IX

MID-TERM EXAMINATION

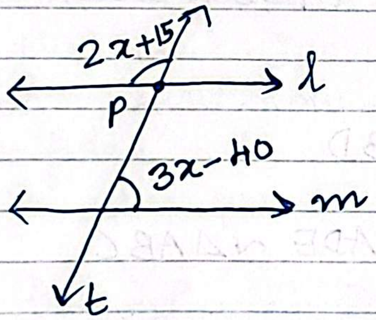
Class: IX | Max. Marks: 80
Date: 30-8-2024 | Duration: 3 hours

SECTION - A (1 mark each)

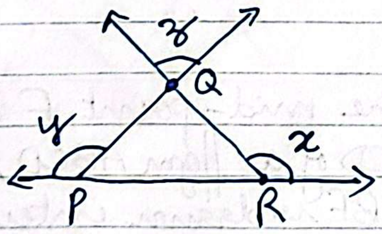
1) The number 0.737337333 is
(a) a rational number (b) an integer (c) an irrational number (d) a prime number.

2) Zero of the polynomial $p(x) = a^2x$; $a \neq 0$ is
(a) $x = 1$ (b) $x = a$ (c) $x = -1$ (d) $x = 0$

3) Which point given below satisfy the equation $2x + 3y = 12$
(a) $(-6, 8)$ (b) $(6, -8)$ (c) $(2, 3)$ (d) $(-4, 5)$

4)


Find the value of x if $l \parallel m$.
(a) $90°$ (b) $83°$
(c) $132°$ (d) $41°$

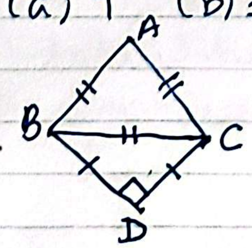
5)


Write z in terms of x and y
(a) $x + y - 180°$ (c) $x + y - 360°$
(b) $x + y + 180°$ (d) $x + y + 360°$

6) What is the coordinate of the point which lies on the y-axis at a distance 7 units in the negative direction of the y-axis?
(a) $(7, 0)$ (b) $(-7, 0)$ (c) $(0, 7)$ (d) $(0, -7)$

7) If $(x+1)$ is a factor of $p(x) = (x-1)(2x^2 + 4x + p)$, then the value of p is
(a) 1 (b) -1 (c) 2 (d) -2

8) The value of $(81)^{0.16} \times (81)^{0.09} =$ ___
(a) 9 (b) 3 (c) 81.25 (d) 27

9)


$\triangle ABC$ is an equilateral $\triangle$ and $\triangle BDC$ is an isosceles right angled triangle, then $\angle ABD =$ ___ (a) $45°$ (b) $60°$ (c) $105°$ (d) $120°$

10) Which of the following is/are correct ?

(i) Every integer is a rational number

(ii) Every rational number is an integer

(iii) a real number is either a rational or irrational number

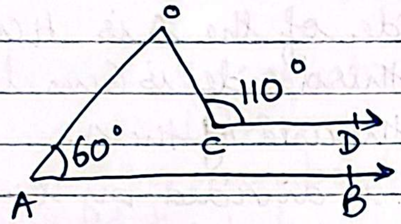
(iv) Every whole number is a natural number

(a) (ii) (b) (iii) (c) (i) and (iii) (d) all of these

11) Value of $\left[9\left(64^{\frac{1}{3}}+125^{\frac{1}{3}}\right)\right]^{\frac{1}{4}}$ is

(a) 9 (b) 3 (c) 81 (d) $9\cdot\sqrt[4]{9}$

12)



$AB \parallel CD$, $\angle BAO = 60°$, $\angle OCD = 110°$, then $\angle AOC =$ ___

(a) 40° (b) 50° (c) 60° (d) 70°

13) Equation of line parallel to y-axis and passing through point (−3, 7) is

(a) $x=-3$ (b) $y=-3$ (c) $z=7$ (d) $x=-7$

14) Zero of zero polynomial is

(a) 0 (b) 1 (c) any real number (d) none of these

15) One of the factors of $(25x^2-1)+(1+5x)^2$ is

(a) $5+x$ (b) $5-x$ (c) $5x-1$ (d) $10x$

16) The angle which is eight time its complement is

(a) 80° (b) 72° (c) 90° (d) 88°

17) If the altitude of an equilateral Δ is $4\sqrt{3}$ cm, its area is ___

(a) $9\sqrt{3}\,cm^2$ (b) $6\sqrt{3}\,cm^2$ (c) $3\sqrt{3}\,cm^2$ (d) $16\sqrt{3}\,cm^2$

18) The area of right Δ in which hypotenuse is 13cm and one side is 5cm is

(a) $45\,cm^2$ (b) $30\,cm^2$ (c) $90\,cm^2$ (d) $60\,cm^2$

19) Assertion :- $a^3(b-c)^3+b^3(c-a)^3+c^3(a-b)^3=3(a-b)(b-c)(c-a)$

Reason :- If $(a+b+c)=0$, then $a^3+b^3+c^3=3abc$

(a) assertion and reason are true and reason is the correct explanation

(b) both assertion and reason are true but reason is not the correct explanation of assertion.

(c) assertion is true but reason is false

(d) assertion is false but reason is true.

20) Assertion:- the measure of an angle which exceeds its complement by 30° is 80°

Reason:- Two angles are said to be complementary if their sum of measure of angles is 180°.

SECTION-B (2 marks each)

21) Find five rational numbers between $\frac{1}{6}$ and $\frac{1}{3}$

22) The perimeter of a Δ is 50 cm. One side of the Δ is 4 cm longer than the smaller side and third side is 6 cm less than twice the smaller side. Find the area of the Δ.

23) Find the remainder when $x^{11}+101$ is divided by $x+1$

24) Find the coordinates of the vertices of a rectangle whose length and breadth are 6 units and 3 units respectively, one vertex at the origin, the longer side lies on the y-axis and one of the vertices lies in the second quadrant.

25) Represent $\sqrt{10}$ on number line

(Or)

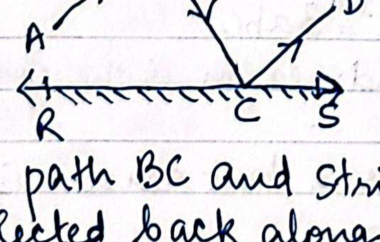
Represent $\sqrt{9.5}$ on number line

SECTION-C (3 marks each)

26) If $\sqrt{3} = 1.732$ and $\sqrt{2} = 1.414$, find the value of $\frac{1}{\sqrt{3}-\sqrt{2}}$

27) Factorise: $2x^3 - 3x^2 - 17x + 30$

28)



PQ and RS are two mirrors placed parallel to each other. Incident ray AB strikes PQ at B and reflected ray moves along the path BC and strikes the mirror RS at C and again reflected back along CD. Prove that AB||CD.

29) Find three solutions of the linear equation $2x - y = 4$.

30) Simplify : $\sqrt{625} - 8\sqrt[3]{125} + \sqrt[4]{81} + 15\sqrt[5]{32}$

31) Prove that when two lines intersect each other vertically opposite angles are equal.

SECTION-D (5 marks each)

32) The cost of a toy horse is same as that of cost of 3 balls. Express this statement as a linear equation in two variables Also draw its graph

(Or)

Solve the equation $2x+1 = x-3$ and represent the solution(s) on

(i) the number line (ii) the cartesian plane.

33) (i) Find the value of a and b in the following

$$\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = a-b\sqrt{6}$$

(ii) If $a = 6+2\sqrt{3}$, find the value of $a-\frac{1}{a}$

34) (i) If $x+\frac{1}{x}=5$, find the value of $x^4+\frac{1}{x^4}$

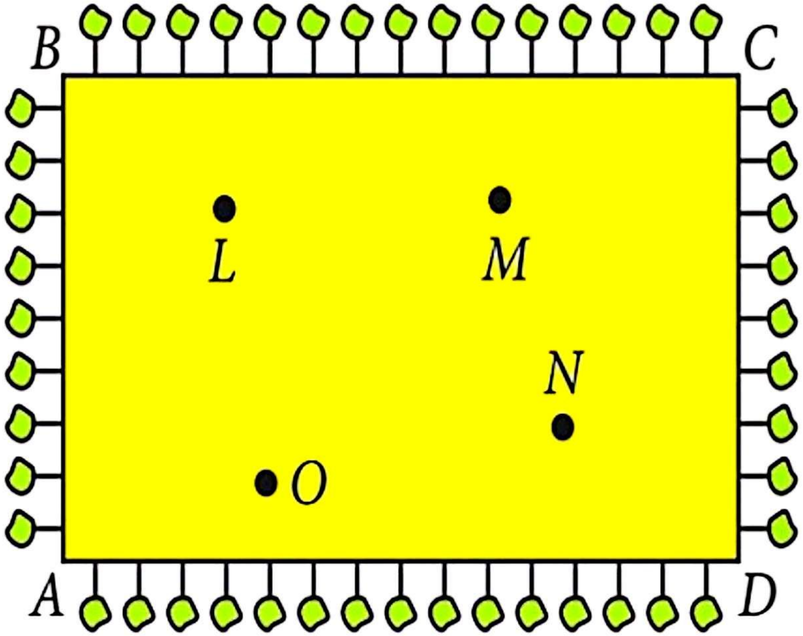
(ii) If the polynomials az^3+4z^2+3z-4 and z^3-4z+a leave the same remainder, when divided by $z-3$, find the value of a.

35) The lengths of the sides of a Δ are 7cm, 13cm and 12cm. Find the length of perpendicular from the opposite vertex to the side whose length is 12cm.

SECTION-E (4 marks each)

On the occasions of `Diwali' a rectangular plot have been allotted for 'Diwali Mela' to students of secondary school in Hyderabad. In order to reduce smog and pollution they decided to keep little leaf linden plant on the boundary at a distance of 1 m from each other. Four air purifier machines have also been set up at points L, M, N, O. (Answer the following questions considering A as origin).

36)



Based on the above information, answer the following questions.

1 What are the coordinates of L?

(a) (4, 7) (b) (7, 4) (c) (7, 3) (d) (4, 8)

2 What are the coordinates of N?

(a) (3, 12) (b) (12, 5) (c) (12, 3) (d) None of these

3 Distance between L and N is

(a) $6\sqrt{5}$ units (b) $4\sqrt{5}$ units (c) $3\sqrt{5}$ units (d) None of these

4 Considering D as origin, what are the coordinates of M?

(a) (-6, 7) (b) (7, 6) (c) (-7, 7) (d) (6, 6)

Case Study – 2

On his birthday, Manoj planned that this time he celebrates his birthday in a small orphanage centre. He bought apples to give to children and adults working there. Manoj donated 2 apples to each children and 3 apples to each adult working there along with Birthday cake. He distributed 60 total apples.

37)

Based on the above information, answer the following questions.

1 How to represent the above situation in linear equations in two variables by taking the number of children as 'x' and the number of adults as 'y'?

(a) $2x + y = 60$ (b) $2x + 3y = 60$ (c) $3x + 2y = 60$ (d) $3x + y = 60$

2 If the number of children is 15, then find the number of adults?

(a) 10 (b) 15 (c) 25 (d) 20

3 If the number of adults is 12, then find the number of children?

(a) 12 (b) 15 (c) 14 (d) 18

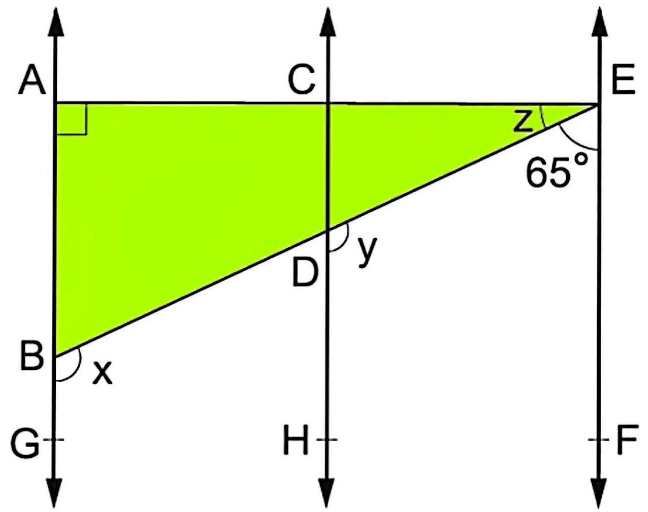
4 . Find the value of b, if $x = 5$, $y = 0$ is a solution of the equation $3x + 5y = b$.

(a) 12 (b) 15 (c) 14 (d) 18

Case Study – 1

In a society, a triangular shaped park is there and three parallel roads AB || CD || EF are there in which one road CD is in the middle of the park shown in given below figure.

38)



Based on the figure and situation, Answer the following questions:

1 Find the value of y.
(a) 150° (b) 115° (c) 110° (d) None of these

2 . Find the value of z.
(a) 90° (b) 80° (c) 70° (d) None of these

3 Find the value of y.
(a) 150° (b) 115° (c) 110° (d) None of these

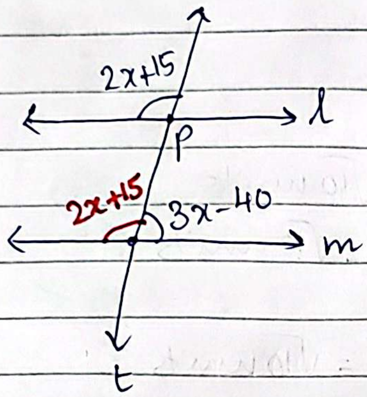
4 Find ∠ABD.
(a) 55° (b) 45° (c) 65° (d) None of these

IX Mid-term Examination (Answers)

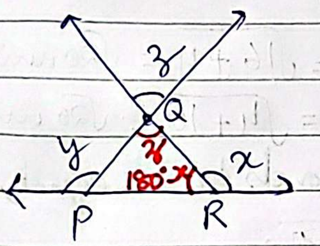
1) rational number (a)
Since the decimal expansion is terminating.

2) put $p(x) = 0$
$\Rightarrow a^2 x = 0$
$x = \frac{0}{a^2} = 0$ (d)

3) $(-6, 8)$ (a)
LHS, $2 \times (-6) + 3 \times 8 = -12 + 24 = 12$, RHS

4)


$2x + 15^\circ + 3x - 40^\circ = 180^\circ$ (linear pair)
$5x - 25 = 180^\circ$
$5x = 205^\circ$
$x = 41^\circ$ (d)

5)


$\angle PQR = z$ (VOA)
$\angle QRP = 180^\circ - x$ (linear pair)
Using exterior angle property in $\triangle PQR$,
$y = z + 180^\circ - x$
$\therefore z = x + y - 180^\circ$ (a)

6) $(0, -7)$ (d)

7) $p(-1) = 0$
$\Rightarrow (-1-1)(2(-1)^2 + 4(-1) + p) = 0$
$\Rightarrow -2(2 - 4 + p) = 0$
$\Rightarrow -2(-2 + p) = 0$
$(-2 + p) = 0$
$p = 2$ (c)

8) $(81)^{0.16} + (81)^{0.09} = (81)^{0.16+0.09} = (81)^{0.25} = 3^{4 \times \frac{1}{4}} = 3$ (b)

9) $\angle ABC + \angle DBC = \angle ABD$
$\therefore \angle ABD = 60^\circ + 45^\circ = 105^\circ$ (c)

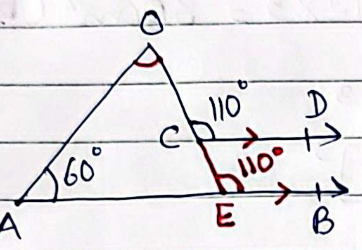
10) (i) and (iii) (c)

11) $\left[9\left(64^{\frac{1}{3}}+125^{\frac{1}{3}}\right)\right]^{\frac{1}{4}} = \left[9\left(4^{\cancel{3}\times\frac{1}{\cancel{3}}}+5^{\cancel{3}\times\frac{1}{\cancel{3}}}\right)\right]^{\frac{1}{4}}$

$= \left[9\ (4+5)\right]^{4}$

$= (9\times9)^{4} = (81)^{4} = 3^{\cancel{4}\times\frac{1}{\cancel{4}}} = 3$ (b)

12)



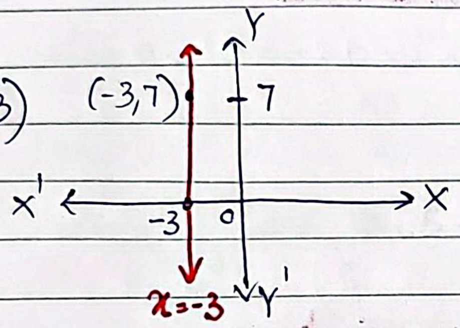
$\angle OCD = \angle OEB = 110^\circ$ (corresponding angles)

Using exterior angle property,

$\angle AOE = 110^\circ - 60^\circ = 50^\circ$

$\therefore \angle AOC = 50^\circ$ (b)

13)



$x = -3$ (a)

14) any real number (c)

15) $(25x^2-1)+(1+5x)^2 = 25x^2\cancel{-1}\cancel{+1}+25x^2+10x$

$= 50x^2+10x$

$= 10x(5x+1)$

One of the factors is $10x$ (d)

16) Let the angle be x

$x = 8(90^\circ - x)$

$x = 720^\circ - 8x$

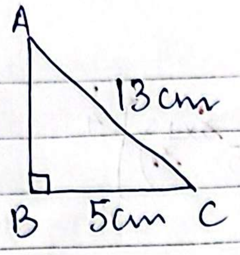
$9x = 720^\circ$

$x = 80^\circ$ (a)

17) $\frac{\cancel{\sqrt{3}}a}{2} = 4\cancel{\sqrt{3}}$

$a = 8cm$

area $= \frac{\sqrt{3}a^2}{4} = \frac{\sqrt{3}\times64}{4} = 16\sqrt{3}cm^2$ (d)

18) 

Using Pythagoras theorem,

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

$169 = AB^2 + 25$

$AB^2 = 169 - 25 = 144$

$AB = \sqrt{144} = 12cm$

$\therefore$ area $(\Delta ABC) = \frac{1}{2} \times AB \times BC = \frac{1}{2} \times 12 \times 5 = 30cm^2$ (b)

19) $a^3(b-c)^3 + b^3(c-a)^3 + c^3(a-b)^3$

$= [a(b-c)]^3 + [b(c-a)]^3 + [c(a-b)]^3$

$= 3abc(b-c)(c-a)(a-b)$

(d) assertion is false but reason is true

20) Let the angle be x

$x - (90° - x) = 30°$

$x - 90° + x = 30°$

$2x = 120°$

$x = 60°$

(d) assertion is false but reason is true

SECTION-B

21) $\frac{1}{6}$ $\quad$ $\frac{1 \times 2}{3 \times 2}$

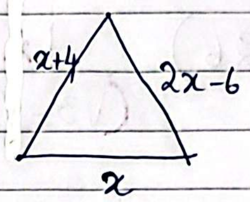
$\frac{1 \times 6}{6 \times 6}$ $\quad$ $\frac{2 \times 6}{6 \times 6}$

$\frac{6}{36}$ $\quad$ $\frac{12}{36}$

$\therefore$ 5 rational no.s are $\frac{7}{36}, \cancel{\frac{8}{36}}^{\frac{2}{9}}, \cancel{\frac{9}{36}}^{\frac{1}{4}}, \cancel{\frac{10}{36}}^{\frac{5}{18}}, \frac{11}{36}$

$= \frac{7}{36}, \frac{2}{9}, \frac{1}{4}, \frac{5}{18}, \frac{11}{36}$

22) Let the smaller side be x cm
Then, the other sides are $(x+4)$ cm and $(2x-6)$ cm.



Perimeter $= x + x + 4 + 2x - 6 = 50$

$$4x - 2 = 50$$
$$4x = 52$$
$$x = \frac{52}{4} = 13\text{cm}$$

$\therefore$ The sides are $x = 13$cm

$$x + 4 = 17\text{cm}$$
$$2x - 6 = 26 - 6 = 20\text{ cm}$$

Let $a = 13$cm, $b = 17$cm and $c = 20$cm

$$S = \frac{a+b+c}{2} = \frac{50}{2} = 25\text{cm}$$

area of $\Delta = \sqrt{S(S-a)(S-b)(S-c)}$

$$= \sqrt{25(25-13)(25-17)(25-20)}$$

$$= \sqrt{25 \times \underset{4\times3}{12} \times \underset{4\times2}{8} \times 5}$$

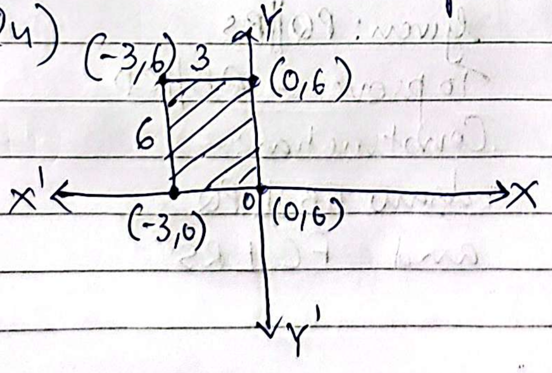
$$= 5 \times 4 \times \sqrt{30}$$

$$= \underline{\underline{20\sqrt{30}\text{ cm}^2}}$$

23) Let $p(x) = x^{11} + 101$

remainder $= p(-1) = (-1)^{11} + 101 = -1 + 101 = \underline{\underline{100}}$

24)



Vertices of the required rectangle are $(0,0)$, $(0,6)$, $(-3,6)$ and $(-3,0)$.

25) Construction

SECTION-C

26) $\dfrac{1\times(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = \dfrac{\sqrt{3}+\sqrt{2}}{(\sqrt{3})^2-(\sqrt{2})^2} = \dfrac{\sqrt{3}+\sqrt{2}}{3-2} = \sqrt{3}+\sqrt{2}$

$= 1.732 + 1.414$

$= \underline{\underline{3.146}}$

27) $2x^3 - 3x^2 - 17x + 30$

Let $p(x) = 2x^3 - 3x^2 - 17x + 30$

Factors of 60 are $\pm 1, \pm 2, \pm 3$ etc

$p(1) = 2 - 3 - 17 + 30 = 32 - 20 = 12 \neq 0$

$p(2) = 2\times 8 - 3\times 4 - 17\times 2 + 30 = 16 - 12 - 34 + 30$

$= 46 - 46 = 0$

$\therefore (x-2)$ is a factor of $p(x)$

On dividing $p(x)$ by $(x-2)$,

$$\begin{array}{r|l} & 2x^2 + x - 15 \\ \hline x-2 & 2x^3 - 3x^2 - 17x + 30 \\ & \overset{(-)}{\cancel{2x^3}} \overset{(+)}{-} 4x^2 \\ \hline & \cancel{x^2} - 17x + 30 \\ & \overset{(-)}{\cancel{x^2}} \overset{(+)}{-} 2x \\ \hline & -\cancel{15x} + \cancel{30} \\ & \overset{(+)}{-}\cancel{15x} \overset{(-)}{+} \cancel{30} \\ \hline & \underline{\underline{0}} \end{array}$$

quotient $= 2x^2 + x - 15$

remainder $= 0$

Using division algorithm,

$p(x) = (x-2)(2x^2 + x - 15) + 0$

$= (x-2)(2x^2 + 6x - 5x - 15)$

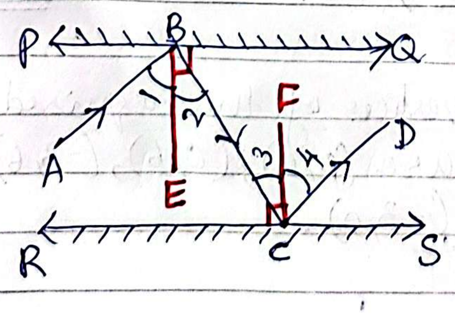
$= (x-2)[2x(x+3) - 5(x+3)]$

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

S P

1 −30

6, −5

28) 

Given: $PQ \parallel RS$

To prove :- $AB \parallel CD$

Construction:-

draw $EB \perp PQ$

and $FC \perp RS$

Proof :- Since $EB \perp PQ$ and $FC \perp RS$ and also $PQ \parallel RS$,
$EB \parallel FC$.

Using laws of reflection, $\angle 1 = \angle 2$ (angle of incidence = angle of reflection)
and $\angle 3 = \angle 4$

$\angle 2 = \angle 3$ (alternate interior angles, $BE \parallel FC$)

$\Rightarrow 2\angle 2 = 2\angle 3$

$\Rightarrow \angle ABC = \angle BCD$ [$\because \angle 1 = \angle 2$ and $\angle 3 = \angle 4$]

These angles form a pair of alternate interior angles only when $AB \parallel CD$.

Hence proved.

29) $2x - y = 4$

$2x - 4 = y$

$y = 2x - 4$

x	0	1	2
y	-4	-2	0

When $x = 0$, $y = -4$

When $x = 1$, $y = 2 - 4 = -2$

When $x = 2$, $y = 4 - 4 = 0$

30) $\sqrt{625} - 8\sqrt[3]{125} + \sqrt[4]{81} + 15 \times \sqrt[5]{32}$

$= 25 - 8 \times 5 + 3^{4 \times \frac{1}{4}} + 15 \times 2^{5 \times \frac{1}{5}}$

$= 25 - 40 + 3 + 15 \times 2$

$= 25 - 40 + 3 + 30$

$= 58 - 40$

$= \underline{\underline{18}}$

31) Do yourself

SECTION – D

32) Let the cost of 1 ball be ₹x and that of 1 toy horse be ₹y

ATQ, $y = 3x$

$\Rightarrow 3x - y + 0 = 0$ is the required linear equation in two variables in the form $ax + by + c = 0$.

For the graph, $y = 3x$

x	0	1	2
y	0	3	6

(graph)

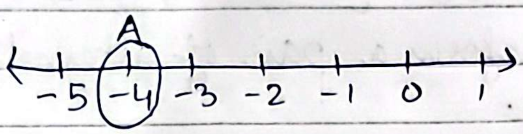
Or

$2x+1 = x-3$

$2x - x = -3-1$

$x = -4$

(i) On the number line



A represents -4 on the number line

(ii) On the cartesian plane
(graph)

33 (i) $\dfrac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = \dfrac{(\sqrt{2}+\sqrt{3})(3\sqrt{2}+2\sqrt{3})}{(3\sqrt{2}-2\sqrt{3})(3\sqrt{2}+2\sqrt{3})}$

$= \dfrac{3\times2 + 2\sqrt{6} + 3\sqrt{6} + 2\times3}{(3\sqrt{2})^2 - (2\sqrt{3})^2}$

$= \dfrac{6+5\sqrt{6}+6}{18-12} = \dfrac{12+5\sqrt{6}}{6}$

$= \dfrac{12}{6} + \dfrac{5}{6}\sqrt{6} = 2 + \dfrac{5}{6}\sqrt{6}$

On Comparing, $a = 2, b = -\dfrac{5}{6}$

(ii) $a = 6+2\sqrt{3}$

$\dfrac{1}{a} = \dfrac{1}{6+2\sqrt{3}} = \dfrac{6-2\sqrt{3}}{(6+2\sqrt{3})(6-2\sqrt{3})} = \dfrac{6-2\sqrt{3}}{(6)^2-(2\sqrt{3})^2} = \dfrac{6-2\sqrt{3}}{36-12}$

$= \dfrac{6-2\sqrt{3}}{24} = \dfrac{2(3-\sqrt{3})}{24} = \dfrac{3-\sqrt{3}}{12}$

$\therefore a - \dfrac{1}{a} = 6+2\sqrt{3} - \dfrac{(3-\sqrt{3})}{12} = \dfrac{72+24\sqrt{3}-3+\sqrt{3}}{12} = \dfrac{69+25\sqrt{3}}{12}$

34) (i) $x + \frac{1}{x} = 5$

$\left(x + \frac{1}{x}\right)^2 = 25$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 25$

$\therefore x^2 + \frac{1}{x^2} = 23$

$\left(x^2 + \frac{1}{x}\right)^2 = (23)^2$

$\Rightarrow x^4 + \frac{1}{x^4} + 2 = 529$

$\therefore x^4 + \frac{1}{x^4} = 527$ //

(ii) Let $p(z) = az^3 + 4z^2 + 3z - 4$ and $f(z) = z^3 - 4z + a$

$p(3) = 27a + 4\times9 + 3\times3 - 4$

$= 27a + 36 + 9 - 4$

$= 27a + 41$

$f(3) = 27 - 4\times3 + a$

$= 27 - 12 + a$

$= 15 + a$

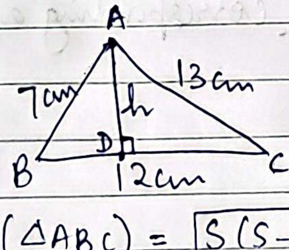
ATQ, $p(3) = f(3)$

$\Rightarrow 27a + 41 = 15 + a$

$\Rightarrow 26a = -26$

$\boxed{a = -1}$

35)



Let $a = 7cm$, $b = 13cm$, $c = 12cm$

$s = \frac{a+b+c}{2} = \frac{7+13+12}{2} = \frac{32}{2} = 16cm$

area $(\triangle ABC) = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{16\times9\times3\times4} = 4\times3\times2\sqrt{3}$

$= 24\sqrt{3}cm^2$ //

Also, Area $(\triangle ABC) = \frac{1}{2}\times BC \times AD$

$\Rightarrow 24\sqrt{3} = \frac{1}{2}\times12\times h$

$h = \frac{24\sqrt{3}}{6} = 4\sqrt{3}cm$ //

$\therefore$ length of required perpendicular $= 4\sqrt{3}cm$

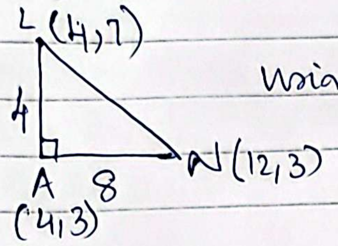
~~36~~

SECTION-E

36) (i) L(4,7) (a)

(ii) N(12,3) (c)

(iii)



using Pythagoras theorem,

$LN^2 = LA^2 + AN^2$

$= 16 + 64$

$= 80$

$LN = \sqrt{80} = 4\sqrt{5}$ units (b)

5 | 80
2 | 16
2 | 8
2 | 4
2

(iv) M(−6,7)

37) (i) $2x + 3y = 60$ (b)

(ii) When $x = 15$, $2 \times 15 + 3y = 60$

$3y = 60 - 30 = 30$

$y = 10$ (a)

(iii) When $y = 12$, $2x + 3 \times 12 = 60$

$2x = 60 - 36 = 24$

$x = 12$ (a)

(iv) $3x + 5y = b$

$3 \times 5 + 5 \times 0 = b$

$\therefore b = 15$ (b)

38) ~~(i)~~ Since AB || EF, $90° + z + 65° = 180°$ (co-interior angles)

$z = 180° - 155 = 25°$

Since EF || CD, $y + 65° = 180°$ (cointerior angles)

$y = 180° - 65° = 115°$

$x = y = 115°$ (corresponding angles)

(i) $y = 115°$ (b)

(ii) $z = 25°$ (d)

(iii) $y = 115°$ (b)

(iv) $\angle ABD = 180° - x$ (linear pair)

$= 180° - 115°$

$= 65°$ (c)