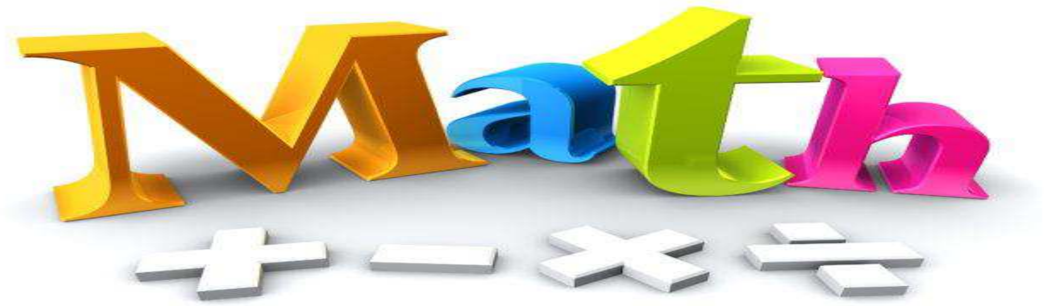
ROYAL EDUCATION SOCIETY'S SCHOOL ATHANI

ROYAL EDUCATION SOCIETY, ATHANI

KNOWLEDGE IS POWER

Estd.2008

10th MATHEMATICS PASSING PACKAGE 2020-21



PRACTICE MAKES PERFECT

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EX) Solve x and y by any method.

$x+2y=3$ **and** $x-15y=2$.

Solution: Elimination Method.

$x+2y=3$ ---------- (1)

$7x-15y=2$ --------- (2)

$\cancel{7x}+14y=21$

$\cancel{7x}-15y=2$

$29y=19$

$\boxed{y=19/29}$

Put $y=19/29$ in equation (1). We get

$x+2y=3$

$x+2(\frac{19}{29})=3$

$x+38/29=3$

$x=3-38/29$

$\boxed{x=49/29}$

EX) Solve x and y by any method.

$x+3y=6$ **and** $2x-3y=12$

Solution: Elimination Method.

$x+3y=6$ ------------ (1)

$2x-3y=12$ ----------- (2)

$\cancel{2x}+6y=\cancel{12}$

$\cancel{2x}-3y=\cancel{12}$

$-\quad+\quad-$

$9y=0$

$\boxed{y=0}$

Put $y=0$ in equation (1). We get

$x+3y=6$

$x+3(0)=6$

$x+0=6$

$\boxed{x=6}$

EX) Solve x and y by any method.

$2x+y=5$ **and** $3x+2y=8$.

Solution: Elimination Method

$2x+y=5$----------- (1)

$3x+2y=8$ ----------- (2)

$\cancel{6x}+3y=15$

$\cancel{6x}+4y=16$

$-y=-1$

$\boxed{y=1}$

Put $y=1$ in equation (1).

$2x+y=5$

$2x+1=5$

$2x=5-1$

$2x=4$

$\boxed{x=2}$

Exercise:

EX) Solve for x & y any method.

1) $2x+3y=-13$ **and** $5x-4y=-2$.
2) $5x+y=2$ **and** $6x-3y=1$.
3) $2x+y=5$ **and** $3x+2y=8$.
4) $8x+5y=9$ **and** $3x+2y=4$
5) $0.2x+0.3y=1.3$ **and** $0.4x+0.5y=2.3$
6) $2x+3y=11$ **and** $2x-4y=-24$.
7) $x+2y=3$ **and** $7x-15y=2$.
8) $3x+2y=12$ **and** $x-y=-1$.
9) $x+2y=5$ **and** $-3x-6y+1=0$.

10.) $2x+y=5$ **and** $3x-2y-12=0$.

1. Solve by formula method.

$2x^2 - 3x + 1 = 0$

Solution: $2x^2 - 3x + 1 = 0$

a = 2 b = -3 c = 1

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

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times 1}}{2 \times 2}$$

$$x = \frac{3 \pm \sqrt{9-8}}{4}$$

$$x = \frac{3 \pm \sqrt{1}}{4}$$

$$x = \frac{3 \pm 1}{4}$$

$$x = \frac{3+1}{4} \text{ or } x = \frac{3-1}{4}$$

$\boxed{x = 1}$ or $\boxed{x = \frac{1}{2}}$

2) Solve by formula method.

$x^2 - 7x + 12 = 0$

Solution: $x^2 - 7x + 12 = 0$

a = 1 b = -7 c = 12

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

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \times 1 \times 12}}{2 \times 1}$$

$$x = \frac{7 \pm \sqrt{49-48}}{2}$$

$$x = \frac{7 \pm \sqrt{1}}{2}$$

$$x = \frac{7 \pm 1}{2}$$

$$x = \frac{7+1}{2} \text{ or } x = \frac{7-1}{2}$$

$\boxed{X = 4}$ Or $\boxed{X = 3}$

EX) Solve by formula method

$x^2 - 2x - 4 = 0$

Solution: a = 1 b = -2 c = -4

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

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \times 1 \times (-4)}}{2 \times 1}$$

$$x = \frac{2 \pm \sqrt{4+16}}{2}$$

$$x = \frac{2 \pm \sqrt{20}}{2}$$

$$x = \frac{2 \pm 2\sqrt{5}}{2}$$

$$x = \frac{\cancel{2}(1 \pm 1\sqrt{5})}{\cancel{2}}$$

$\boxed{x = 1 + \sqrt{5}}$ $\boxed{x = 1 - \sqrt{5}}$

Exercise: solve by formula method.

1. $x^2 - 3x - 10 = 0$
2. $x^2 + 7x - 60 = 0$
3. $3x^2 - 5x + 2 = 0$
4. $2x^2 - 3x + 1 = 0$
5. $3x^2 - 12x + 15 = 0$
6. $x^2 + 2x - 3 = 0$
7. $x^2 - 2x - 3 = 0$
8. $3x^2 + 5x - 2 = 0$
9. $3x^2 - 2\sqrt{6}x + 2 = 0$
10. $\sqrt{2}\,x^2 + 7x + 5\sqrt{2} = 0$

1) Prove that $3+\sqrt{5}$ is irrational number.

Solution: let us assume that $3+\sqrt{5}$ is rational number.

$3+\sqrt{5} = \frac{p}{q}$ $\quad p \in z$ *and* $q \neq 0.$

$\sqrt{5} = \frac{p}{q} - 3$

$\sqrt{5} = \frac{p-3q}{q}$

w.k.t $\frac{p-3q}{q}$ is rational number.

$\sqrt{5}$ is a irrational number.

$\therefore$ $3+\sqrt{5}$ Is irrational number.

2) Prove that $3-\sqrt{5}$ is irrational number.

Solution: let us assume that $3-\sqrt{5}$ is rational number.

$3-\sqrt{5} = \frac{p}{q}$ $\quad p \in z$ *and* $q \neq 0.$

$-\sqrt{5} = \frac{p}{q} - 3$

$-\sqrt{5} = \frac{p-3q}{q}$

$\sqrt{5} = \frac{-p+3q}{q}$

w.k.t $\frac{-p+3q}{q}$ is rational number.

$\sqrt{5}$ is a irrational number.

$\therefore$ $3-\sqrt{5}$ Is irrational number.

3) Prove that $3+2\sqrt{5}$ is irrational number.

Solution: : let us assume that $3+2\sqrt{5}$ is rational number.

$3+2\sqrt{5} = \frac{p}{q}$ $\quad p \in z$ *and* $q \neq 0.$

$2\sqrt{5} = \frac{p}{q} - 3$

$2\sqrt{5} = \frac{p-3q}{q}$

$\sqrt{5} = \frac{p-3q}{2q}$

w.k.t $\frac{p-3q}{2q}$ is rational number.

$\sqrt{5}$ is a irrational number.

$\therefore$ $3+2\sqrt{5}$ Is irrational number.

Exercise

Prove that following numbers are irrational number.

1) $5+\sqrt{3}$
2) $5-\sqrt{3}$
3) $2+\sqrt{3}$
4) $2+\sqrt{5}$
5) $3+5\sqrt{2}$
6) $6+\sqrt{2}$
7) $3-\sqrt{7}$
8) $5-\sqrt{5}$
9) $3+\sqrt{7}$
10) $2-\sqrt{5}$

- **DISTANCE FORMULA:**

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

Ex) Find the distance between two points (6, 5) and (4, 4).

Solution: (6, 5) = (x_1, y_1)

(4, 4) = (x_2, y_2)

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

$$d = \sqrt{(4-6)^2 + (4-5)^2}$$

$$d = \sqrt{(-2)^2 + (-1)^2}$$

$$d = \sqrt{4+1}$$

$$\boxed{d = \sqrt{5} \text{ units.}}$$

Ex2) Find the distance between two points (4, 7) and (2, 3).

Solution: (4, 7) = (x_1, y_1)

(2, 3) = (x_2, y_2)

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

$$d = \sqrt{(2-4)^2 + (3-7)^2}$$

$$d = \sqrt{(-2)^2 + (-4)^2}$$

$$d = \sqrt{4+16}$$

$$d = \sqrt{20}$$

$$\boxed{d = 2\sqrt{5} \text{ Units.}}$$

EX3) Find the distance between two points (2, 3) and (6,-8).by using formula.

Solution: (2, 3) = (x_1, y_1)

(6,-8) = (x_2, y_2)

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

$$d = \sqrt{(6-2)^2 + (-8-3)^2}$$

$$d = \sqrt{(4)^2 + (-11)^2}$$

$$d = \sqrt{16+121}$$

$$\boxed{d = \sqrt{137} \text{ units.}}$$

Exercise

Find the distance between following points.

1) **Find the distance between two points (-2, 5) and (-5, 2).**
2) **Find the distance between two points (1, 7) and (-2, 3).**
3) **Find the distance between two points (-6, 4) and (5, -7).**
4) **Find the distance between two points (-4, -7) and (-2, -3).**
5) **Find the distance between two points (1, 1) and (3, 2).**
6) **Find the distance between two points (-3, 2) and (2, -3).**
7) **Find the distance between two points (4, 3) and (8, -3).**

➢ MID POINT FORMULA.

$$P(X,Y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

EX) find the midpoint of the points $(-4, 1)$ and $(5, 2)$.

Solution: $(-4,1) = (x_1, y_1)$

$(5,2) = (x_2, y_2)$

$$P(X,Y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$P(X,Y) = \left(\frac{-4+5}{2}, \frac{1+2}{2}\right)$$

$$P(X,Y) = \left(\frac{1}{2}, \frac{3}{2}\right)$$

EX) find the midpoint of the points $(3, 1)$ and $(4, 5)$.

Solution: $(3,1) = (x_1, y_1)$

$(4,5) = (x_2, y_2)$

$$P(X,Y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$P(X,Y) = \left(\frac{3+4}{2}, \frac{1+5}{2}\right)$$

$$P(X,Y) = \left(\frac{7}{2}, \frac{6}{2}\right)$$

$$P(X,Y) = \left(\frac{7}{2}, 3\right)$$

EX) **find the midpoint of the points $(5, 3)$ and $(5, 1)$.**

Solution: $(5,3) = (x_1, y_1)$

$(5,1) = (x_2, y_2)$

$$P(X,Y) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$P(X,Y) = \left(\frac{5+5}{2}, \frac{3+1}{2}\right)$$

$$P(X,Y) = \left(\frac{10}{2}, \frac{4}{2}\right)$$

$$P(X,Y) = (5, 2)$$

➢ SECTION FORMULA:

$$P(X,Y) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$$

EX) Find the coordinates of the point which divides the join of $(-1, 7)$ and $(4, -3)$ in the ratio 2:3.

Solution: $(-1,7) = (x_1, y_1)$

$(4,-3) = (x_2, y_2)$ $\quad m_1 : m_2 = 2:3$

$$P(X,Y) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$$

$$P(X,Y) = \left(\frac{(2)(4)+3(-1)}{2+3}, \frac{(2)(-3)+3(7)}{2+3}\right)$$

$$P(X,Y) = \left(\frac{8-3}{5}, \frac{-6+21}{5}\right)$$

$$P(X,Y) = (1, 3).$$

Exercise

EX) Find the coordinates of the point which divides the join of $(4, -1)$ and $(-2, -3)$ in the ratio 1:3.

EX) Find the coordinates of the point which divides the join of $(-6, 10)$ and $(3, -8)$ in the ratio 2:7.

EX) Find the midpoint of the points $(5, -6)$ and $(-1, -4)$.

EX) Find the midpoint of the points $(2, -2)$ and $(-7, 4)$.

EX) Find the quotient and remainder when $p(x) = 3x^3 + x^2 + 2x + 5$ is divided by $g(x) = x^2 + 2x + 1$.

Solution: $p(x) = 3x^3 + x^2 + 2x + 5$

$$g(x) = x^2 + 2x + 1$$

$$\begin{array}{r|l}
 & 3x - 5 \\
\hline
x^2 + 2x + 1 & \cancel{3x^3} + x^2 + 2x + 5 \\
 & \cancel{3x^3} + 6x^2 + 3x \\
 & - \quad - \quad - \\
\hline
 & \cancel{-5x^2} - x + 5 \\
 & \cancel{-5x^2} - 10x - 5 \\
 & + \quad + \quad + \\
\hline
 & 9x + 10
\end{array}$$

Quotient = $3x - 5$

Remainder = $9x + 10$

EX) Find the quotient and remainder when $p(x) = x^3 - 3x^2 + 5x - 3$ is divided by $g(x) = x^2 - 2$.

Solution: $p(x) = x^3 - 3x^2 + 5x - 3$

$$g(x) = x^2 - 2$$

$$\begin{array}{r|l}
 & x - 3 \\
\hline
x^2 - 2 & \cancel{x^3} - 3x^2 + 5x - 3 \\
 & \cancel{x^3} \qquad\quad - 2x \\
 & - \qquad\quad + \\
\hline
 & -3x^2 + 7x - 3 \\
 & -3x^2 \qquad + 6 \\
 & + \qquad\quad - \\
\hline
 & 7x - 9
\end{array}$$

Quotient = $x - 3$

Remainder = $7x - 9$

EX) Show that polynomial $x^2 + 3x + 1$ is a factor of polynomial $3x^4 + 5x^3 - 7x^2 + 2x + 2$.

Solution: $p(x) = 3x^4 + 5x^3 - 7x^2 + 2x + 2.$

$$g(x) = x^2 + 3x + 1$$

$$\begin{array}{r|l}
 & 3x^2 + 4x + 2 \\
\hline
x^2 + 3x + 1 & \cancel{3x^4} + 5x^3 - 7x^2 + 2x + 2 \\
 & \cancel{3x^4} + 9x^3 - 3x^2 \\
 & - \quad - \quad + \\
\hline
 & \cancel{-4x^3} - 10x^2 + 2x + 2 \\
 & \cancel{-4x^3} - 12x^2 - 4x \\
 & + \quad + \quad + \\
\hline
 & \cancel{2x^2} + \cancel{6x} + \cancel{2} \\
 & \cancel{2x^2} + \cancel{6x} + \cancel{2} \\
 & - \quad - \quad - \\
\hline
 & 0
\end{array}$$

Exercise

EX) Find the quotient and remainder when $p(x) = x^4 - 3x^2 + 4x + 5$ is divided by $g(x) = x^2 - x + 1$.

EX) Find the quotient and remainder when $p(x) = x^3 - 3x^2 + 5x - 3$ is divided by $g(x) = 2 - x^2$.

EX) Show that polynomial $x - 2$ is a factor of polynomial $x^3 - 3x^2 + 3x - 2$.

➢ AREA OF SECTOR

❖ **Area of Sector** = $\frac{\theta}{360^0} \times \pi r^2$

❖ **Length of arc** = $\frac{\theta}{360^0} \times 2\pi r$

EX) Find the area of a sector the circle with radius 6cm if angle of sector is 60^0.

Solution: Given $r = 6cm\ \theta = 60^0$

Area of Sector = $\frac{\theta}{360^0} \times \pi r^2$

$$= \frac{60^0}{360^0} \times \frac{22}{7} \times 6 \times 6$$

$$= \frac{\cancel{60^0}}{\cancel{360^0}} \times \frac{22}{7} \times 6 \times \cancel{6}$$

$$= \frac{22}{7} \times 6$$

$$\boxed{\text{Area of Sector} = \frac{136}{7}\ cm^2}$$

EX) In a circle of radius 21 cm if angle, an arc subtends an angle of 40^0 at the centre. Find the length of the arc.

Solution: Given $r = 21cm\ \theta = 40^0$

Length of arc = $\frac{\theta}{360^0} \times 2\pi r$

$$= \frac{40^0}{360^0} \times 2 \times \frac{22}{7} \times 21$$

$$= \frac{1}{9} \times 2 \times \frac{22}{7} \times 21$$

$$\boxed{\text{Length of arc} = \frac{136}{7}\ \text{cm}^2}$$

EX) In a circle of radius 21 cm if angle, an arc subtends an angle of 60^0 at the centre find the area of segment.

Solution: Given $r = 21cm\ \theta = 60^0$

Area of Sector = $\frac{\theta}{360^0} \times \pi r^2$

$$= \frac{60^0}{360^0} \times \frac{22}{7} \times 21 \times 21$$

$$= \frac{\cancel{60^0}}{\cancel{360^0}} \times \frac{22}{\cancel{7}} \times \cancel{21} \times 21$$

$$\boxed{\text{Area of Sector} = 231\ cm^2}$$

Area of equilateral triangle $= \frac{\sqrt{3}}{4} a^2$

$$= \frac{\sqrt{3}}{4} \times 21 \times 21$$

Area of equilateral triangle $= 441 \frac{\sqrt{3}}{4}$ cm^2

Area of segment = Area of sector – Area of Equilateral Triangle

$$\boxed{\text{Area of Sector} = 231 - 441 \frac{\sqrt{3}}{4}\ \text{cm}^2}$$

Exercise

EX) Find the area of a sector the circle with radius 7cm if angle of sector is 90^0.

EX) In a circle of radius 21 cm if angle, an arc subtends an angle of 40^0 at the centre. Find the length of the arc.

EX) In a circle of radius 14 cm if angle, an arc subtends an angle of 60^0 at the centre find the area of segment.

PROBABILITY:

$$P(E) = \frac{n(E)}{n(S)}$$

Ex) A die is thrown once, Find the probability of getting A) A prime number B) a number lying between 2 and 6. C) An odd number. D) an perfect square.

Solution: A die ids thrown once,

$S = \{1, 2, 3, 4, 5, 6\}$

$n(S) = 6$

A) A prime number

$E = \{2, 3, 5, \}$, $n(E) = 3$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{3}{6}$

$\boxed{P(E) = \frac{1}{2}}$

B) A number lying between 2 and 6.

$E = \{3, 4, 5, \}$, $n(E) = 3$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{3}{6}$

$\boxed{P(E) = \frac{1}{2}}$

C) An odd number.

$E = \{1, 3, 5\}$, $n(E) = 3$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{3}{6}$

$\boxed{P(E) = \frac{1}{2}}$

D) A perfect square.

$E = \{1, 4\}$ $n(E) = 2$

$P(E) = \frac{n(E)}{n(S)}$

$P(E) = \frac{2}{6}$

$\boxed{P(E) = \frac{1}{3}}$

EX) A box contains 90 disc which are numbered from 1 to 90. If one disc is drawn at random from box, find the probability that it bears A) a two digit number B) A perfect a square number.

Solution: $n(S) = 90$

A) a two digit number

$n(E) = 81$

$P(E) = \frac{n(E)}{n(S)} = \frac{81}{90}$

$P(E) = \frac{9}{10}$

B) A perfect a square number.

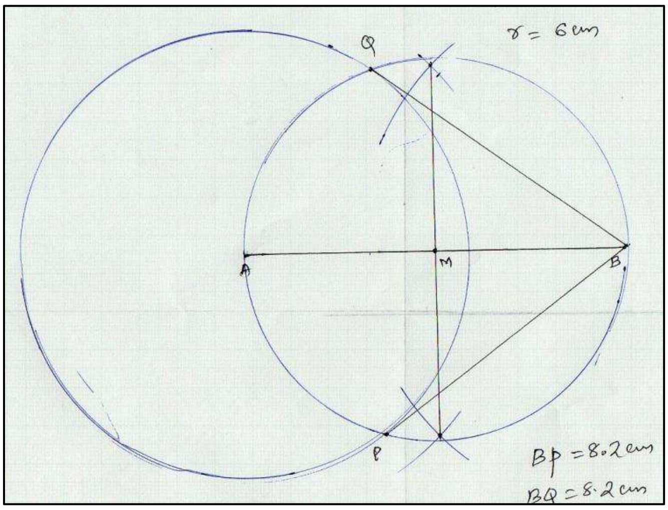
$n(E) = 9$

$P(E) = \frac{n(E)}{n(S)} = \frac{9}{90} = 1/9$

CONSTRUCTION:

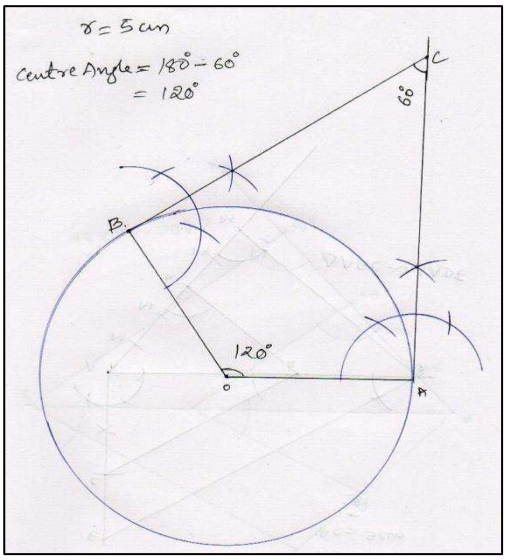
Ex) draw a circle of radius 6cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

Solution:



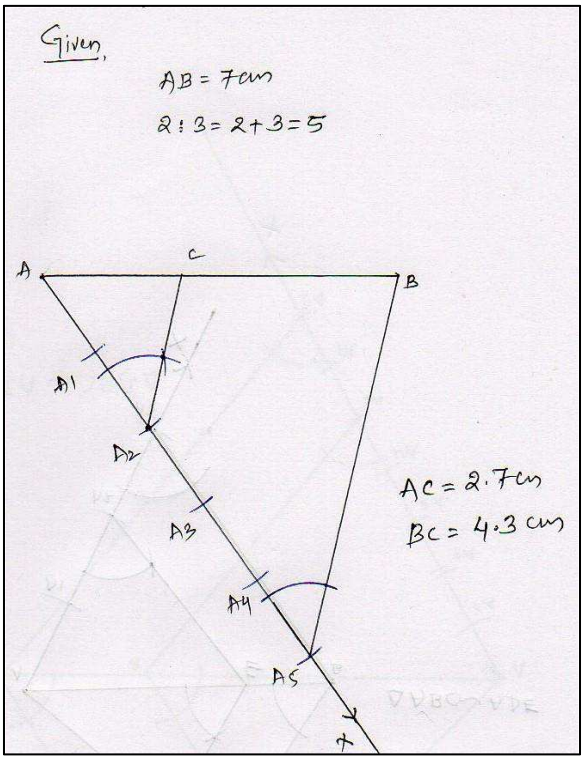
EX) Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle of 60^0 .

Solution:



EX) Draw a line segment of length of 7cm and dived in the 2:3. Measure the two parts.

Solution:



Exercise

1) Draw a circle of radius 4.5cm. From a point 11 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

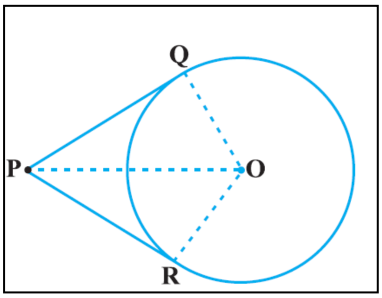
2) Draw a pair of tangents to a circle of radius 5.6cm which are inclined to each other at an angle of 70^0 .

2) Draw a line segment of length of 7cm and dived in the 2:3. Measure the two parts.

3 MARKS QUESTION :

Theorem: The lengths of tangents drawn from an external point to a circle are equal.

Proof:



O is centre of circle. P is external point, PQ and PR are tangents.

To prove that $PQ = PR$

Join OQ, OR and OP.

In ΔOPQ and ΔOPR

$< Q = < R = 90^0$

$OQ = OR$ are radii of circle.

OP is common hypotenuse

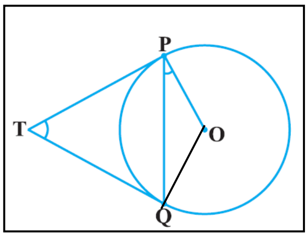
By using RHS rule.

$\Delta OPQ \cong \Delta OPR$

$PQ = PR$

Theorem: Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠ PTQ = 2 ∠ OPQ.

Proof:



O is centre of circle. TP and TQ are two tangents.

Join OQ. We know that. ΔOPQ is isosceles triangle.

$2\angle OPQ + \angle POQ = 180^0$ ------------ (1)

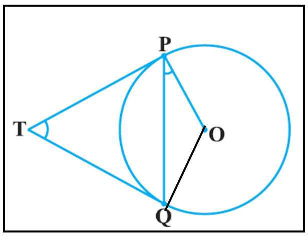
$\angle PTQ + \angle POQ = 180^0$ --------------- (1)

From equation (1) and (2)

$2\angle OPQ + \cancel{\angle POQ} = \angle PTQ + \cancel{\angle POQ}$

$\angle PTQ = 2\angle OPQ$

Theorem: Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.



Proof: O is the centre of circle. TP and TQ are two tangents. To show that

$\angle POQ + \angle PTQ = 180^0$

We know that

$< Q = < P = 90^0$ (The tangent at any point of a circle is perpendicular to the radius through the point of contact).

And OPTQ is quadrilateral .

$\angle POQ + \angle OPT + \angle PTQ + \angle OQT = 360^0$

$\angle POQ + 90^0 + \angle PTQ + 90^0 = 360^0$

$\angle POQ + \angle PTQ + 180^0 = 360^0$

$\angle POQ + \angle PTQ = 360^0 - 180^0$

$\boxed{\angle POQ + \angle PTQ = 180^0}$

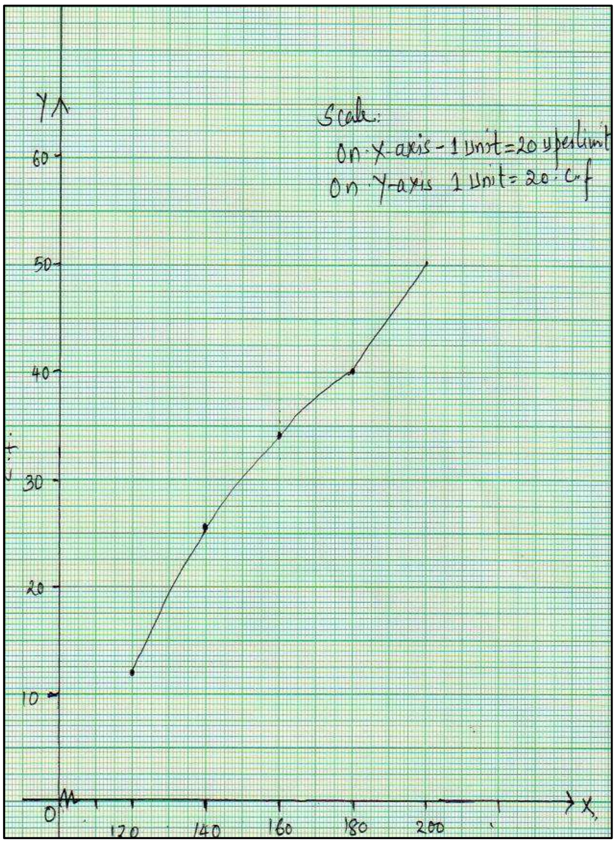
Ogive Graph:

EX 1) Draw the less than type ogive of following distribution table.

C.I	100-120	120-140	140-160	160-180	180-200
f	12	14	8	6	10

Solution:

C.I	f	c.f
Less than120	12	12
Less than140	14	14+12=26
Less than160	8	26+8=34
Less than180	6	34+6=40
Less than200	10	40+10=50
	N= 50	

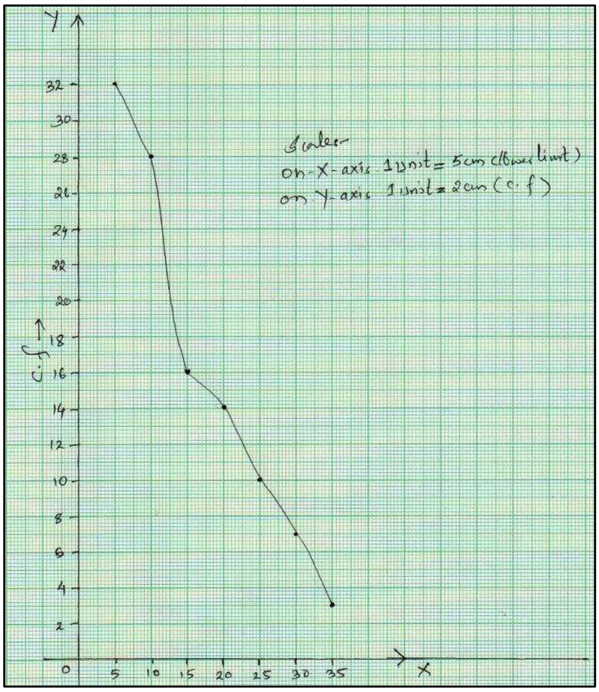


2) Draw the more than type ogive of following distribution table.

C.I	5-10	10-15	15-20	20-25	25-30	30-35	35-40
f	2	12	2	4	3	4	3

Solution:

C.I	f	C.F
More than 5	2	30
More than10	12	30-2= 28
More tha15	2	28-12= 16
More than20	4	16-2= 14
More than 25	3	14-4= 10
More than 30	4	10-3= 7
More than 35	3	7-4= 3
	N=30	



Mean:

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Ex) find Mean of the following distribution table.

C.I	0-2	2-4	4-6	6-8	8-10	10-12	12-14
f	1	2	1	5	6	2	3

Solution:

C.I	f	C.M (x)	fx
0-2	1	1	1
2-4	2	3	6
4-6	1	5	5
6-8	5	7	35
8-10	6	9	54
10-12	3	11	33
12-14	2	13	26
	$\sum f = 20$		$\sum fx = 160$

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{160}{20}$$

$$\boxed{\bar{x} = 8}$$

Exercise:

Ex) find Mean of the following distribution table.

C.I	5-15	15-25	25-35	35-45	45-55	55-65
f	6	11	21	23	14	5

Mode :

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

EX) find the mode of the following data

C.I	1-3	3-5	5-7	7-9	9-11
f	7	8	2	2	1

Solution:

$f_0 = 7$, $f_1 = 8$, $f_2 = 2$, $l = 3$, $h = 2$

$$= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 3 + \left(\frac{8-7}{2(8)-7-2}\right) \times 2$$

$$= 3 + \left(\frac{1}{16-7-2}\right) \times 2$$

$$= 3 + \left(\frac{1}{7}\right) \times 2$$

$$= 3 + \left(\frac{2}{7}\right)$$

$$= 3 + 0.285$$

$$\boxed{\text{Mode} = 3.285}$$

Exercise:

1) Find the Mode of the following data.

C.I	0-20	20-40	40-60	60-80	80-100	100-120
f	10	35	52	61	38	29

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Median:

$$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f}{f}\right) \times h$$

EX) find median of the following distribution table.

C.I	65-85	85-105	105-125	125-145	145-165	165-185	185-205
f	4	5	13	20	14	8	4

Solution:

C.I	f	c.f
65-85	4	4
85-105	5	4+5=9
105-125	13	9+13=**22 c.f**
125-145	**f 20**	**22+20=42**
145-165	14	42+14=56
165-185	8	56+8=64
185-205	4	64+4=68
	N=68	

Solution:

$$\text{Median} = l + \left(\frac{\frac{n}{2} - \text{c.f}}{\text{f}}\right) \times h$$

N = 68, N/2= 68/2 = 34

L = 125, f = 20, c.f = 22 , h = 20

$$\text{Median} = 125 + \left(\frac{34-22}{20}\right) \times 20$$

$$= 125 + \left(\frac{12}{\cancel{20}}\right) \times \cancel{20}$$

$$= 125 + 12$$

$$\boxed{\text{Median} = 137}$$

Exercise:

1) Find median of the following distribution table.

C.I	118-126	127-135	136-144	145-153	154-162	163-171	172-180
f	3	5	9	12	5	4	2

2) Find median of the following distribution table.

C.I	0-10	10-20	20-30	30-40	40-50	50-60
f	5	8	20	15	7	5

3) Find mean, Median, Mode of the following distribution table.

C.I	1-4	4-7	7-10	10-13	13-16	16-19
f	6	30	40	16	4	4

4) Draw the less than type ogive of following distribution table.

C.I	40-45	45-50	50-55	55-60	60-65	65-70	70-75
f	2	3	8	6	6	3	2

5) Draw the more than type ogive of following distribution table.

C.I	135-140	140-145	145-150	150-155	155-160	160-165
f	4	7	18	11	6	5

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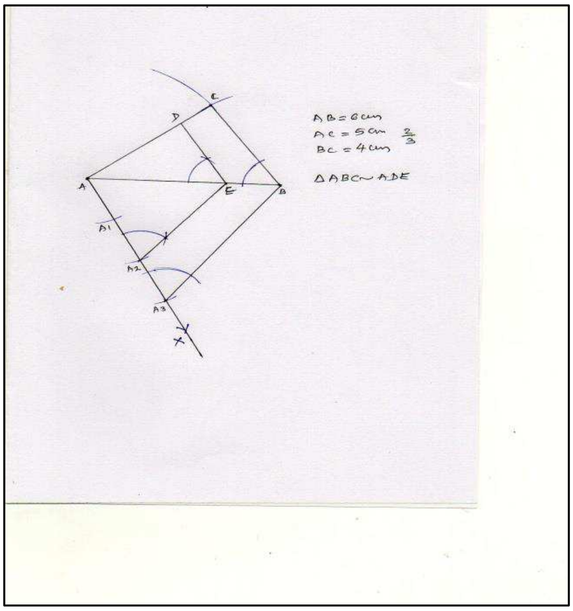
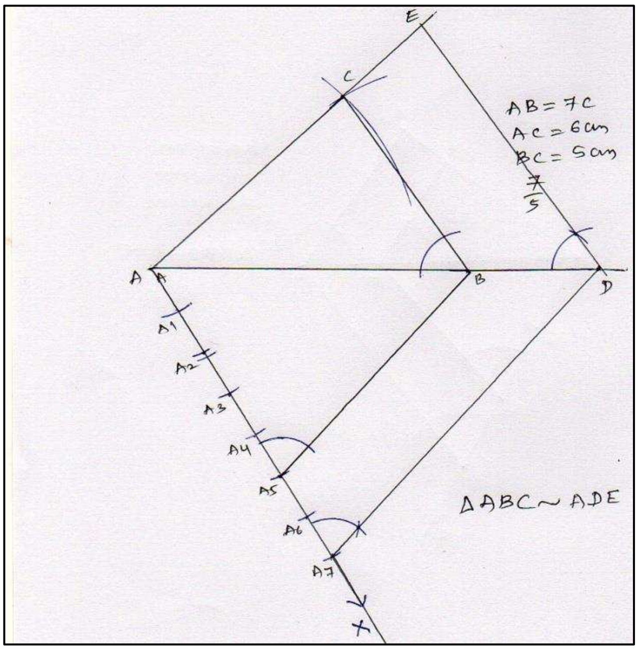
Construction:

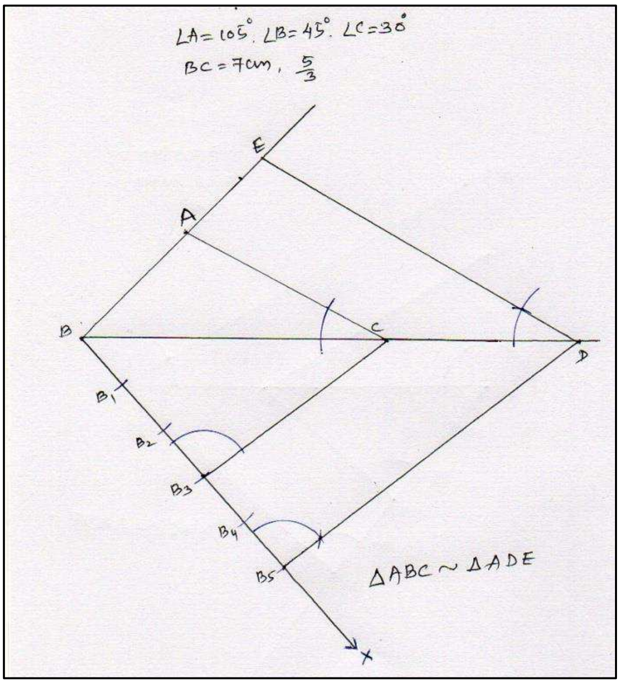
EX) Construct a triangle of sides 4cm, 5cm, and 6cm and then a triangle similar to it whose sides are 2/3 of the corresponding sides of the first triangle.



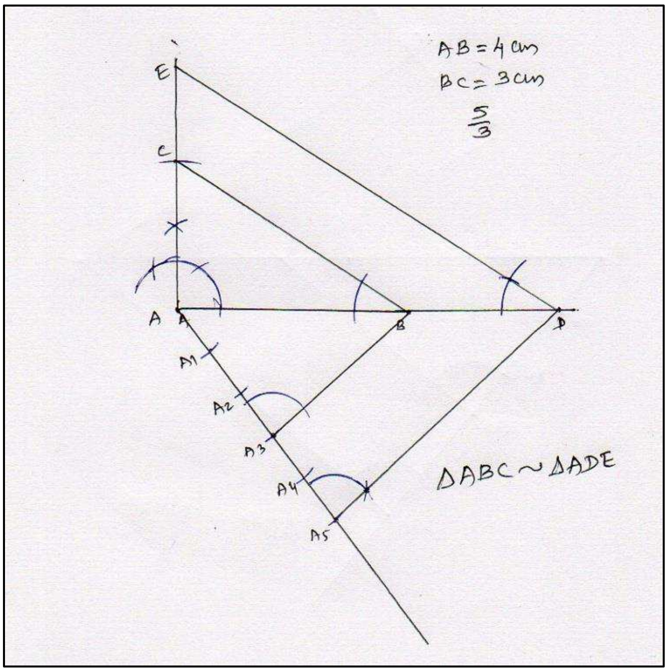
EX) Construct a triangle with sides 5cm, 6cm and 7cm and then another triangle whose sides are 7/5 of the corresponding sides of the first triangle.



EX) Draw a triangle ABC with side BC=7cm, $< B$ = 45° and $< A = 105^0$ then construct a triangle whose sides are 4/3 times the corresponding sides of the ΔABC.



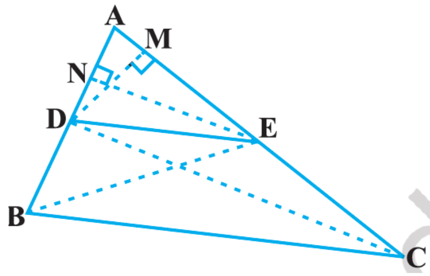
EX) Draw a right triangle in which the sides (other than hypotenuse) are if lengths 4cm and 3cm. Then construct another triangle whose sides are 5/3 times the corresponding side of the given triangle.



4 MARKS QUESTION :

THALE'S THEOREM (B P T)

SATEMENT: "If *a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct Points, the other two sides are divided in the same ratio"*



Proof: ΔABC **DE||BC.**

To prove $\frac{AD}{BD} = \frac{AE}{EC}$

Join BE and CD and then draw DM ⊥ AC and EN ⊥ AB.

Area of triangle =1/2 × base× height

$$\frac{Area\ (\Delta ADE)}{Area\ (\Delta BDE)} = \frac{1/2 \times AD \times EN}{1/2 \times DB \times EN}$$

$$\frac{Area\ (\Delta ADE)}{Area\ (\Delta BDE)} = \frac{AD}{DB} \text{ ------------------------ (1)}$$

$$\frac{\text{Area } (\Delta \text{ADE})}{\text{Area } (\Delta \text{BDE})} = \frac{1/2 \times \text{AD} \times \text{EN}}{1/2 \times \text{DB} \times \text{EN}}$$

$$\frac{Area\ (\Delta ADE)}{Area\ (\Delta DEC)} = \frac{1/2 \times DM \times AE}{1/2 \times DM \times EC}$$

$$\frac{Area\ (\Delta ADE)}{Area\ (\Delta DEC)} = \frac{AE}{EC} \text{ ------------------------ (2)}$$

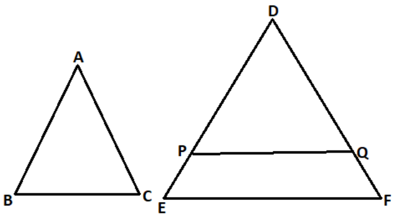
From questions (1) and (2) we get

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

Theorem: A.A.A Similarity

If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar.

Proof:



In ΔABC **and** ΔDEF

$\langle B = \langle E$ **And** $\langle C = \langle F$

To prove $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

Cut $DP = AB$ **and** $DQ = AC$ **join PQ**

In ΔABC **and** ΔDPQ

$\langle A = \langle D$

$AB = DP$
$AC = DQ$

$\Delta ABC \cong \Delta DPQ$ **(By SAS rule)**

$\langle B = \langle P$

$\langle E = \langle P$

PQ is parallel to EF, By Thales theorem.

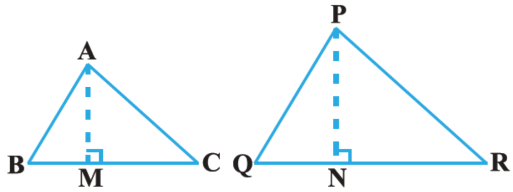
$$\frac{DP}{DE} = \frac{DQ}{DF}$$

Similarly $\boxed{\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}}$

Areas of Similar Triangles:

"The ratio of the areas two similar triangle is equal to the square of the ratio of their corresponding sides".

Proof:



ΔABC and ΔPQR are similar triangles $\Delta ABC \sim \Delta PQR$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$

To prove $\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{AC^2}{PR^2}$

Draw AM ⊥ BC and PN ⊥ QR

In ΔABM and ΔPQN

$< B =< Q$

$< M =< N = 90^0$

By A.A.A similarity

$\Delta ABM \sim \Delta PQN$

$$\frac{AB}{PQ} = \frac{BM}{QR} = \frac{AM}{PN}$$

$\frac{AB}{PQ} = \frac{AM}{PN}$ **-------------(1)**

$$\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{\frac{1}{2} \times AM \times BC}{\frac{1}{2} \times PN \times QR}$$

$$\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AM}{PN} \times \frac{BC}{QR}$$

$\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AB}{PQ} \times \frac{BC}{QR}$ **(From 1)**

$$\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AB}{PQ} \times \frac{AB}{PQ}$$

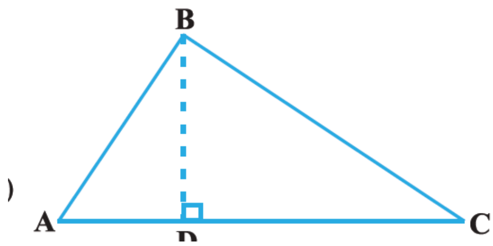
$$\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AB^2}{PQ^2}$$

Similarly $\boxed{\frac{area\ of\ \Delta ABC}{area\ of\ \Delta PQR} = \frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{AC^2}{PR^2}}$

Pythagoras Theorem :

Statement: **"In a right triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides."**

Proof: ΔABC **right triangle at** $< B = 90^0$



To prove , $AC^2 = AB^2 + BC^2$

Draw BD ⊥ AC

In ΔABC **and** ΔADB.

$< B =< D = 90^0$

$< A$ **Is common**

By A.A.A similarity

$\Delta ABC \sim \Delta ADB.$

$\frac{AB}{AD} = \frac{BC}{DB} = \frac{AC}{AB}$

$\frac{AB}{AD} = \frac{AC}{AB}$

$AB^2 = AC \times AD$ --------------------(1)

Similarly $\Delta ABC \sim \Delta BDC.$

$< B =< D = 90^0$

$< C$ **Is common**

By A.A.A similarity

$\Delta ABC \sim \Delta BDC$

$\frac{AB}{BD} = \frac{BC}{DC} = \frac{AC}{BC}$

$\frac{BC}{DC} = \frac{AC}{BC}$

$BC^2 = AC \times DC$ --------------------------(2)

Adding (1) and (2) we get.

$$\begin{aligned} AB^2 + BC^2 &= AC \times AD + AC \times DC \\ &= AC(AD + DC) \\ &= AC \times AC \end{aligned}$$

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

$$\boxed{AC^2 = AB^2 + BC^2}$$

GRAPH :

Ex: Solve by graph $2x - 5y = -4$ and $2x + y = 8$

Solution: $2x - 5y = -4$

X	0	-2	3
Y	0.8	0	2

$2x - 5y = -4$

$2x + y = 8$

$-\quad -\quad -$

-6y = -12

Y = 2

$x = 0 \;:\quad 2(0) - 5y = -4$

$-5y = -4$

$y = 4/5$

$\boxed{y = 0.8}$

$y = 0 \;:\quad 2x - 5(0) = -4$

$2x = -4$

$\boxed{x = -2}$

$y = 2 \;:\quad 2x - 5(2) = -4$

$2x = -4 + 10$

$x = 6/2$

$\boxed{x = 3}$

$2x + y = 8$

X	0	4	3
Y	8	0	2

$x = 0 \;: 2x + y = 8$

$2(0) + y = 8$

$y = 8$

$y = 0 \;: 2x + y = 8$

$2x + 0 = 8$

$2x = 8$

$x = 8/2$

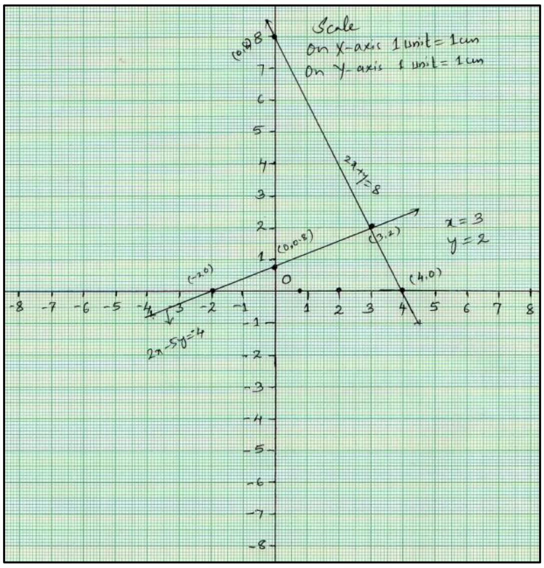
$x = 4$

$y = 2 \;:\quad 2x + (2) = 8$

$2x = 8 - 2$

$x = 6/2$

$\boxed{x = 3}$



Ex: Solve by graph $x + 2y = -2$ and $3x + 2y = 2$

Solution: $x + 2y = -2$

X	0	-2	2
Y	-1	0	-2

$x = 0 \;:\quad x + 2y = -2$

$0 + 2y = -2$

$\boxed{y = -1}$

$y = 0 \;:\quad x + 2y = -2$

$x + 2(0) = -2$

$\boxed{x = -2}$

$y = -2 \;:\quad x + 2(-2) = -2$

$x - 4 = -2$

$x = -2 + 4$

$\boxed{x = 2}$

$3x + 2y = 2$

X	0	0.6	2
Y	1	0	-2

$x = 0 \;:\quad 3x + 2y = 2$

$3(0) + 2y = 2$

$\boxed{y = 1}$

$y = 0 \;:\quad 3x + 2y = 2$

$3x + 2(0) = 2$

$x = 2/3$

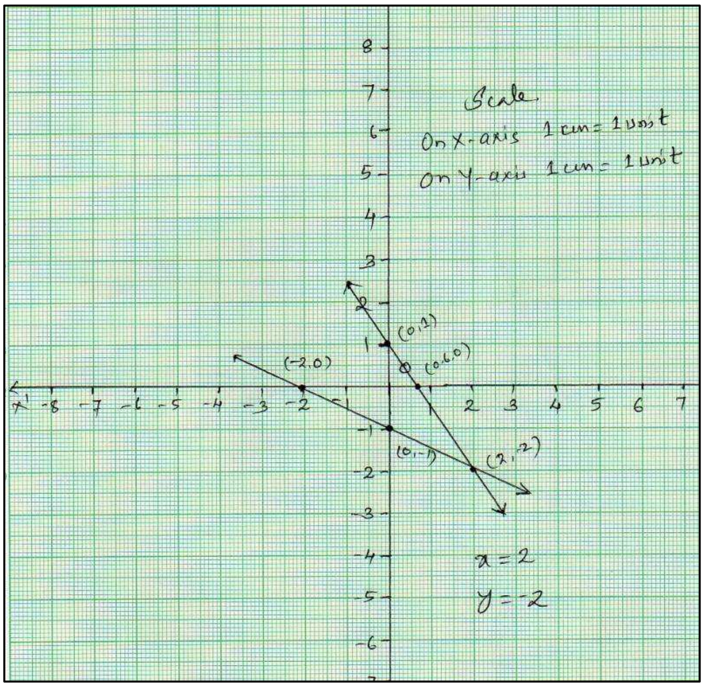
$\boxed{x = 0.6}$

$y = -2 \;:\quad 3x + 2(-2) = 2$

$3x - 4 = 2$

$3x = 2 + 4$

$\boxed{x = 2}$



Ex: Solve by graph $2x + 3y = 2$ and $x - 2y = 8$

Solution: $2x + 3y = 2$

X	0	1	4
Y	0.6	0	-2

$x = 0 \;:\quad 2(0) + 3y = 2$

$y = 2/3$

$\boxed{y = 0.6}$

$y = 0 \;:\quad 2x + 3(0) = 2$

$2x = 2$

$\boxed{x = 1}$

$y = -2 \;:\; 2x + 3(-2) = 2$

$2x = 2 + 6$

$x = 8/2$

$\boxed{x = 4}$

$x - 2y = 8$

X	0	8	4
Y	-4	0	-2

$x = 0 \;:\; 0 - 2y = 8$

$y = -4$

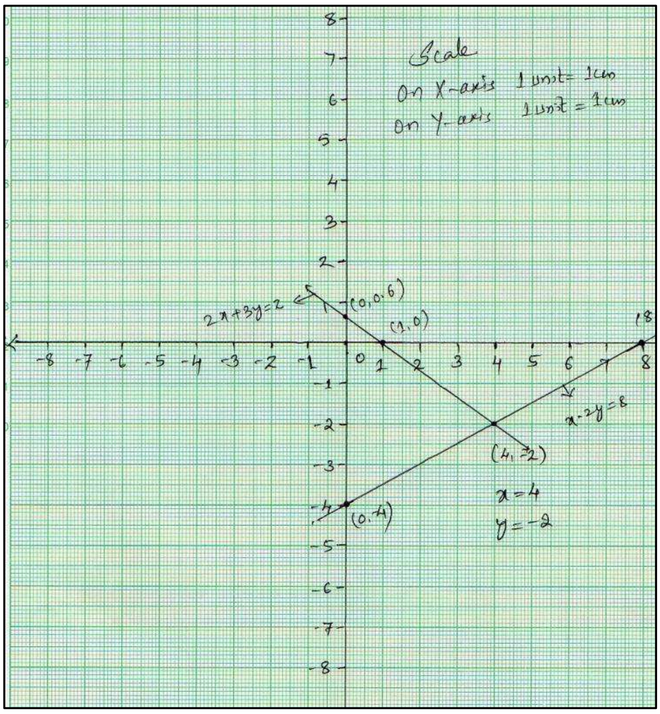
$y = 0 \;:\; x - 2(0) = 8$

$x = 8$

$y = -2 \;:\; x - 2(-2) = 8$

$x = 8 - 4$

$\boxed{x = 4}$



Exercise:

Solve the following pair of linear equation by graphically method.

1) $2x + y - 6 = 0$ and $4x - 2y - 4 = 0$
2) $y = 2x - 2$ and $y = 4x - 4$
3) $x + 3y = 6$ and $2x - 3y = 12$
4) $x + 3y = 13$ and $3x + y = 7$
5) $x - y = -2$ and $4x - y - 4 = 0$

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