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MID TERM EXAMINATION, SEPTEMBER, 2024

SUBJECT: MATHEMATICS | **TIME ALLOWED: 3 HOURS**
GRADE: 09 | **MAXIMUM MARKS: 80**
SUBJECT CODE: 041 | **DATE: 09/09/2024**

General Instructions:

1. *This Question Paper has 5 Sections A-E.*
2. *Section A has 20 MCQs carrying 1 mark each*
3. *Section B has 5 questions carrying 2 marks each.*
4. *Section C has 6 questions carrying 3 marks each.*
5. *Section D has 4 questions carrying 5 marks each.*
6. *Section E has 3 case based integrated units of assessment (4 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.*
7. *All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E*
8. *Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated*

Q No: | MARKS

Section-A
Section has 20 questions of 1 mark each.

1 Rationalising factor for the denominator of the expression $\frac{1}{3+\sqrt{5}}$ is 1

a. $3+\sqrt{5}$ b. $5-\sqrt{3}$ c. $\sqrt{3}+5$ d. $3-\sqrt{5}$

2 $\sqrt{2}$ is a polynomial of degree 1

a. 2 b. 0 c. 1 d. 0.5

3 The decimal expansion of the number $\sqrt{2}$ is 1

a. a finite decimal b. 1.414
c. non-terminating recurring d. non-terminating non-recurring

4 If $p(x) = x^2 - 3\sqrt{2}x - 1$, then $p(3\sqrt{2})$ is equal to 1

a. $6\sqrt{2}-1$ b. 0 c. $3\sqrt{2}-1$ d. -1

5 If $x^{51} + 51$ is divided by $x + 1$, the remainder is 1

a. 0 b. 1 c. 49 d. 50

6 The value of 2.999… in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$, is 1

a. $\frac{2999}{1000}$ b. $\frac{19}{10}$ c. 3 d. $\frac{26}{9}$

7 The factors of $(1-x^3)$ are 1

a. $(1+x)(1-x+x^2)$ b. $(1-x)(1+x+x^2)$
c. $(1+x)(1-x^2)$ d. $(1+x)(1+x^2)$

8 If (2,0) is a solution of the linear equation $2x + 3y = k$, then the value of k is 1

a. 4 b. 6 c. 5 d. 2

9 The solution of the equation $\frac{x}{2} + \frac{x}{3} = 5$ is 1

a. 5 b. 6 c. 4 d. 7

10 Point $(-3,5)$ lies in the 1

a. first quadrant b. second quadrant

c. third quadrant d. fourth quadrant

11 If the coordinates of two points are $P(-2,3)$ and $Q(-3,5)$ then 1
$(abscissa\ of\ P) - (abscissa\ of\ Q)$ is

a. -2 b. -5 c. 1 d. -1

12 If we multiply or divide both sides of a linear equation with a non-zero number, 1
then the solution of the linear equation

a. changes b. remains the same

c. changes in case of multiplication only d. changes in case of division only

13 The number of dimensions a point has 1

a. 0 b. 1 c. 2 d. 3

14 If the difference between two supplementary angles is 40^0, then the angles are 1

a. $65^0, 125^0$ b. $210^0, 150^0$ c. $70^0, 110^0$ d. None of these

15 The angle which exceeds its complement by 30^0 is 1

a. 150^0 b. 120^0 c. 60^0 d. 80^0

16 Meena drew a figure and named it $\overleftrightarrow{AB}$. Which of the following best describes 1
the figure Meena drew?

a. it is an angle b. it is a line segment

c. it could be a line segment or a ray d. it could be a line or a line segment

17 If "equals be added to equals the wholes are equal" is stated in the form of 1

a. an axiom b. a definition c. a postulate d. a proof

18 Which words complete the statement below: 1
When two lines intersect, _____ pairs of adjacent angles are formed and all pairs are _____.

a. 2: supplementary b. 2: complementary

c. 4: supplementary d. 4: complementary

19 **Assertion (A):** 3 is one of the zero of the polynomial $p(x) = x^3 - 3x^2 + 4x - 12$ 1
then $p(3) = 0$

Reasoning (R): If $(x - a)$ is a factor of $x^3 - a^2x + x + 2$ then $a = -2$

a. Both **A** and **R** are true and **R** is the correct explanation of **A**
b. Both **A** and **R** are true and **R** is not the correct explanation of **A**
c. **A** is true but **R** is false
d. **A** is false but **R** is true

20 **Assertion (A):** If a ray $\overrightarrow{CD}$ stands on a line $\overleftrightarrow{AB}$ such that $\angle ACD = \angle BCD$, then 1
$\angle ACD = 90^0$

Reason (R): If a ray $\overrightarrow{CD}$ stands on a line $\overleftrightarrow{AB}$ such that $\angle ACD + \angle BCD = 180^0$

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SECTION B

Section has 5 questions of 2 marks each.

21 Classify the following numbers as rational or irrational and give justification of your answer. 2

a. 0.05918 b. 1.010010001...

c. $\sqrt{\frac{9}{27}}$ d. $\frac{12}{75}$

22 Factorise : $185 \times 185 - 15 \times 15$ 2

23 Solve the equation $u - 5 = 15$ and state the axiom that you use here. 2

24 Simplify $\left(\frac{3125}{243}\right)^{-\frac{4}{5}}$ 2

OR

Simplify: $(3\sqrt{5} - 5\sqrt{2})(4\sqrt{5} + 3\sqrt{2})$

25 Which axis is parallel to the line on which the two points $(4,3)$ and $(4,-2)$ lie? 2

OR

Without plotting the points indicate the quadrant in which the points will lie if:

(i) Ordinate is -3 and abscissa is -2

(ii) Abscissa is 5 and ordinate is -6

SECTION C

Section has 6 questions of 3 marks each.

26 Simplify $\sqrt[4]{81} - 8\sqrt[3]{216} + 15\sqrt[5]{32} + \sqrt{225}$ 3

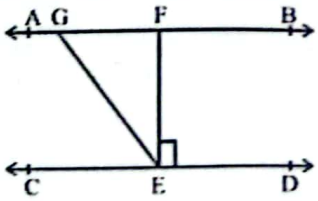
27 Locate $\sqrt{9.5}$ on the number line 3

28 Factorise $5x^2 + 30x + 40$ by splitting the middle term 3

OR

Factorise: $125x^3 + 27y^3 + 8z^3 - 90xyz$

29 In Figure, if AB || CD, $EF \perp CD$ and $\angle GED = 126°$, find $\angle AGE$, $\angle GEF$ and $\angle FGE$ 3



30 Without actually calculating the cubes, find the value of : 3

$$\left(\frac{-3}{4}\right)^3 + \left(\frac{-5}{8}\right)^3 + \left(\frac{11}{8}\right)^3$$

a. 5 b. 6 c. 4 d. 7

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OR

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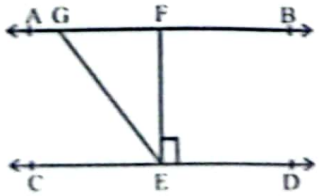
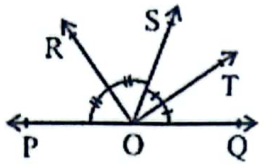


30 Without actually calculating the cubes, find the value of : 3

$$\left(\frac{-3}{4}\right)^3 + \left(\frac{-5}{8}\right)^3 + \left(\frac{11}{8}\right)^3$$

31 In Figure, ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of $\angle POS$ and $\angle SOQ$, respectively. If $\angle POS = x$, find $\angle ROT$. 3



OR

It is given that $\angle XYZ = 64°$ and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects $\angle ZYP$, find $\angle XYQ$ and reflex $\angle QYP$.

SECTION D

Section has 4 questions of 5 marks each.

32 Using factor theorem, factorise the polynomial $x^3 + x^2 - 4x - 4$ 5

OR

Factorise: $x^8 - y^8$

33 a. For what value of c, the linear equation $2x + cy = 8$ has equal values of x and y as its solution? 2

b. Write three solutions of the equation $4x - 5y = 15$ 3

OR

a. Write the linear equation $3x + 2y = 18$ in the form of $ax + by + c = 0$. Also write the values of a, b and c. Are $(4, 3)$ and $(1, 2)$ solutions of this equation? 3

b. If the length of a rectangle is decreased by 3 units and breadth increased by 4 units, then the area will increase by 9 sq. units. Represent this equation as a linear equation in two variables. 2

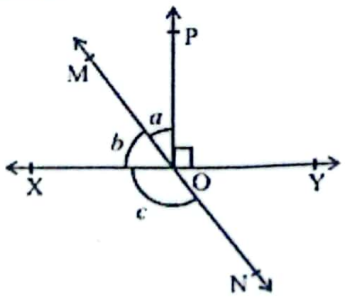
34 Simplify:

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

b. If $x = 2 + \sqrt{3}$, find the value of $x^2 + \frac{1}{x^2}$ 2

35 a. If a transversal intersects two lines such that the bisectors of a pair of corresponding angles are parallel, then prove that the two lines are parallel. 3

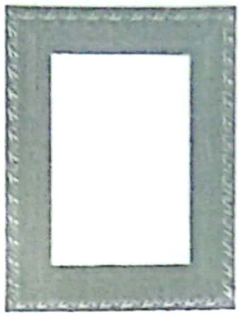
b. In Figure, lines XY and MN intersect at O. If $\angle$ POY = 90° and a : b = 2 : 3, find c. 2



SECTION E – CASE STUDY

Section has 3 questions of 4 marks each.

36 Read the following and answer the questions that follow:
Kavita made a scenery for gift so that she can gift it to her best friend on her birthday. The length of the photo-frame is thrice its breadth. Let the length and breadth of the photo-frame be x and y respectively.



Based on the above information, answer the following questions:

a. Write the linear equation which satisfies the above information. 1

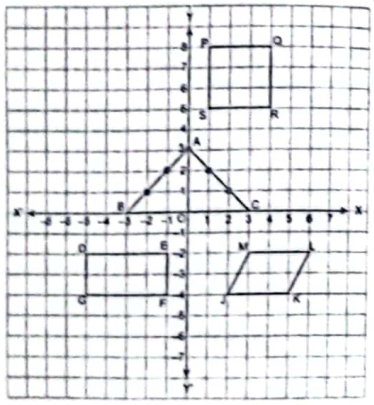
b. What are the number of solutions that satisfy the equation? 1

c. Does (6,2), (3, 2), (8,2) and (4, 1) satisfy the above equation 2

OR

If the value of y is 4, find the value of x, also write it in the standard form

37 Divit is learning geometrical shapes. He draws some of them on a squared paper. The vertical lines through the centre of the triangle and the base of the triangle are the coordinate axes for the sheet



Based on the above information, answer the following questions:

a. Which one of the following are not the coordinates of the vertex of any of the triangles $(0,3),(3,0),(-3,0),(0,-3)$ 1

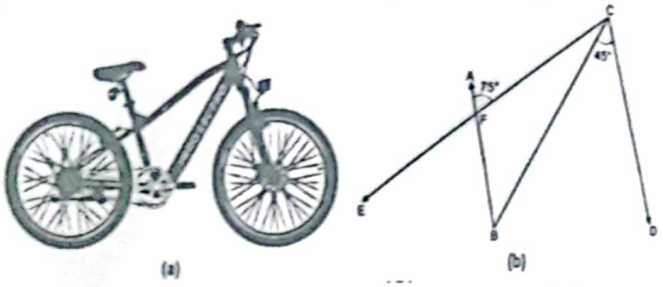
b. Write the coordinates of the vertices of the rectangle $DEFG$ 1

c. What are the vertices of the parallelogram JKLM. 2

OR

What is the length of the square PQRS and also find it's area.

38 Tejinder singh bought an electric cycle for his son. He saw his bicycle and felt very happy. After seeing the bicycle he thought of some geometrical figures.



(a) (b)

Based on the above information, answer the following questions:

a. From the above geometrical figure find $\angle CBF$, if $\angle BCD = 45^0$ and AB||CD? 1

b. In the given figure, if $\angle AFC = 75^0$, then find $\angle CFB$ 1

c. Find $\angle FCB$ in the given figure? 2

OR

What is the value of $\angle EFB$?

****

IX **H.W-13**

1) $\frac{1}{(3+\sqrt{5})(3-\sqrt{5})} \times (3-\sqrt{5}) = \frac{3-\sqrt{5}}{9-5} = \frac{3-\sqrt{5}}{4}$

∴ the rationalising factor is $3-\sqrt{5}$ (d)

2) $\sqrt{2}x^0$

degree = 0 (b)

3) $\sqrt{2}$ is an irrational number. Its decimal expansion is non-terminating non-recurring (d)

4) $p(x) = x^2 - 3\sqrt{2}x - 1$

$p(3\sqrt{2}) = (3\sqrt{2})^2 - 3\sqrt{2} \times 3\sqrt{2} - 1$

$= 18 - 18 - 1$

$= -1$ (d)

5) $p(x) = x^{51} + 51$

$p(-1) = (-1)^{51} + 51 = -1 + 51 = 50$ (d)

6) 3 (c)

7) $1 - x^3 = (1-x)(1+x+x^2)$ (b)

8) When $x = 2, y = 0$

$2 \times 2 + 3 \times 0 = k$

∴ $k = 4$ (a)

9) $\frac{x}{2} \times \frac{3}{3} + \frac{x}{3} \times \frac{2}{2} = 5$

$\frac{3x + 2x}{6} = 5$

$5x = 30$

$x = 6$ (b)

10) Second quadrant (b)

11) abscissa of $P = -2$

Abscissa of $Q = -3$

∴ $-2 - (-3) = -2 + 3 = 1$ (c)

12) remains the same (b)

13) 0 (a)

14) Let the two supplementary angles be x° and $(180-x)^\circ$

$$x-(180^\circ-x)=40^\circ$$
$$x-180^\circ+x=40^\circ$$
$$2x=40^\circ+180^\circ=220$$
$$x=110^\circ$$

∴ The angles are 110° and 70° (c)

15) Let the angle be x

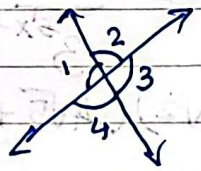
$$x-(90^\circ-x)=30^\circ$$
$$x-90^\circ+x=30^\circ$$
$$2x=120^\circ$$
$$x=60^\circ$$ (c)

16) it could be a line or a line segment (d)

17) an axiom (a)

18) $(\angle 1,\angle 2),(\angle 2,\angle 3),(\angle 3,\angle 4),(\angle 4,\angle 1)$

4 ; Supplementary (c)



19) $p(3)=(3)^3-3(3)^2+4\times3-12=27-27+12-12=0$ True

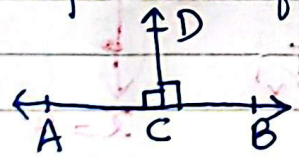
$p(a)=0$

$\Rightarrow a^3-a^3+a+2=0$

$a=-2$ True

(b) Both A and R are true and R is not the correct explanation of A.

20)



(a) Both A and R are true and R is the correct explanation of A.

21) (a) $0.05918 \Rightarrow$ rational number since the decimal expansion is terminating.

(b) $1.010010001\ldots \Rightarrow$ irrational number since the decimal expansion is non-terminating non-repeating.

(c) $\sqrt{\frac{91}{273}}=\sqrt{\frac{1}{3}}=\frac{1}{\sqrt{3}} \Rightarrow$ irrational number since $\sqrt{3}$ is an irrational number and the decimal expansion is non-terminating non-repeating.

(d) $\frac{12}{75}\frac{4}{25} = \frac{4}{25}$, a rational number in $\frac{p}{q}$ form; $q \neq 0$

22) $185 \times 185 - 15 \times 15 = 185^2 - 15^2$ $\quad (a^2-b^2) = (a+b)(a-b)$

$= (185+15)(185-15)$

$= 200 \times 170$

$= 34000$

23) $4 - 5 = 15$

$4 - 5 + 5 = 15 + 5$

$4 = 20$

axiom:- If equals are added to equals, the wholes are equal.

24) $\left(\frac{3125}{243}\right)^{-\frac{4}{5}} = \frac{5^{5^1 \times -\frac{4}{5^1}}}{3^{5^1 \times -\frac{4}{5^1}}} = \frac{5^{-4}}{3^{-4}} = \frac{3^4}{5^4} = \frac{81}{625}$

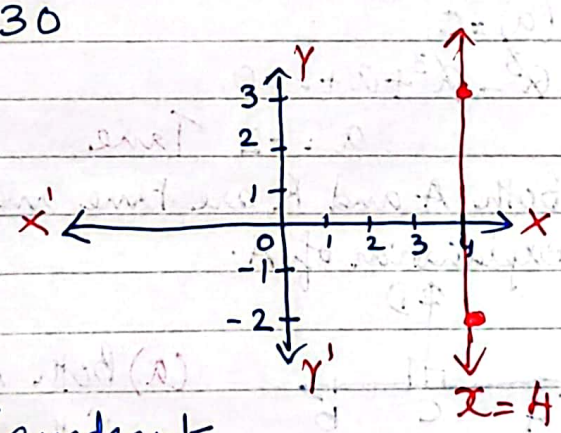
OR $(3\sqrt{5} - 5\sqrt{2})(4\sqrt{5} + 3\sqrt{2})$

$= 12 \times 5 + 9\sqrt{10} - 20\sqrt{10} - 15 \times 2$

$= 60 - 11\sqrt{10} - 30$

$= 30 - 11\sqrt{10}$ //

25) $x = 4$ is a line parallel to y-axis



OR (i) $(-2, -3) \Rightarrow$ III quadrant

(ii) $(5, -6) \Rightarrow$ IV quadrant

26) $\sqrt[4]{81} - 8\sqrt[3]{216} + 15\sqrt[5]{32} + \sqrt{225}$

$= 3^{4^1 \times \frac{1}{4^1}} - 8 \times 6^{3^1 \times \frac{1}{3^1}} + 15 \times 2^{5^1 \times \frac{1}{5^1}} + 15$

$= 3 - 48 + 30 + 15$

$= 48 - 48 = 0$

27) Construction

28) $5x^2+30x+40 = 5(x^2+6x+8)$

$= 5(x^2+4x+2x+8)$

$= 5(x(x+4)+2(x+4))$

$= 5(x+4)(x+2)$

S	P
6	8 < 4, 2

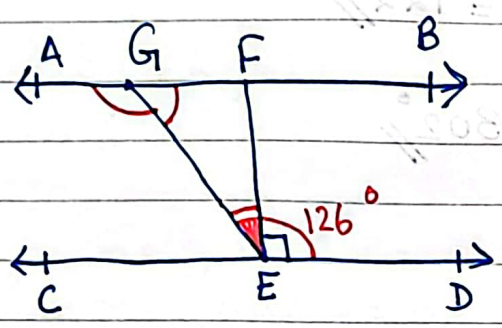
OR $125x^3+27y^3+8z^3-90xyz$

$= (5x)^3+(3y)^3+(2z)^3-3\times 5x\times 3y\times 2z$

$[a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)]$

$= (5x+3y+2z)(25x^2+9y^2+4z^2-15xy-6yz-10xz)$

29)



Since AB ∥ CD,

$\angle AGE = \angle GED = 126°$ (alternate interior angles)

$\angle GEF = 126° - 90° = 36°$

$\angle FGE = 180° - \angle AGE$ (linear pair)

$= 180° - 126°$

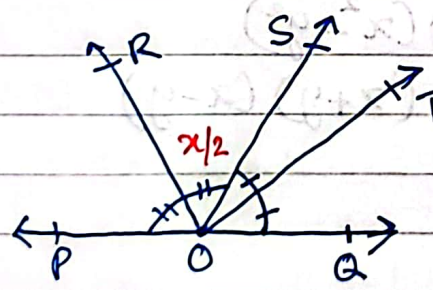
$= 54°$

30) checking :- $-\frac{3^{x2}}{4x2} + \frac{-5}{8} + \frac{11}{8} = \frac{-11}{8} + \frac{11}{8} = 0$

If $a+b+c=0$, then $a^3+b^3+c^3 = 3abc$

$\therefore \left(-\frac{3}{4}\right)^3 + \left(-\frac{5}{8}\right)^3 + \left(\frac{11}{8}\right)^3 = 3\times -\frac{3}{4}\times -\frac{5}{8}\times \frac{11}{8} = \frac{495}{256}$

31)



Given :- OR bisects $\angle POS$

$\Rightarrow \angle POR = \angle ROS \rightarrow (1)$

OT bisects $\angle SOQ$

$\Rightarrow \angle SOT = \angle TOQ \rightarrow (2)$

$\angle POS = x$

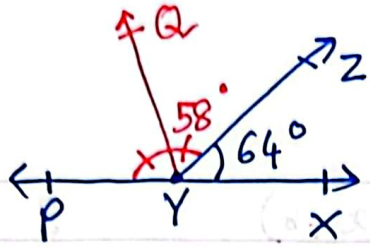
Then, $\angle POR = \angle ROS = \frac{x}{2}$

$\angle SOQ = 180° - x$ (linear pair)

$\Rightarrow \angle SOT = \angle TOQ = \frac{1}{2}\angle SOQ = \frac{1}{2}(180°-x) = 90° - \frac{x}{2}$

$\therefore \angle ROT = \angle ROS + \angle SOT = \frac{x}{2} + 90° - \frac{x}{2} = 90°$

(OR)



$\angle XYZ = 64°$

$\angle ZYP = 180° - 64°$ (linear pair)

$= 116°$

Since YQ bisects $\angle ZYP$, $\angle ZYQ = \angle QYP = \frac{1}{2}\angle ZYP$

$= \frac{1}{2} \times 116°$

$= \underline{58°}$

$\therefore \angle XYQ = 64° + 58° = 122°$ //

$\angle QYP = 58°$

reflex $\angle QYP = 360° - 58° = 302°$ //

32) $x^3 + x^2 - 4x - 4$

$= x^2(x+1) - 4(x+1)$

$= (x^2 - 4)(x+1)$

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

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

(OR) $x^8 - y^8 = (x^4)^2 - (y^4)^2$ $\quad a^2 - b^2 = (a+b)(a-b)$

$= (x^4 + y^4)(x^4 - y^4)$

$= (x^4 + y^4)((x^2)^2 - (y^2)^2)$

$= (x^4 + y^4)(x^2 + y^2)(x^2 - y^2)$

$= (x^4 + y^4)(x^2 + y^2)(x+y)(x-y)$

33) (a) when $x = y$

$2x + cy = 8$

$\Rightarrow 2x + cx = 8$

when $x = 2$, $4 + 2c = 8$

$2c = 4$

$c = 2$

(b) $4x - 5y = 15$

$-5y = 15 - 4x$

$5y = 4x - 15$

$y = \frac{4x-15}{5}$

When $x = 0$, $y = \frac{-15}{5} = -3$

When $x = 5$, $y = \frac{20-15}{5} = \frac{5}{5} = 1$

When $x = \frac{15}{4}$, $y = \frac{15-15}{5} = 0$

x	0	5	15/4
y	-3	1	0

OR (a) $3x + 2y = 18$

$\Rightarrow 3x + 2y - 18 = 0$ is the required linear equation in the form of $ax + by + c = 0$; where

$a = 3, b = 2, c = -18$

When $x = 4$ and $y = 3$,

LHS, $3x + 2y = 12 + 6 = 18$, RHS

Hence $(4, 3)$ is a solution of the given equation.

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

LHS, $3x + 2y = 3 + 4 = 7 \neq 18$

Hence $(1, 2)$ is not a solution of the given equation.

(b) Let the length and breadth of the rectangle be x units and y units respectively; area $= l \times b$

ATQ, $(x-3)(y+4) = xy + 9$

$\Rightarrow xy + 4x - 3y - 12 = xy + 9$

$\Rightarrow 4x - 3y - 21 = 0$ is the required linear equation in two variables.

34) (a) $\frac{(\sqrt{2}+\sqrt{3})(3\sqrt{2}+2\sqrt{3})}{(3\sqrt{2}-2\sqrt{3})(3\sqrt{2}+2\sqrt{3})}$

$= \frac{3\times 2 + 2\sqrt{6} + 3\sqrt{6} + 2\times 3}{(3\sqrt{2})^2 - (2\sqrt{3})^2}$

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

$= \frac{12}{6} + \frac{5}{6}\sqrt{6}$

$= 2 + \frac{5}{6}\sqrt{6}$

On comparing with $a - b\sqrt{6}$, $a = 2$, $b = -\frac{5}{6}$

(b) $x = 2+\sqrt{3}$

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

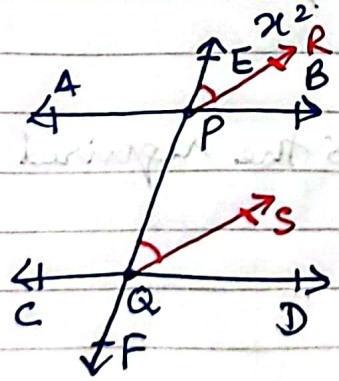
$\left(x+\frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2$

$\Rightarrow (2+\sqrt{3}+2-\sqrt{3})^2 = x^2 + \frac{1}{x^2} + 2$

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

$\therefore x^2 + \frac{1}{x^2} = 16 - 2 = \underline{\underline{14}}$

35)



Given:- Lines AB and CD are intersected by a transversal EF.

$\angle EPB$ and $\angle PQD$ are corresponding angles.

PR bisects $\angle EPB \Rightarrow \angle EPR = \angle RPB$

QS bisects $\angle PQD \Rightarrow \angle$

$PR \parallel QS$

To prove:- $AB \parallel CD$.

Proof:- Since $PR \parallel QS$, $\angle EPR = \angle PQS$ (Corresponding angles)

$\Rightarrow 2\angle EPR = 2\angle PQS$

$\Rightarrow \angle EPB = \angle PQD$ [$\because$ PR and QS are angle bisectors]

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

Hence Proved.

(b) $\angle POY = \angle POX$ (linear pair)

$= 90^\circ$

$a + b = 2x + 3x = 90^\circ$

$5x = 90^\circ$

$x = 18^\circ$

$\therefore \angle b = 3x$

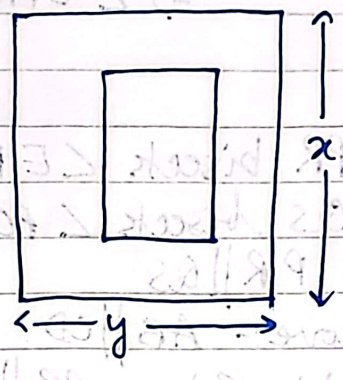
$= 54^\circ$

Since MN is a straight line, $b + c = 180^\circ$ (linear pair)

$\therefore c = 180^\circ - 54^\circ$

$= \underline{\underline{126^\circ}}$

36) Length = x units
breadth = y units



(a) $x = 3y$

$x - 3y + 0 = 0$ is the required linear equation.

(b) Infinitely many solutions.

(c) $(6, 2)$

$6 - 6 = 0$

$(3, 2)$

$3 - 6 = -3 \neq 0$

$(8, 2)$

$8 - 6 = 2 \neq 0$

$(4, 1)$

$4 - 3 = 1 \neq 0$

Hence, $(6, 2)$ satisfy the above equation.

OR

$x = 3y = 3 \times 4 = 12$

$x - 3y + 0 = 0$

37) (a) (0, -3)

(b) D(-5, -2), E(-1, -2), F(-1, -4), G(-5, -4)

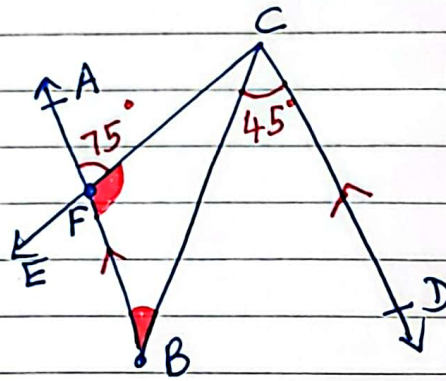
(c) J(2, -4), K(5, -4), L(6, -2), M(3, -2)

OR

side of the square PQRS = 3 units

area = side × side = 9

38)



(a) $\angle CBF = \angle BCD = 45^\circ$ (alternate interior angles)

(b) $\angle CFB = 180^\circ - 75^\circ$ (linear pair)

$= 105^\circ$

(c) $\angle FCB = 180^\circ - (45^\circ + 105^\circ)$

$= 180^\circ - 150^\circ$

$= 30^\circ$

OR $\angle EFB = 180^\circ - \angle CFB$

$= 180^\circ - 105^\circ$

$= 75^\circ$.