DATE: 30/09/2024	FIRST TERMINAL EXAMINATION (2024 - 25)	TIME: 3 Hrs
GRADE: IX	MARKING SCHEME MATHEMATICS (041)	MAX MARKS: 80

GENERAL INSTRUCTIONS:

1. THIS QUESTION PAPER HAS 5 SECTIONS A, B, C, D, E
2. SECTION A HAS 20 MCQS CARRYING 1 MARK EACH
3. SECTION B HAS 5 QUSTIONS 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 INTERGRATED 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 QUESTIONS OF 5 MARKS, 2 QUESTIONS OF 3 MARKS AND 2 QUESTIONS OF 2 MARKS HAS BEEN PROVIDED.

SL. NO.	SECTION A	MARKS
	SECTION A CONSISTS OF 20 QUESTIONS OF 1 MARK EACH	
1.	a. $11^{1/4}$	1
2.	C. 1	1
3.	b.16380	1
4.	d. y - axis	1
5.	c. infinitely many	1
6.	d. 72^0	1
7.	a. 100^0 and 80^0	1
8.	d. 360^0	1
9.	c. 30^0	1
10.	a. $\frac{7}{2}$	1
11.	a. 2	1
12.	a. Is always an irrational number	1
13.	a. 2x	1
14.	c. (3,0)	1
15.	c. 6	1
16.	d. $(x + 1)(x^2 − x +1)$	1
17.	a. 3	1
18.	c. 60^0	1
19.	b. Both A and R are true and R is not the correct explanation of A	1
20.	d. Both A and R is false	1

SECTION B

SECTION B CONSISTS OF 5 QUESTIONS OF 2 MARKS EACH

21.	Find the measure of an angle, if seven times its complement is 10° less than three times its supplement. Let angle = x Complement of angle = 90 – x Supplement of angle = 180 – x From question $7(90° – x) = 3(180° – x) – 10$ $4x = 100$ $x = 25°$ Or In the below Figure, AB, CD and EF are three lines concurrent at O. Find the value of y. Given, AB, CD and EF are three lines concurrent at O. We have to find the value of y. We know that the vertically opposite angles are equal. ∠AOE = ∠BOF So, ∠BOF = 5y From the figure, ∠COE + ∠AOE + ∠AOD = 180° 2y + 5y + 2y = 180° 4y + 5y = 180° 9y = 180° y = 180°/9 y = 20° Therefore, the value of y is 20°.	2
22.	Five years ago Arjun's age was three times Shriya's age. If age of Arjun is x years and age of Shriya is y years, represent the above statement as a linear equation in two variables in the standard form and mention the values of a, b and c. Given Arjun's age = x years and Shriyas age = y years According to the condition: (x -5) = 3(y - 5) X – 5 = 3y – 15 X – 3y + 10 = 0 a = 1, b = - 3, c = 10	2
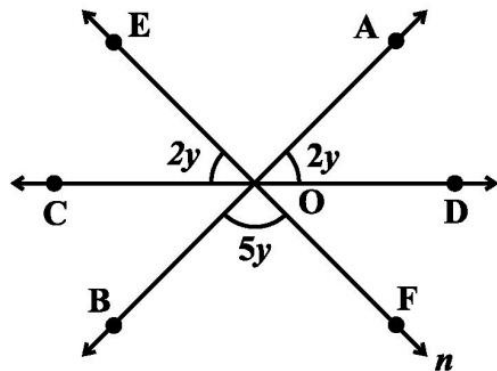
23.	Show that $\dfrac{1}{3-\sqrt{8}} - \dfrac{1}{\sqrt{8}-\sqrt{7}} + \dfrac{1}{\sqrt{7}-\sqrt{6}} - \dfrac{1}{\sqrt{6}-\sqrt{5}} + \dfrac{1}{\sqrt{5}-2} = 5$	2

We have,

$$\dfrac{1}{(3-\sqrt{8})} - \dfrac{1}{(\sqrt{8}-\sqrt{7})} + \dfrac{1}{(\sqrt{7}-\sqrt{6})} - \dfrac{1}{(\sqrt{6}-\sqrt{5})} + \dfrac{1}{(\sqrt{5}-2)} = 5$$

L.H.S.

$$\dfrac{1}{(3-\sqrt{8})} - \dfrac{1}{(\sqrt{8}-\sqrt{7})} + \dfrac{1}{(\sqrt{7}-\sqrt{6})} - \dfrac{1}{(\sqrt{6}-\sqrt{5})} + \dfrac{1}{(\sqrt{5}-2)}$$

By rationalize every part and we get

$$\dfrac{1}{(3-\sqrt{8})} \times \dfrac{(3+\sqrt{8})}{(3+\sqrt{8})} - \dfrac{1}{(\sqrt{8}-\sqrt{7})} \times \dfrac{(\sqrt{8}+\sqrt{7})}{(\sqrt{8}+\sqrt{7})} + \dfrac{1}{(\sqrt{7}-\sqrt{6})} \times \dfrac{(\sqrt{7}}{(\sqrt{7}}$$

$$- \dfrac{1}{(\sqrt{6}-\sqrt{5})} \times \dfrac{(\sqrt{6}+\sqrt{5})}{(\sqrt{6}+\sqrt{5})} + \dfrac{1}{(\sqrt{5}-2)} \times \dfrac{(\sqrt{5}+2)}{(\sqrt{5}+2)}$$

$$= \dfrac{(3+\sqrt{8})}{(9-8)} - \dfrac{(\sqrt{8}+\sqrt{7})}{8-7} + \dfrac{(\sqrt{7}+\sqrt{6})}{7-6} - \dfrac{(\sqrt{6}+\sqrt{5})}{6-5} + \dfrac{(\sqrt{5}+2)}{5-4}$$

$$= 3 + \sqrt{8} - \sqrt{8} - \sqrt{7} + \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + 2$$

$$= 3 + 2 = 5$$

R.H.S

OR

Prove that $\dfrac{a^{-1}}{a^{-1}+b^{-1}} + \dfrac{a^{-1}}{a^{-1}-b^{-1}} = \dfrac{2b^2}{b^2-a^2}$

$$\dfrac{a^{-1}}{a^{-1}+b^{-1}} + \dfrac{a^{-1}}{a^{-1}-b^{-1}} = \dfrac{2b^2}{b^2-a^2}$$

L.H.S. $= \dfrac{a^{-1}}{a^{-1}+b^{-1}} + \dfrac{a^{-1}}{a^{-1}-b^{-1}}$

$$= \dfrac{\frac{1}{a}}{\frac{1}{a}+\frac{1}{b}} + \dfrac{\frac{1}{a}}{\frac{1}{a}-\frac{1}{b}}$$

$$= \dfrac{\frac{1}{a}}{\frac{b+a}{ab}} + \dfrac{\frac{1}{a}}{\frac{b-a}{ab}}$$

$$= \dfrac{1}{a} \times \dfrac{ab}{b+a} + \dfrac{1}{a} \times \dfrac{ab}{b-a}$$

$$= \dfrac{b}{b+a} + \dfrac{b}{b-a}$$

$$= \dfrac{b^2 - ab + b^2 + ab}{b^2 - a^2}$$

$$= \dfrac{2b^2}{b^2 - a^2}$$

= R.H.S.

24.	If $p(y) = y^3 - 3y^2 + 4y - 6$, then evaluate $p(3) - p(-1) + p(0)$	2

P(3) = 27 − 27 + 12 − 6 = 6
P(-1) = -1 − 3 − 4 − 6 = - 14
P(0) = - 6
p(3) − p(-1) + p(0) = 6 - - 14 + 6 = 26

| 25.	Write the decimal expansion of $4\frac{1}{8}$ and state what type of decimal it is.	2

$4\frac{1}{8}$ = 4.125. It has a terminating decimal expansion

SECTION C
SECTION C CONSISTS OF 6 QUESTONS OF 3 MARKS EACH

26.	Factorise: (a) $6x^2 + 7x - 3$ Given, the polynomial is $6x^2 + 7x - 3$. We have to factorise the polynomial. On factoring by splitting the middle term, $6x^2 + 7x - 3$ $6x^2 + 9x - 2x - 3$ $3x(2x + 3) - 1(2x + 3)$ $(3x - 1)(2x + 3)$ Therefore, the factors are $(2x + 3)$ and $(3x - 1)$. (b) $1 + 8y^3 = (1 + 2y)(1 - 2y + 4y^2)$	3
27.	Simplify with positive exponent: (a) $(27)^{\frac{-1}{3}} \times (32)^{\frac{2}{5}} = 4/3$ $\qquad\qquad (b) (16)^{\frac{-1}{4}} + (25)^{\frac{-1}{2}} = 7/10$ $\qquad\qquad$ OR Simplify by rationalising the denominator: $\frac{6-4\sqrt{2}}{6+4\sqrt{2}}$ $\quad$ $\frac{6-4\sqrt{2}}{6+4\sqrt{2}} \bullet \frac{(6-4\sqrt{2})}{(6-4\sqrt{2})}$ $\Rightarrow \dfrac{(6-4\sqrt{2})^2}{(6)^2 - (4\sqrt{2})^2}$ $\Rightarrow \dfrac{36 + 32 - 48\sqrt{2}}{36 - 32}$ $= \dfrac{68 - 48\sqrt{2}}{4}$ $= 17 - 12\sqrt{2}.$	3
28.	If $(x + 1)$ is a factor of $ax^3 + x^2 - 2x + 4a - 9$, find the value of a. Let $p(x) = ax^3 + x^2 - 2x + 4a - 9$ Since $x + 1$ is a factor, $p(-1) = 0$ $\qquad -a + 1 + 2 + 4a - 9 = 0$ $\qquad 3a = 6, a = 6/3 = 2$	3
29.	Three vertices of a rectangle are (4, 2), (-3, 2) and (-3, 7). Plot these points and find the coordinates of the fourth vertex. Also find the area of the rectangle so formed. Fourth vertex = (4, 7) Area of rectangle = 5 x 7 = 35 squnits	3
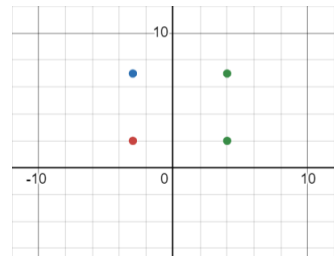
30.

In the figure, if AB || CD, then what is the value of y.
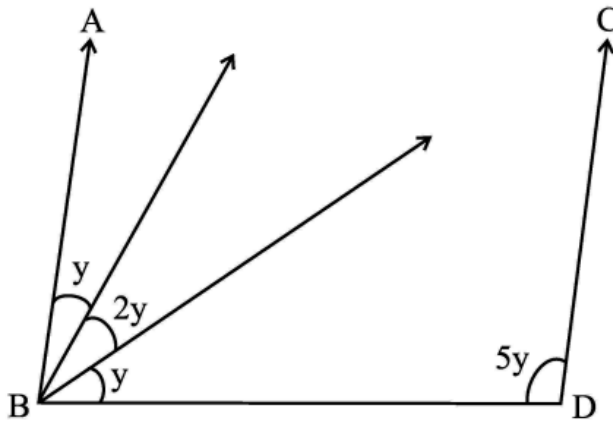
Since AB is parallel to CD,
4y + 5y = 180 (co interior)
9y = 180
Y = 180/9 = 20⁰

b. Express 0.666666.......in the p/q form

we have to express $0.\overline{6}$ in $\frac{p}{q}$ from

Let x = $0.\overline{6}$ = 0.6666....(1)

Multiplying equation (1) with 10

10x = 10 × (0.6666.....)

10x = 0.6666.....(2)

Subtract (2) from(1) i.e. (2) – (1)

10X – X = 6.666..... – 0.6666...

9x = 6 ⇒ x = $\frac{2}{3}$

Thus, $0.\overline{6}$ = 2/3

OR

In fig, if PQ || ST, ∠PQR = 110⁰ and ∠RST = 130⁰ then find the value of ∠QRS.
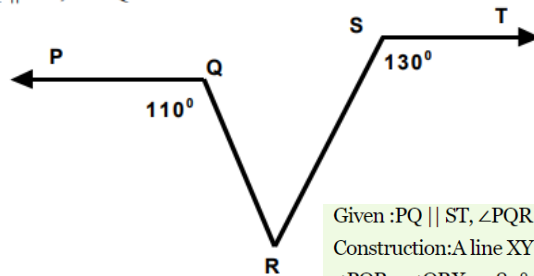
Given :PQ || ST, ∠PQR = 110° and ∠RST = 130°
Construction:A line XY parallel to PQ and ST is drawn.
∠PQR + ∠QRX = 180° **(Angles on the same side of transversal.)**
110° + ∠QRX = 180°
∠QRX = 180° - 110°
∠QRX = 70°

Also,∠RST + ∠SRY = 180° **(Angles on the same side of transversal.)**
130° + ∠SRY = 180°
∠SRY = 50°

Now,∠QRX +∠SRY + ∠QRS = 180°
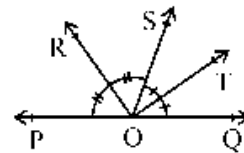70° + 50° + ∠QRS = 180°
∠QRS = 60°

Hence, ∠QRS = 60°

3

| 31. | If x = 3k + 2 and y = 2k − 1 is a solution of the equation 4x − 3y + 1 = 0, find k. | 2 |
| | Also find two solutions for the equation. | 1 |

It is given that $4x - 3y + 1 = 0$

Now by substituting the value of x and y in the equation

$4(3k + 2) - 3(2k - 1) + 1 = 0$

On further calculation

$12k + 8 - 6k + 3 + 1 = 0$

$6k + 12 = 0$

So we get

$6k = -12$

By division

$k = -2$

SECTION D
SECTION D CONSISTS OF 4 QUESTIONS OF 5 MARKS EACH

| 32. | a. In the given figure, ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of ∠ POS and ∠ SOQ, respectively. If ∠ POS = x, find ∠ ROT. | 5 |

Since ray OS stands on the line POQ. Therefore,

$\angle POS + \angle SOQ = 180°$

$\Rightarrow x + \angle SOQ = 180°$

$\Rightarrow \angle SOQ = 180° - x$

$\Rightarrow 2\angle SOT = 180° - x \ [\because OT \text{ is bisector of } \angle SOQ]$

$\Rightarrow \angle SOT = 90° - \dfrac{x}{2}$

Now, $\angle ROT = \angle ROS + \angle SOT = \dfrac{x}{2} + 90° - \dfrac{x}{2} = 90° \ [\because OR \text{ is}$

bisector of $\angle POS]$

b. In Fig. lines XY and MN intersect at O. If ∠ POY = 90° and a : b = 2 : 3, find c.
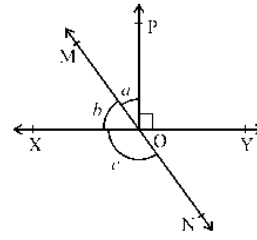
In the given figure,

$\angle POY = 90°$

$\angle POX + \angle POY = 180°$ (Linear pair)

$\angle POX + 90° = 180°$

$\Rightarrow \angle POX = 90°$

$a : b = 2 : 3$

Let $a = 2x°$

and $b = 3x°$

$\angle POX = a + b = 5x$

$90° = 5x$

$\Rightarrow x = 18°$

$\angle MOX = b = 3x = 54°$

$\angle MOX + \angle NOX = 180°$ (Linear pair)

$b + c = 180°$

$54° + c = 180°$

$c = 180° - 54° = 126°$

Or

a. In Fig. , POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that ∠ ROS = $\frac{1}{2}$ (∠ QOS − ∠ POS)
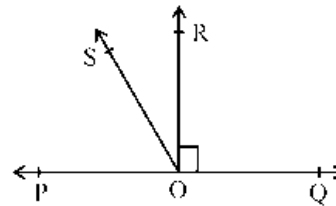
$\angle ROS = 90° - \angle POS$ − (i)

$\angle QOS = \angle QOR + \angle ROS = 90° + \angle ROS$

$\Rightarrow 90° = \angle QOS - \angle ROS$ − (ii)

Substituting (ii) in (i) we get

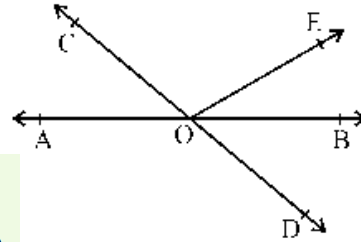$\angle ROS = \angle QOS - \angle ROS - \angle POS$

$\Rightarrow 2\angle ROS = \angle QOS - \angle POS$

$\Rightarrow \angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

Hence proved.

b. In Fig. , lines AB and CD intersect at O.
   If ∠ AOC + ∠ BOE = 70° and ∠ BOD = 40°,
   find ∠ BOE and reflex ∠ COE.

Given:∠BOD = 40°

Since AB and CD intersects, ∠AOC = ∠BOD(vertically opposite angles)
∠AOC = 40°

Also,∠AOC + ∠BOE = 70°
⇒ ∠BOE = 70° − ∠AOC = 70° − 40° = 30°

We need to find reflex∠COE
Reflex∠COE = 360° − ∠COE

Now, ∠AOC + ∠COE + ∠BOE = 180°
⇒ ∠COE + (∠AOC + ∠BOE) = 180°
⇒ ∠COE + (40° + 30°) = 180°
⇒ ∠COE = 180° − 70° = 110°

Reflex∠COE = 360° − 110° = 250°

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33. Form linear equations in two variables for the following situations.   **5**

a. The taxi fare in a city is such that Rs 50 is fixed amount and Rs 16
   per km is charged. Taking the distance covered as x km and total fare
   as Rs y, write a linear equation in x and y.
   Also, find the fare if the taxi covers 120km.

   Let Rs.y = Total fare of the journey .
   and let total distance covered by taxi is = x km,
   it is given that, fare per km is = Rs 16
   so,
   fare of x km = 16x
   and it is also given that = Rs 50 is fixed amount,
   so,
   our equation algebraically is =
   y = 50 + 16x

   y -16x = 50 ..
   now, when 120km distance is covered
   Total fare will be ,
   y = 50 + 16x
   y = 50 + 16 x 120
   y = 50+1920
   y = Rs. 1970 (Ans)
   Therefore the total fare for 120 km is Rs 1970 .

	b. If present age of son and father are expressed by x and y respectively and after 10 years father will be twice as old as his son. Write the relation between x and y. Also find fathers age when son is 20 years old. Age of son = x years Age of father = y years After 10 years age of son = x + 10 After 10 years age of father = y + 10 According to the condition Y + 10 = 2(x + 10) Y − 2x = 10 When x = 20 years, age of father = 50 years		
34.	a. Find the value of k, if (x - 1) is a factor of $p(x) = 2x^2 + kx + \sqrt{2}$ if x−1 is a factor of given eqn then it will satisfy this eqn ,x−1=0, $p(x) = 2x^2+kx+\sqrt{2}$ $2+k+\sqrt{2}=0$ $k=-(\sqrt{2}+2)$ b. Factorise: $x^3 + 13x^2 + 32x + 20$ **(iii)** Let $p(x) = x^3 + 13x^2 + 32x + 20$ We shall find a factor of p(x) by using some trial value of x, say x = -1. (Since all the terms are positive.) $p(-1) = (-1)^3 + 13(-1)^2 + 32(-1) + 20$ = -1 + 13 - 32 + 20 = 0 Since the remainder of p(-1) = 0, by factor theorem we can say x + 1 is a factor of $p(x) = x^3 + 13x^2 + 32x + 20$. Now dividing p(x) by x + 1 using long division, $$\begin{array}{r} x^2 +12x +20 \\ x+1\overline{)x^3 +13x^2 +32x +20} \\ \underline{x^3 +x^2} \\ 12x^2 +32x \\ \underline{12x^2 +12x} \\ 20x +20 \\ \underline{20x +20} \\ 0 \end{array}$$	2 3	

Therefore, $x^3 + 13x^2 + 32x + 20 = (x + 1)(x^2 + 12x + 20)$

Now taking $x^2 + 12x + 20$, find two numbers p, q such that:

p + q = 12 (co-efficient of x)

p × q = 1 × 20 = 20 (product of co-efficient of x² and the constant term.)

By trial and error method, we get p = 10, q = 2.

Now splitting the middle term of the given polynomial,
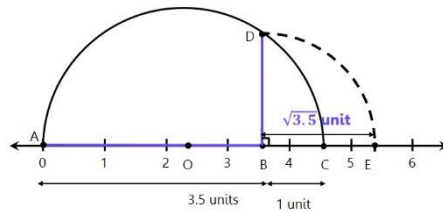
$x^2 + 12x + 20 = x^2 + 10x + 2x + 20$

$= x(x + 10) + 2(x + 10)$

$= (x + 10)(x + 2)$

Therefore, $x^3 + 13x^2 + 32x + 20 = (x + 1)(x + 10)(x + 2)$

35.	a. Construct √3.5 on a number line.	2.5

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

x=2+√3   (i)
Sol :
1/x=1/(2+√3)
1/x=(2−√3)/(2−√3)×1/(2+√3)
1/x=(2−√3)/(4−3)=2−√3   (ii)
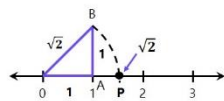
Adding (i) and (ii)

X + 1/x = 4

Or

a. Construct √2 on a number line.

Let's draw the number line

Hence, point P is √2

2.5

2.5

2.5

2.5

b. If a and b are rational numbers and $\frac{2+\sqrt{3}}{2-\sqrt{3}} = a + b\sqrt{3}$, find the values of a and b

LHS : $\dfrac{2+\sqrt{3}}{2-\sqrt{3}}$

Rationalising denominator, we get

$\dfrac{2+\sqrt{3}}{2-\sqrt{3}} \times \dfrac{2+\sqrt{3}}{2+\sqrt{3}}$

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

$= 7 + 4\sqrt{3} = a + b\sqrt{3}$

$\therefore a = 7; b = 4$

SECTION E
CASE BASED QUESTIONS

36.	Case Study:	

Apartments have increasingly become the most supplied property type across cities in India. Their popularity can be attributed to reasons including but not limited to contemporary looks, modern day amenities, in-house maintenance and better security. Inaya is planning to buy a 2BHK apartment and the layout is given below. The design and the measurement has been made such that area bedrooms and kitchen together is 95 sq.m.
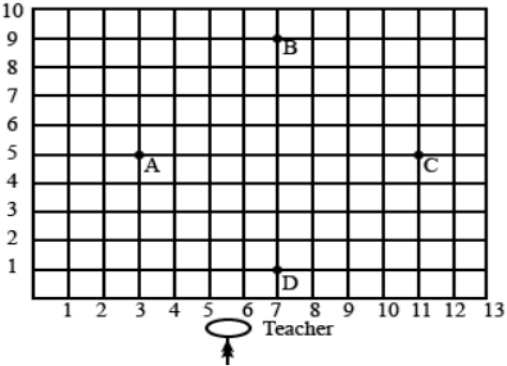

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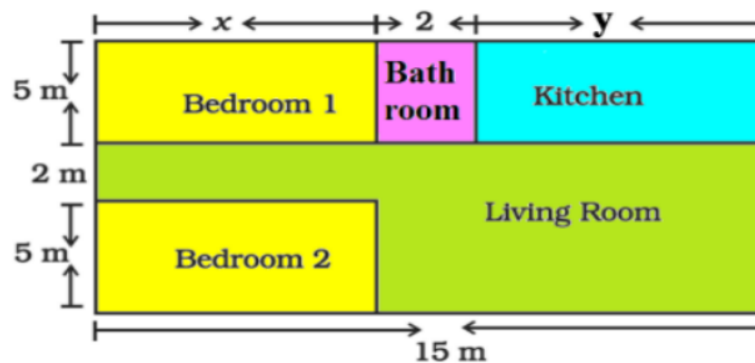
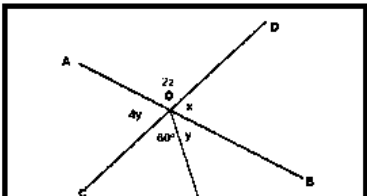a. Which pair of linear equations in two variables does describe this situation.

(a) x + y =17, 3x + y = 15

(b) x + y =27, 3x + 4y = 95

(c) 5x + 2y =15, x + 4y = 12

(d) 2x + y =19, x + y = 13

	Answer : d.	
	b. What is the length of the outer boundary of the layout? (a) 40m (b) 54m (c) 27m (d) 48m Answer : b	1
	c. If y = 7m, what is the value of x? (a) 13m (b) 4m (c) 6m (d) 3m Answer : c	2
37.	Case study: Students of a school are standing in rows and columns in their playground for a drill practice. A, B, C and D are the positions of four students as shown in the figure. 	
	(i) What are the coordinates of A and B respectively? A(3,5) and B(7,9)	1
	(ii) What is the distance between B and D? 8 units	1
	(iii) What is the mirror image of coordinate A with respect to Y axis? A(-3, 5)	1
	(iv) If point E is (-5, -10), what is the distance of the point with respect to X axis? 10 units	1
38.	Case study: Maths teacher draws a straight line AB shown	

on the blackboard as per the following figure.

1. Now he told Raju to draw another line CD as in the figure

2. The teacher told Ajay to mark ∠AOD as 2z

3. Suraj was told to mark ∠AOC as 4y

4. Clive Made and angle ∠COE = 60°

5. Peter marked ∠BOE and ∠BOD as y and x respectively

a. What is the value of x? 1. 48° 2. 96° 3. 100° 4. 120° 1. 96		1
b. What is the value of y? 1. 48° 2. 96° 3. 100° 4. 24° 4. 24		1
c. What should be the value of x + 2z? 1. 148° 2. 360° 3. 180° 4. 120° 2. 180		2