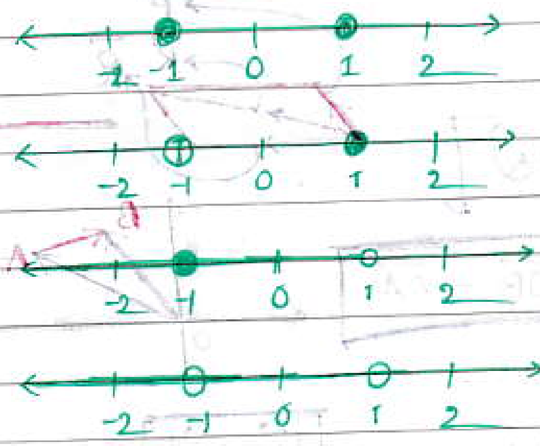
$$|\vec{P}| = \sqrt{5^2 + 5^2 + 5^2}$$

$\vec{P} = P_x \hat{i} + P_y \hat{j} + P_z \hat{k}$

$$|\vec{P}| = \sqrt{P_x^2 \underbrace{\hat{i}^2}_{1} + P_y^2 \underbrace{\hat{j}^2}_{1} + P_z^2 \underbrace{\hat{k}^2}_{1}}$$

$$= \sqrt{P_x^2 + P_y^2 + P_z^2}$$

20 Subject: Chapter 8 Date:



$[-1, 1]$

$]-1, 1]$ or $(-1, 1]$

$[-1, 1[$ or $[-1, 1)$

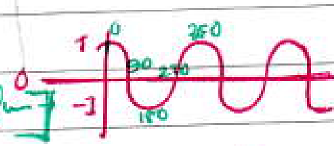
$]-1, 1[$ or $(-1, 1)$

#Notes:

1. $y = e^x$ For any value of x, $\overbrace{\text{positive/negative}}^{\text{Domain} = R}$, y is greater than 0, but never equal to 0. } Range > 0

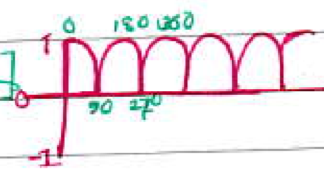
2. $y = e^{x^2}$ For any value of x, $\overbrace{\text{positive/negative}}^{\text{Domain} = R}$, y is equal or greater than 1, $y \geq 1$. } Range ≥ 1

3. $\boxed{-1 \leq \sin x \leq 1}$
$\boxed{-1 \leq \cos x \leq 1}$ → [Have positive value & negative]



$\cos 0 = 1$
$\cos 90 = 0$
$\cos 180 = -1$

$\boxed{0 \leq \cos^2 x \leq 1}$ → [no negative value]



$\cos^2 0 = 1$
$\cos^2 90 = 0$
$\cos^2 180 = 1$

Subject : Date :

④ $\ln x$ Here $x>0$

⑤ $\sqrt{x}$ Here $x\geq 0$

⑥ $\ln(x)^2 = 2\ln x$

⑦ $\ln(xy) = \ln x + \ln y$

⑧ $\ln\left(\frac{x}{y}\right) = \ln x - \ln y$

⑨ $e^{\ln x} = x$

⑩ $\cos(-\theta) = \cos\theta$
$\sec(-\theta) = \sec\theta$ $\cos\theta,\ \sec\theta \ f+$

⑪ $2\sin^2\theta = 1-\cos 2\theta$
$2\cos^2\theta = 1+\cos 2\theta$
$\cos^2\theta - \sin^2\theta = \cos 2\theta$

⑫ $2\cos A\cos B = \cos(A+B) + \cos(A-B)$

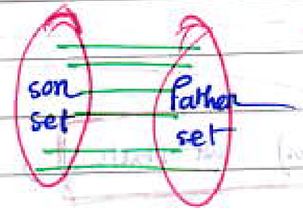
⑬ $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$

⑭ Denominators $\neq 0$

⑮ $f(x) = y$

$f^{-1}(y) = x$

⑯



- When a son belongs to two fathers it's not a function
- when a son of two identities belongs to a father of two same identities, it's "one one set".
  $f(x_1) = f(x_2) \dashrightarrow x_1 = x_2$
- When not enough/all father are being able to make son, it's not onto function.
  Range $\neq$ co-domain
- When all fathers makes son it's onto function.
  Range = co-domain

$\tan(a-b) = \dfrac{\tan a - \tan b}{1+\tan a\tan b}$

$\sin 2\theta = 2\sin\theta\cos\theta$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$\cos 2\theta = 2\cos^2\theta - 1$

Subject : Functions : Post Test 22

Date :

$f(x) = ax^2 + bx + c$, $a > 0$, domain : R

Range : $\left[\frac{4ac-b^2}{4a}, \infty\right)$

[: ≥

] : ≤

(: >

) : <

$a < 0$, Range $\left(-\infty, \frac{4ac-b^2}{4a}\right]$

domain : R

$f(x) = \sqrt{ax+b}$ and $f(x) = \frac{1}{\sqrt{ax+b}}$

$a > 0$ range : $[0, \infty)$

Domain : $\left[-b/a, \infty\right)$

$a < 0$ Domain $\left(-\infty, -b/a\right]$

range : $[0, \infty)$

$f(x) = \sqrt{a^2 - x^2}$ where $a > 0$

Domain : $[-a, a]$

Range : $[0, a]$

$f(x) = \frac{ax+b}{cx+d}$

Domain : $R - \left\{\frac{d}{c}\right\}$

Range : $R - \left\{\frac{a}{c}\right\}$

Subject : Deteraminents & Matrics
notes and keeps

24

Date :

^ " " দ্বারা দাগানো সমুদ্রের

(1) বই এবং ^ ~~[illegible]~~ বোধ দুনাদের ওদেখা।

(2) " • " – Wasiul / Asif indications.

3,5,8,10
10 vs.
4,6,7,9

(3) <row modification> ↔ < cf > ↔ <column modification>

(4) 3,5,8,10 ⟶ cf দিয়ে করা

(5) 1,3 ⟶ same beginning ⟶ Exception subsequence.

(6) 4,6,7,9 ⟶ same ending

(7) 4,10 ⟶ same beginning concept

(8) 10 ⟶ ending in revolt against 4,6,7,9

(9) 1,4 ⟶ synced in ways

(10) 5,7 ⟶ synced in ways ⟶ 3 lined ⟶ same beginning

(11) 2 ⟶ 1 lined.

(12) 8 ⟶ 2 lined.

1,3
4,10
5,7

(1) $2abc(a+b+c)^3$

(2) $(b^2-ac)(ax^2+2bxy+by^2)$

(3) $p(p-1)^2(p^2-1)$

(4) $4a^2b^2c^2$

(5) $4x^2y^2z^2$

× (6) $2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$

(7) $(a+b+c)^3$

(8) $(1+a^2+b^2)^3$

(9) $(x-y)(y-z)(z-x)(xyz-1)$

× (10) $(x-y)(y-z)(z-x)(xy+yz+zx)$

Finding:

[3, 5, 8, 10 ⟶ cf
4, 6, 7, 9 ⟶ $c_2' = c_2 - c_3$ ⟶ 4, 6
$c_1' = c_1 - c_2$ ⟶ 7, 9

Subject : 25

1

$\rightarrow$ sync with ④

④ হবে $\rightarrow$ ④

$(a+b)^2$, $(b+c)^2$ $\rightarrow$ $a^2\ b^2\ c^2$ $\rightarrow$ a^2+b^2, b^2+c^2 $\rightarrow$ $ab\ bc\ ca$

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

① $c'_2 = c_2 - c_1$ & $c'_3 = c_3 - c_1$ — Exception in maintaining subsequence — same in ③

③ same

② cf

③ $r'_1 = r_1 - r_2 - r_3$ $\rightarrow$ ④ এর আগে

④ same

④ cf

⑤ $c'_2 = b \times c_2$ & $c'_3 = c \times c_3$

4 এর সাথে জুড়ো ছিলো

⑥ cf

Follow up

⑦ $c'_2 = c_2 + c_1$ & $c'_3 = c_3 + c_1$ — compensation for 1

c|r|c|c

Subject : 26 Date :

②

1

$$\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix} = (b^2-ac)(ax^2+2bxy+cy^2)$$

① $c'_3 = -c_1x - c_2y + c_3$

Subject : 27 Date :

3 sync with 1

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & p & p^2 \\ 1 & p^2 & p^4 \end{vmatrix} = p(p-1)^2(p^2-1)$$

1. $c_2' = c_2 - c_1$ & $c_3' = c_3 - c_2$ } Exception in maintaining subsequence } 1 follow কর

2. cf

*** First two steps are first two steps of 1 with exceptions in $c_3 - c_2$ / $c_3 - c_1$ thing

Subject : ~~27~~ 28

Date :

4 $a^2b^2c^2$

same with (1)

$$\begin{vmatrix} b^2+c^2 & ab & ca \\ ab & c^2+a^2 & bc \\ ca & bc & a^2+b^2 \end{vmatrix} = 4a^2b^2c^2$$

Step (1) symbolises that (4) aimed (1) by converting $(a+b)^2$ to (a^2+b^2) step 2 কে focus (1).

r

(1) $r_1' = a \times r_1$ & $r_2' = b \times r_2$ & $r_3' = c \times r_3$

(2) $r_1' = r_1 - (r_2 + r_3)$ → (1) এর মত আছে

c

(3) cf

(4) $c_2' = c_2 \times b$ & $c_3' = c_3 \times c$

(1) এর মত সবসময় খুব subsequent

(5) $c_2' = c_2 - c_3$ → same ending as (6)

$<4a^2b^2c^2>$

6,7,9,10

Similarities with (1)

r_1 modification দিয়ে শুরু

2টা r_1

r_1 obsessed

c_2 obsessed after cf

HEART'S

5

sync with 7

$$\begin{vmatrix} x^2 & yz & z^2+zx \\ x^2+xy & y^2 & zx \\ xy & y^2+yz & z^2 \end{vmatrix} = 4x^2y^2z^2$$

R

1. $R_1' = R_1 + R_2 + R_3$
2. $R_1' = R_1 - R_2$ & $R_2' = R_2 - R_3$

C

3. cf

$\left.\right\}$ similarities with 7

$\longrightarrow \langle 4x^2y^2z^2 \rangle$

R_1 modification ফিরে আসো

শুধু R_1

R_1 obssessed

c নাই after cf

Subject : 30 Date :

6 cccc

$$\begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$$

1. $c'_1 = c_1 + c_2 + c_3$ — a+b+c involved
2. $c'_1 = c_1 - c_2$
3. $c'_3 = c_3 - c_1$
4. $c'_2 = c_2 - c_3$ → same ending as 4

would go on to be seen in 7, 9, 10

Subject : Date :

$a-b-c$ $2a$ $2a$ a positive

$-a+b-c$ $2b$ $2b$ b positive

$-a-b+c$ $2c$ $2c$ c positive

7 same with 5

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

(1) $r_1' = r_1 + r_2 + r_3$

(2) cf

(3) $c_1' = c_1 - c_2$ & $c_2' = c_2 - c_3$

similar with 5

same ending as 9.

Subject : ~~31~~ 32

Date :

(8)

There's no c

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

All Elements must present

c and c

(1) $c_1 = c_1 - bc_3$ & $c'_2 = c_2 + ac_3$

(2) cf

2 and 8

1 lined — $c_3' =$ modification

2 lined — c_3 in the modification of c_1 and c_2

Subject : ~~34~~ 33 Date :

SA = Summation Addition

9

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3-1 & y^3-1 & z^3-1 \end{vmatrix} = (x-y)(y-z)(z-x)(xyz-1)$$

① SA

② cf in sa1 & $\widehat{sa2 \equiv sa1}$ / Just 1, 1, 1 [Top]

③ $c'_1 = c_1 - c_2$ & $c'_2 = c_2 - c_3$

$(yz)(x)$ zx xy

① $c_1' = c_1 \times x$ & $c_2' = c_2 \times y$ & $c_3' = c_3 \times z$

② cf [from bottom]

③ 1, 1, 1 [in top]

④ $c_1' = c_1 - c_2$ & $c_2' = c_2 - c_3$

⑤ cf

$c_2' = c_2 - c_3$ previous used in ordering 4, 6.

[illegible]

⑥ $c_1' = c_1 - c_2$

⑦ cf

Subject : 34 Date :

(10)

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$

① $c'_1 = c_1 \times x$ & $c'_2 = c_2 \times y$ & $c'_3 = c_3 \times z$

② cf [from bottom]

③ 1, 1, 1 [in top]

④ $c'_1 = c_1 - c_2$ & $c'_2 = c_2 - c_3$

⑤ cf

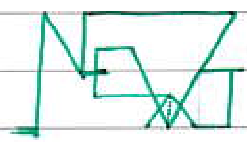
⑥ $c'_1 = c_1 - c_2$

⑦ cf

$c'_2 = c_2 - c_3$ popular used in ending of 4, 6. তাই হলো,

4 begining
4 ending

Subject : 35 Date :



(Next)

These 10's are main.

Note : I couldn't find 10 in KAMR

Subject : 36 Date :

Descendent of (7)

(11)

$$\begin{vmatrix} a+b+2c & a & b \\ \overset{c}{\cancel{a}},b & b+c+2a & \overset{b}{\cancel{a}},c \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$$

(1) $c'_1 = c_1 + c_2 + c_3$

(2) cf

(3) $\pi'_1 = \pi_1 - \pi_2$ & $\pi'_2 = \pi_2 - \pi_3$

Opposite to 7

beginning + ending

11, 17, 18. & 5, 7

Also 19 - Exception

(12) → 4

$$\begin{vmatrix} 1 & bc & bc(b+c) \\ 1 & ca & ca(c+a) \\ 1 & ab & ab(a+b) \end{vmatrix} = \begin{vmatrix} a & 1 & b+c \\ b & 1 & c+a \\ c & 1 & a+b \end{vmatrix} abc = 0$$

1. $r_1' = r_1 \times a$ & $r_2' = r_2 \times b$ & $r_3' = r_3 \times c$ } beginning of ~~4~~

2. cf

3. $\boxed{c_1' = c_1 + c_3}$ $\left\{ \begin{matrix} c_1 \rightleftarrows c_2 \\ + \rightleftarrows - \end{matrix} \right\}$ 4 ending $\boxed{c_2' = c_2 - c_3}$

D/15,16/21,22

Subject : 38

11

13.

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$$

① $R_1' = R_1 - R_2$, $R_2' = R_2 - R_3$

11 Ending
5 [illegible] middle

13, 14, 20

Subject : 39 Date :

14.2 $\nearrow$ 11

$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$

① $R_1' = R_1 - R_2$, $R_2' = R_2 - R_3$ } 11 Ending 5 middle

13, 14, 20

Subject : 40 Date :

15.. 11, 12

$$\begin{vmatrix} x+y & x & y \\ & x+z & \\ x & & z \\ y & z & y+\cancel{x} \end{vmatrix}$$

VIOLATION

① $c_1' = c_1 - c_2 - c_3$ } 11 beginning

② $rc_2' = rc_2 - rc_3$ } 12 ending w, 4 ending w — $[c_2' = c_2 - c_3]$

12/15, 16/21, 22

16.

$$\begin{vmatrix} a+x & b+x & c+x \\ a+y & b+y & c+y \\ a^2 & b^2 & c^2 \end{vmatrix}$$

① $c_1' = c_1 - c_2$, $c_2' = c_2 - c_3$

② cf

③ $c_1' = c_1 - c_2$

④ cf

12/15, 16/21,22

17.

$$\begin{vmatrix} 1+u_1 & u_2 & u_3 \\ u_1 & 1+u_2 & u_3 \\ u_1 & u_2 & 1+u_3 \end{vmatrix}$$

① $c_1' = c_1 + c_2 + c_3$

② cf

③ $r_1' = r_1 - r_2$, $r_2' = r_2 - r_3$

11, 17, 18, 19, & 5, 7

১৪.

$$\begin{vmatrix} 1 & -a & a^2 \\ a^2 & 1 & -a \\ -a & a^2 & 1 \end{vmatrix}$$

① $c_1' = c_1 + c_2 + c_3$

② ef

③ $r_1' = r_1 - r_2$, $r_2' = r_2 - r_3$

④ Extension/[illegible]

11, 17, 18, 19, & 5, 7

Subject : Date :

19.

$$\begin{vmatrix} (b+c)^2 & a^2 & 1 \\ (c+a)^2 & b^2 & 1 \\ (a+b)^2 & c^2 & 1 \end{vmatrix} \quad // \quad \begin{vmatrix} (b+c)^2 & a^2 & 1 \\ (c+a)^2 & b^2 & 1 \\ (a+b)^2 & c^2 & 1 \end{vmatrix}$$

① $c_1' = c_1 - c_2$

② cf

③ $r_1' = r_1 - r_2$, $r_2' = r_2 - r_3$

11, 17, 18, 19, 5, 7

Subject :

45

20.

$$\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} = 0$$

① $R'_2 = R_2 - R_1 \quad , \quad R'_3 = R_3 - R_1$

① first step
back to beginning

Exceptional / deal breaking

13.14.20

HEART'S

21.

$$\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

① c.f

② c.f

③ c.f

12/15,16/21,22

Subject : 47 Date :

22.

$$\begin{vmatrix} 1 & x-a & y-b \\ 1 & x_1-a & y_1-b \\ 1 & x_2-a & y_2-b \end{vmatrix} = \begin{vmatrix} 1 & x & y \\ 1 & x_1 & y_1 \\ 1 & x_2 & y_2 \end{vmatrix}$$

① SA

② SA

12/15.16/21,22

Subject: Focus Mode

→ Board after 2006
8 first, 8 second
18

Date:

r_1 & c_2 ମିଶା ପରିବର୍ତ୍ତନ

1. $\begin{vmatrix} (b+c)^2 & & \\ & (c+a)^2 & \\ & & (a+b)^2 \end{vmatrix}$ — c|r|c|c

2. $\begin{vmatrix} a & b & \\ b & c & \\ & & 0 \end{vmatrix}$ — c

3. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & p & p^2 \\ 1 & p^2 & p^4 \end{vmatrix}$ — c|

4. $\begin{vmatrix} b^2+c^2 & & \\ & c^2+a^2 & \\ & & a^2+b^2 \end{vmatrix}$ — rr|cc

5. $\begin{vmatrix} a^2 & & \\ & b^2 & \\ & & c^2 \end{vmatrix}$ — rr|

6. ~~$\begin{vmatrix} & & a+b \\ & & p+q \\ & & x+y \end{vmatrix}$~~ — cccc

c rights ensured
Also rights of sequence

7. $\begin{vmatrix} a-b-c & & \\ & b-c-a & \\ & & c-a-b \end{vmatrix}$ — r|c

8. $\begin{vmatrix} 1+a^2-b^2 & & \\ & 1-a^2+b^2 & \\ & & 1-a^2-b^2 \end{vmatrix}$ — c|

2 & 8

2 = c_2, c_3 modification
8 = c_3 in modification

9. $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3-1 & y^3-1 & z^3-1 \end{vmatrix}$

7's ording ≡
9's ording ≡ 16's beginning

[$c_1' = c_1 - c_2$, $c_2' = c_2 - c_3$]

10. ~~$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix}$~~ — X

11. $\begin{vmatrix} a+b+2c & & \\ & b+c+2a & \\ & & c+a+2b \end{vmatrix}$ — c|r

$c_2' = c_2 - c_3 \rightleftharpoons c_1' = c_1 + c_3$

12. $\begin{vmatrix} 1 & bc & bc(b+c) \\ 1 & ca & ca(c+a) \\ 1 & ab & ab(a+b) \end{vmatrix}$ — r|c

13. $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ — r

14. $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$ — r

same

HEART'S

$\begin{vmatrix} a+b & & \\ & a+c & \\ & & b+c \end{vmatrix}$

$\begin{vmatrix} x+y & & \\ & x+z & \\ & & y+z \end{vmatrix}$	15	first step: c r [1 to 5 occupied only c_2 and r_1 এর protest এ এখানে c_1 and r_2 use.]	$\begin{vmatrix} 1 & x-a & y-b \\ 1 & x_1-a & y_1-b \\ 1 & x_2-a & y_2-b \end{vmatrix}$	22
$\begin{vmatrix} a+u & b+u & c+u \\ a+y & b+y & c+y \\ a^2 & b^2 & c^2 \end{vmatrix}$	16	c | c | ; 9's ending = 16's beginning		
$\begin{vmatrix} 1+x_1 & & \\ & 1+x_2 & \\ & & 1+x_3 \end{vmatrix}$	17	c | r		
$\begin{vmatrix} 1 & -a & \\ & 1 & -a \\ -a & & 1 \end{vmatrix}$	18	c | r ; same ; $c_1' = c_1 - c_2$		
$\begin{vmatrix} (b+c)^2 & & \\ (c+a)^2 & & \\ (a+b)^2 & & \end{vmatrix}$	19	c | r		
$\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix}$	20	r → 1 এর 1st step (as) follow করবো		
$\begin{vmatrix} -a^2 & & \\ & -b^2 & \\ & & -c^2 \end{vmatrix}$	21	| | |		

→ row

↓ column

Subject : Chapter 5 50 Date :

Permutation

Arrangement AB, BA

^nP_r = Permutations of n different things taken r at a time $= \boxed{\frac{n!}{(n-r)!}} = {}^nC_r \times r!$

- Permutations of things all different taken r at a time : $\boxed{{}^nP_r = \frac{n!}{(n-r)!}}$
- Permutations of things not all different taken all at a time : $\boxed{\cancel{{}^nP_r} = \frac{n!}{x!\,y!\,z!}}$ x kind things, y kind things, z kind things
- Permutations involving repetitions taken all at a time : $\boxed{n^r = \cancel{{}^nP_r}}$

✓ $n! = (n)(n-1)(n-2) \ldots\ldots 3, 2, 1$

✓ $(n-2)! = (n-2)(n-3)(n-4) \ldots\ldots 3, 2, 1$

Subject : 51

Combination

selection AB or, BA

$$^nC_r = \boxed{\begin{array}{l}\text{Combinations of}\\ n \text{ different things}\\ \text{taken } r \text{ at a time}\end{array}} = \boxed{\frac{n!}{r!\,(n-r)!}} = \frac{^nP_r}{r!}$$

- $\boxed{^nC_r = {}^nC_{n-r}}$ proof [illegible]!
- $\boxed{^nC_r + {}^nC_{r-1} = {}^{n+1}C_r}$ book proof **

Restricted Combinations

- Combinations of n different things taken r at a time in which p always occurs

$$\boxed{^{n-p}C_{r-p}}$$

HEART'S

- Combinations of n different things taken r at a time in which p never occurs.

$$\boxed{{}^{n-p}C_r}$$

- Combinations of n different things taken any number at a time

$$\boxed{2^n - 1}$$

1 set of case being left out and 1 set of case being selected

case where all are left out

- Combinations of p kind things, q kind things, r kind things & k different things taken any number at a time

$$\boxed{2^k (p+1)(q+1)(r+1) - 1}$$

case where all are left out

Subject : 53

Date :

Division into Groups

- The number of ways in which $(m+n)$ different things can be divided into two groups: $\boxed{m \text{ group}}$ & $\boxed{n \text{ group}}$

$$\boxed{{}^{n}C_{r} = {}^{m+n}C_{m} \times 1 = \frac{(m+n)!}{m!\,n!}}$$

case of n things being left out

When $m=n$,

$$\boxed{\frac{(m+m)!}{2!\,(m!)(m!)} = \frac{(2m)!}{2!\,(m!)^2}}$$

m group and n group can arrange themselves between them.

When $m=n$ & equally distributed among two persons,

$$\boxed{\frac{(m+m)!}{m!\,m!} = \frac{(2m)!}{(m!)^2}}$$

—x—o—x—

Subject : 54 Date :

1. 5.1 Exercise math : 13(iv), 14(i), 14(ii)
   5.2 Exercise math : 14(iv), 14(i), 14(ii) ***

Subject : Chapter 6 56 Date :

" Trigonometric Ratios "

6.1

D,
- Sexagesimal system, 90° [unit is $\frac{1}{90}$th of a right angle] θ°

θ,
- Circular System, r r r [unit is the angle subtended where the portion of circumference is equal to the radius] θ^{c}

G,
- Centisimal System, 100grad [unit is $\frac{1}{100}$th of a right angle] θ^{g}

- Sexagesimal to circular / degree to radian : $\theta^{\circ} = \left(\frac{\pi}{180} \times \theta^{\circ}\right)^{c} = \theta^{c}$

- Circular to Sexagesimal / radian to degree : $\theta^{c} = \left(\frac{180}{\pi} \times \theta^{c}\right)^{\circ} = \theta^{\circ}$

180° = 2 x right angle

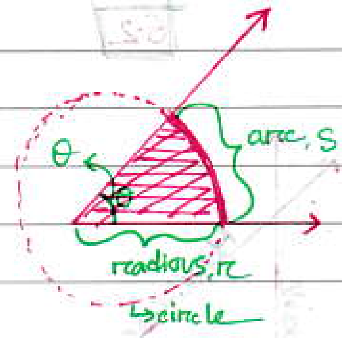
- Sexagesimal to Centesimal / degree to grad : $\theta^{\circ} = \left(\theta^{\circ} \times \frac{10}{9}\right)^{g} = \theta^{g}$

- $\boxed{\frac{D}{180} = \frac{G}{200} = \frac{\theta}{\pi}}$

Subject : 57 Date :

θ = radian angle

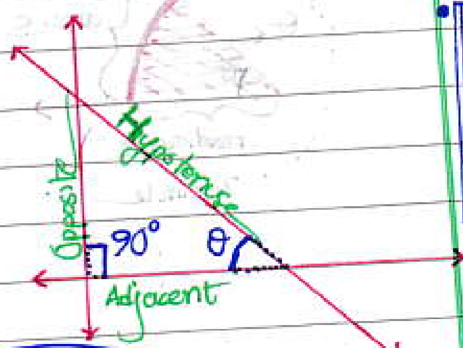
- $s = r\theta$



- $\Delta = \frac{1}{2} r^2 \theta$

Subject: 58 Date:

6.2



sin	cosec
cos	sec
tan	cot

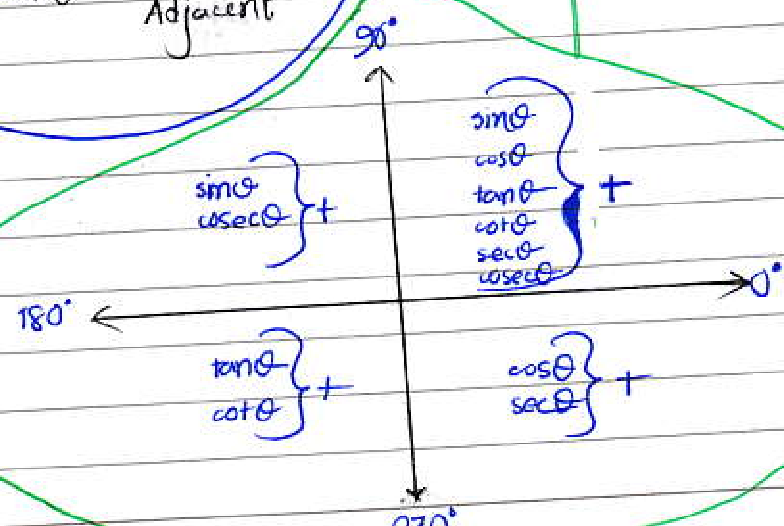
- $\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$
- $\cos\theta = \frac{\text{Adjacent}}{\text{hypotenuse}}$
- $\tan\theta = \frac{\text{opposite}}{\text{Adjacent}}$

SOH
CAH
TOA

- $\sin\theta = 1/\text{cosec}\,\theta$
- $\cos\theta = 1/\sec\theta$
- $\tan\theta = 1/\cot\theta$

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

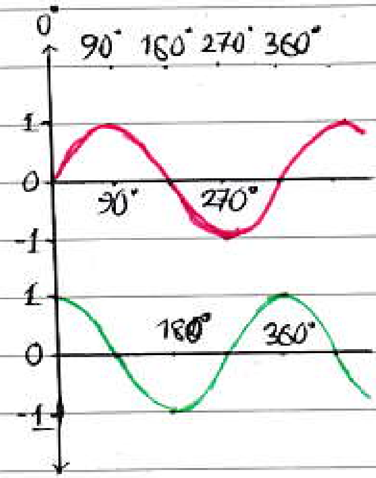
*



$\boxed{6.3}$

- $\sin\theta$ starts from 0
- $\cos\theta$ starts from 1

$[\sin 0 = 0]$ $[\cos 0 = 1]$



Defined Values $\sqrt{\frac{x}{4}}$

$\sin\theta,\ x = 0, 1, 2, 3, 4$

$\cos\theta,\ x = 4, 3, 2, 1, 0$

	0	30	45	60	90
$\sin\theta$	$\sqrt{\frac{0}{4}}$ // 0	$\sqrt{\frac{1}{4}}$ // $\frac{1}{2}$	$\sqrt{\frac{2}{4}}$ // $\frac{1}{\sqrt{2}}$	$\sqrt{\frac{3}{4}}$ // $\frac{\sqrt{3}}{2}$	$\sqrt{\frac{4}{4}}$ // 1
$\cos\theta$	$\sqrt{\frac{4}{4}}$ // 1	$\sqrt{\frac{3}{4}}$ // $\frac{\sqrt{3}}{2}$	$\sqrt{\frac{2}{4}}$ // $\frac{1}{\sqrt{2}}$	$\sqrt{\frac{1}{4}}$ // $\frac{1}{2}$	$\sqrt{\frac{0}{4}}$ // 0

Subject : Permutation Combination Noted from 10ms

Date :

m number of ways

① A work done with [redacted] and n number of ways. $m+n$

② A work done with first, m number of ways, then n number of ways. $m \times n$.

③ Permutation general formula (1) : $^nP_r = \dfrac{n!}{(n-r)!}$ | arrangement of r elements from n elements

④ Permutation formula (2) : $\dfrac{n!}{p!\,q!\,r!}$ | arrangement of seperated p elements, q elements, r elements from n elements.

⑤ Permutation formula (3) : n^r | arrangement of different elements that can be taken r times at a time from n element

⑥ Permutation formula (4) : $(n-1)!$ | arrangement of elements in ~~a circle with different~~ orientation in both sides

⑦ Permutation formula (5) : $\frac{1}{2}(n-1)!$ | arrangement of elements in a circle with same orientation in both sides

⑧ Combination formula (1) : $^nC_r = \dfrac{n!}{r!\,(n-r)!}$ | selection of n things taken r at a time

⑨ Combination formula (2) : $^nC_r = \dfrac{^nP_r}{r!}$ h

⑩ Combination formula (3) : $^nC_r = {}^nC_{n-r}$ h

⑪ Combination formula (4) : $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$ h Prove Important

⑫ Combination formula (5) : $2^n - 1$ | Combination of n things taken 1 at a time.

Subject :

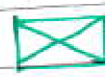
Date :

(13) Greatest ^nC_r value is

(i) When r is even, $r = \frac{n}{2}$

(ii) when r is odd, $r = \frac{n+1}{2}$

(14) Number of diagonals of a n-sided geometric shape : $({}^nC_2 - n)$



$n=4$

$^nC_2 - n = {}^4C_2 - 4 = 2$

(15) Combination formula (8) : $\frac{^nC_r}{^nC_{r+1}} = \frac{r+1}{n-r}$

(16) Combination formula (9) : if $^nC_x = {}^nC_y$

then $x=y$ and $x+y=n$

(17) Selection/Combination of n types of work which can be done in p types of ways : $p^n - 1$