SECTION - A

Q.1 Write the discriminant of the quadratic equation

$(x+5)^2 = 2(5x-3)$

$x^2 + 25 + \cancel{10x} = \cancel{10x} - 6$

$x^2 + 25 + 6 = 0$

$x^2 + 31 = 0$

Discriminant $= b^2 - 4ac$

$(0)^2 - 4 \times 1 \times 31$

$0 - 124$

$-124.$

2. Find after how many places of decimal the decimal form of the number $\frac{27}{2^3 \times 5^4 \times 3^2}$ will terminate

Sol

$$\frac{27}{2^3 \times 5^{4} \times 3^2}$$

$$\frac{\cancel{27}\ 3}{2^3 \times 5^4 \times \cancel{9}}$$

$$\frac{3 \times 2}{2^3 \times 5^4 \times 2} = \frac{6}{2^4\ 5^4} = \frac{6}{10^4} = .0006$$

or.

Express 429 as product of prime factors.

$429 = 3 \times 11 \times 13$

$$\begin{array}{r|l} 3 & 429 \\ \hline 11 & 143 \\ \hline 13 & 13 \\ \hline & 1 \end{array}$$

3, 11, 13 are prime numbers

So 429 can be pressed as product of primes.

3. Find the sum of first 10 multiples of 6.

6, 12, 18 . . . . . (10) terms

$a = 6 \quad d = 12 - 6 = 6$

$n = 10$

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

$S_{10} = \frac{10}{2}(2 \times 6 + (10-1)6)$

$= 5(12 + 9 \times 6)$

$= 5(12 + 54)$

$= 5 \times 66$

$= 330$

4. Find the values of x if the distance between the points $A(0,0)$ and $B(x,-4)$ is 5 units.

$A(0\ 0)$ $\quad B(x,-4)$ $\quad$ Distance = 5 units

$$\sqrt{(x-0)^2+(-4-0)^2} = 5$$

$$\sqrt{x^2+16} = 5$$

$$x^2+16 = 25 \quad \text{(squaring both side)}$$

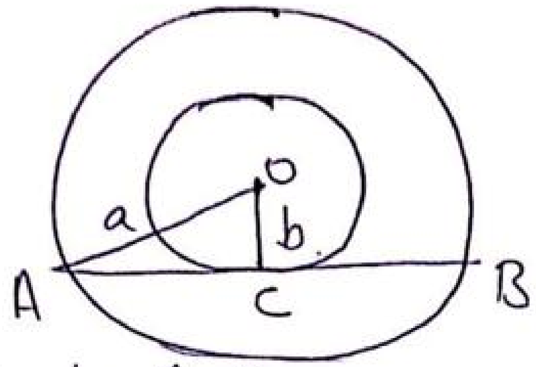
$$x^2 = 25-16$$

$$x^2 = 9$$

$$x = \pm 3$$

$$x = 3, -3$$

5 Two concentric circles of [radii]
a and b (a > b) are given [. Find]
the length of the chord of [the larger]
circle which touches the [smaller]
circle



$OC \perp AB$

$AC^2 = OA^2 - OC^2$

$= a^2 - b^2$

$AC = \sqrt{a^2 - b^2}$

Perpendicular from the ce[ntre]
to the chord bisect the c[hord]

AB = length of the chord =

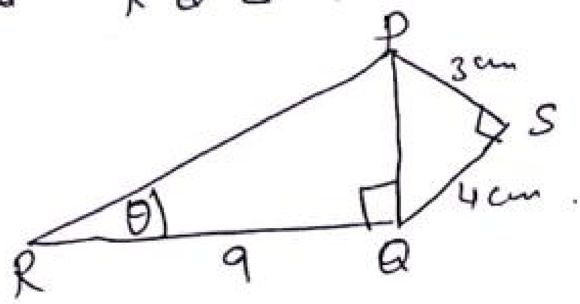
$2\,AC$

$2\sqrt{a^2-b^2}$

Q. In fig PS = 3 cm QS = 4 cm

$\angle PRQ = \theta$ $\angle PSQ = 90°$ $PQ \perp RQ$

and RQ = 9 cm Evaluate $\tan\theta$



$\angle PSQ = 90°$

$PQ^2 = PS^2 + SQ^2$

$= 3^2 + 4^2$

$= 9 + 16$

$= 25$

$PQ = 5$

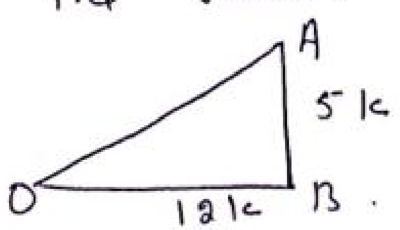
$RQ = 9$

$$\tan\theta = \frac{PQ}{RQ} = \frac{5}{9}$$

or.

Q. $\tan\alpha = \frac{5}{12}$

Find the value of $\sec\alpha$.



$\tan\alpha = \frac{5}{12}$. $AB = 5k$ $OB = 12k$

$OA^2 = AB^2 + OB^2$

$= (5k)^2 + (12k)^2$

$$OA^2 = 25k^2 + 144k^2$$

$$OA^2 = 169k^2$$

$$OA = 13k$$

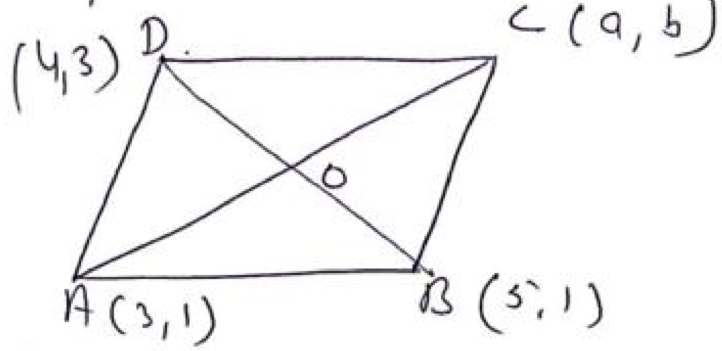
$$\sec\alpha = \frac{OA}{OB}$$

$$= \frac{13\cancel{k}}{12\cancel{k}}$$

$$= \frac{13}{12}.$$

SECTION - B

9. Point A (3, 1) B (5, 1) C (a, b) D (4, 3) are the vertices of a parallelogram ABCD Find the value of a and b.



ABCD is a parallelogram.

Diagonal AC and BD bisect each other

mid point of AC = mid point of BD

$$\left(\frac{a+3}{2}, \frac{b+1}{2}\right) = \left(\frac{4+5}{2}, \frac{3+1}{2}\right)$$

$$\frac{a+3}{2} = \frac{9}{2} \qquad \frac{b+1}{2} = \frac{4}{2}$$

$$2a + 6 = 18 \qquad \frac{b+1}{2} = 2$$

$$2a = 18 - 6 \qquad b + 1 = 4$$

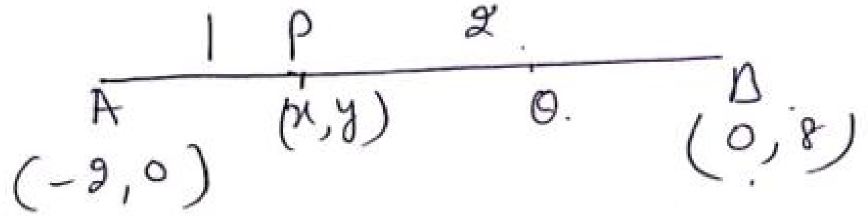
$$2a = 12 \qquad b = 3$$

$$a = 6$$

$a = 6 \quad b = 3.$

Or

Points P and Q trisect the line segment joining the points A (−2, 0) and B (0, 8) such that P is near to A. Find the co-ordinates of the point P and Q.

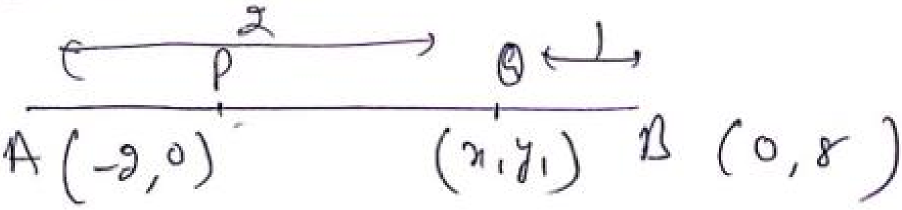


In First case Ratio is = AP : PB = 1 : 2.

$$x = \frac{1 \times 0 + 2 \times -2}{1+2} = -\frac{4}{3}$$

$$y = \frac{1 \times 8 + 2 \times 0}{1+2} = \frac{8}{3}.$$

In Second case.



AQ : QB = 2 : 1

$$x_1 = \frac{2 \times 0 + 1 \times -2}{2+1} = \frac{-2}{3}$$

$$x_2 = \frac{2 \times 8 + 1 \times 0}{2+1} = \frac{16}{3}$$

18. Solve the following pair of linear equation

$$3x - 5y = 4$$

$$2y + 7 = 9x.$$

Substitution method.

$$3x - 5y = 4$$

$$3x = 4 + 5y$$

$$x = \frac{4 + 5y}{3}.$$

Put this value in $2y + 7 = 9x$.

$$2y + 7 = \cancel{9}^{3}\left(\frac{4 + 5y}{\cancel{3}}\right)$$

$$2y + 7 = 12 + 15y$$

$$2y - 15y = 12 - 7$$

$$-13y = 5$$

$$y = -\frac{5}{13}$$

$$x = \frac{4 + 5y}{3} = \frac{4 + 5 \times -\frac{5}{13}}{3}$$

$$= \frac{4 - \frac{25}{13}}{3} = \frac{\frac{52 - 25}{13}}{3}$$

$$= \frac{\cancel{27}^{9}}{13} \times \frac{1}{\cancel{3}} = \frac{9}{13}$$

9. Q. HCF of 65 and 117 is expressible in the form $65n - 117$. Then find the value of n.

$65 = 13 \times 5$

$117 = 13 \times 3 \times 3$

HCF = 13.

$13 = 65n - 117$

$13 + 117 = 65n$

$130 = 65n$

$\frac{\cancel{130}}{\cancel{65}} = n$

$2 = n$.

10. A die is thrown once. Find the probability of getting
I a composite number II a prime number.

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

$$P(\text{a composite number}) = \frac{2}{6} = \frac{1}{3}$$

[$\because$ composite numbers are 4 & 6]

$$P(\text{a prime number}) = \frac{3}{6} = \frac{1}{2}$$

[$\because$ prime numbers are 2, 3, 5]

11 Using completing the square method show that the equation $x^2 - 8x + 18 = 0$ has no solution

$$x^2 - 8x + 18 = 0$$

$$x^2 - 8x + (4)^2 - (4)^2 + 18 = 0$$

$$(x-4)^2 = 16 - 18$$

$$(x-4)^2 = -2 < 0$$

$(x-4)^2$ can not be negative for any real value of x

Therefore the given equation has no solution

(12) Cards number 7 to 40 were put in a box. Poonam selects a card at random what is the probability that Poonam selects a card which is a multiple of seven.

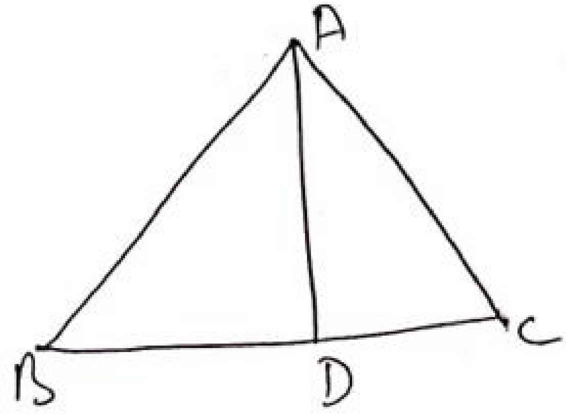
Total no of cards = 34.

P (of getting a card which is multiple of seven) $= \frac{5}{34}$

SECTION C

13) The perpendicular from A on the side BC of a triangle ABC meets BC at D such that $DB = 3CD$

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



Given :- A triangle ABC is given in which $AD \perp BC$ and $DB = 3CD$

To prove :- $2AB^2 = 2AC^2 + BC^2$

Proof :- In ΔADB $\angle D = 90$

$\Rightarrow AB^2 = AD^2 + BD^2$ I (by pythagoras)

In ΔADC $\angle D = 90$.

$AC^2 = AD^2 + DC^2$ II (by pythagoras)

Subtract I & II

$AB^2 - AC^2 = (BD)^2 - (DC)^2$

$= (3CD)^2 - (CD)^2$

$= 9CD^2 - CD^2$

$= 8CD^2$

$$AB^2 - AC^2 = 8CD^2$$

$$= 8\left(\frac{BC}{4}\right)^2$$

$$= \cancel{8}\,\frac{(BC)^2}{\cancel{16}\,2}$$

$$= \frac{BC^2}{2}$$

$\because BC = BC + CD$

$= 3CD + CD$

$= 4CD$

$\frac{1}{4} BC = CD$

$$AB^2 - AC^2 = \frac{BC^2}{2}$$

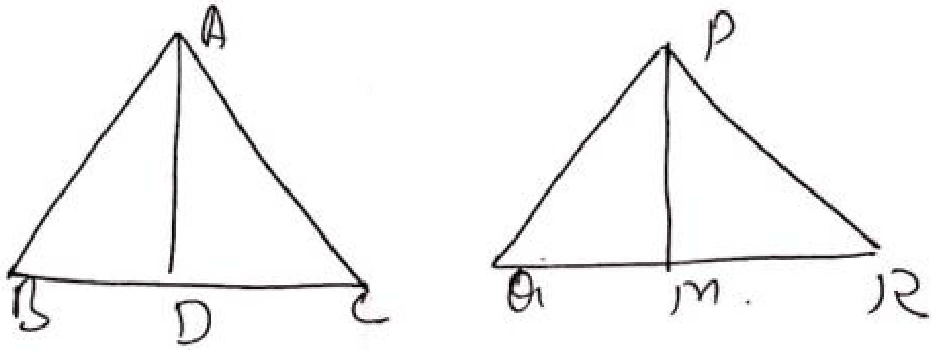
$$2AB^2 - 2AC^2 = BC^2$$

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

13) If AD and PM are medians of triangles ABC and PQR respectively where $\triangle ABC \sim \triangle PQR$. Prove that
Or.

$$\frac{AB}{PQ} = \frac{AD}{PM}.$$

Sol.



Given :- AD and PM are the medians of triangle ABC and PQR respectively $\triangle ABC \sim \triangle PQR$

To prove :- $\frac{AB}{PQ} = \frac{AD}{PM}$.

Proof :-

$\triangle ABC \sim \triangle PQR$

$$\Rightarrow \frac{AB}{PQ} = \frac{BC}{QR}$$

$$\frac{AB}{PQ} = \frac{\cancel{2}BD}{\cancel{2}QM}.$$

$$\frac{AB}{PQ} = \frac{BD}{QM} \text{ and } \angle B = \angle Q.$$

$\Rightarrow \triangle ABD \sim \triangle PQM \Rightarrow \frac{AB}{PQ} = \frac{AD}{PM}$

11) Check whether $g(x)$ is a factor of $p(x)$ by dividing polynomial $p(x)$ by polynomial $g(x)$

where $p(x) = x^5 - 4x^3 + x^2 + 3x + 1$

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

$$x^2 - 1$$

$$x^3 - 3x + 1 \,\big)\, x^5 - 4x^3 + x^2 + 3x + 1$$

$$\underline{\cancel{x^5} \underset{+}{-} 3x^3 \underset{-}{+} \cancel{x^2}}$$

$$-x^3 + 3x + 1$$

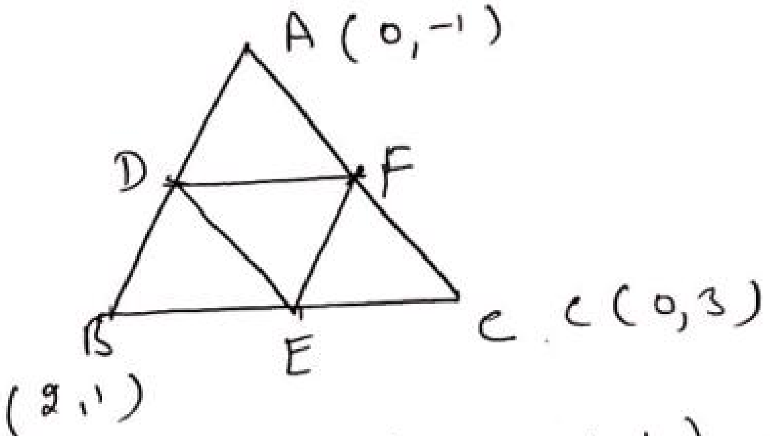
$$\underline{\cancel{\underset{+}{-}x^3} \underset{-}{+} \cancel{3x} \underset{+}{-} 1}$$

$$2$$

since remainder is 2

$g(x)$ is not factor of $p(x)$

15. Find the area of the triangle formed by joining the mid points of the sides of the triangle ABC whose vertices are A (0,-1) B (2,1) C (0,3)



Co-ordinates of D $\left(\frac{2+0}{2}, \frac{1-1}{2}\right) = (1,0)$

Co-ordinates of E $\left(\frac{2+0}{2}, \frac{1+3}{2}\right) = (1,2)$

Co-ordinates of F $\left(\frac{0+0}{2}, \frac{-1+3}{2}\right) = (0,1)$

Area of Δ DEF where

D (1,0) E (1,2) F (0,1)

$\frac{1}{2}\left(1(2-1) + 1(1-0) + 0(0-2)\right)$

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

$\frac{1}{2} \times 2 = 1$ unit.

16. Draw the graph of the equations $x-y+1=0$ and $3x+2y-12=0$ Using this graph, find the values of x and y which satisfy both the equations.

$x-y+1=0$

$x=0$ $\quad 0-y+1=0$

$y=1$

$y=0$ $\quad x-0+1=0$

$x=-1$

$x=1$ $\quad 1-y+1=0$

$-y=-2$

$y=2.$

x	0	-1	1
y	1	0	2

$3x+2y-12=0$

$x=0$ $\quad 2y-12=0$

$2y=12$

$y=6$

$y=0$ $\quad 3x+2\times0-12=0$

$3x=12$

$x=\frac{12}{3}=4$

$x=2$ $\quad 3\times2+2y-12=0$

$2y=6$

$y=3$

x	0	4	2
y	6	0	3