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PRACTICE PAPER 03 (2023-24)

CHAPTER 03 LINEAR EQUATIONS IN TWO VARIABLES

(ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**

CLASS : X **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.

(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.

(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.

(iv). There is no overall choice.

(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The pair of linear equations 2x + 3y = 5 and 4x + 6y = 10 is

(a) inconsistent (b) consistent

(c) dependent consistent (d) none of these

Ans: (c) dependent consistent

2. The pair of equations y = 0 and y = –7 has

(a) one solution (b) two solutions

(c) infinitely many solutions (d) no solution

Ans: (d) No solution (parallel lines)

3. The pair of equations x = 4 and y = 3 graphically represents lines which are

(a) parallel (b) intersecting at (3, 4)

(c) coincident (d) intersecting at (4, 3)

Ans: (d) When lines x = 4, y = 3 will intersect, then x coordinate = 4, y-coordinate = 3

4. A pair of linear equations which has a unique solution x = 2, y = –3 is

(a) x + y = –1; 2x – 3y = –5 (b) 2x + 5y = –11; 4x + 10y = –22

(c) 2x – y = 1 ; 3x + 2y = 0 (d) x – 4y – 14 = 0; 5x – y – 13 = 0

Ans: (b) 2x + 5y = – 11; 4x + 10y = – 22

5. If x = a, y = b is the solution of the pair of equations x – y = 2 and x + y = 4, then the respective values of a and b are

(a) 3, 5 (b) 5, 3 (c) 3, 1 (d) –1, –3

Ans: (c) 3, 1

Adding both equations, we get 2x = 6 ⇒ x = 3

⇒ y = 4 - 3 = 1

6. The pair of equations ax + 2y = 7 and 3x + by = 16 represent parallel lines if

(a) a = b (b) 3a = 2b (c) 2a = 3b (d) ab = 6

Ans: (d) ab = 6

7. Using the following equations: $\frac{4}{x} + 6y = 10$; $\frac{1}{x} - 6y = 5$, find the value of p if p = 3x.

(a) 1 (b) 2 (c) 3 (d) 4

Ans: (a) 1

Adding both equations, we get $\frac{5}{x} = 15 \Rightarrow x = \frac{5}{15} = \frac{1}{3}$

$\Rightarrow p = 3x = 3 \times \frac{1}{3} = 1$

8. The value of k for which the system of equations x + y – 4 = 0 and 2x + ky = 3, has no solution, is

(a) – 2 (b) ≠ 2 (c) 3 (d) 2

Ans: (d) 2

For no solution, $\frac{1}{2} = \frac{1}{k} \neq \frac{-4}{-3} \Rightarrow k = 2$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. **Assertion (A):** If the pair of lines are coincident, then we say that pair of lines is consistent and it has a unique solution.

Reason (R): If the pair of lines are parallel, then the pair has no solution and is called inconsistent pair of equations.

Ans: We know that if the lines are coincident, then it has infinite number of solutions

So, Assertion is false

We know that if the lines are parallel, then it has no solution.

So, reason is true.

Correct option is (d) Assertion (A) is false but reason (R) is true.

10. **Assertion (A):** The value of k for which the system of linear equations $3x - 4y = 7$ and $6x - 8y = k$ have infinite number of solution is 14.

Reason (R): The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solution if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Ans: We know that the system of linear equations

$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinitely many solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

So, Reason is not correct

For Assertion, we have, $a_1 = 3$, $b_1 = -4$, $c_1 = -7$, $a_2 = 6$, $b_2 = -8$ and $c_2 = -k$

Now, $\frac{a_1}{a_2} = \frac{3}{6} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{-4}{-8} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{-7}{-k}$

$\Rightarrow \frac{-7}{-k} = \frac{1}{2} \Rightarrow k = 14$

So, Assertion is correct.

Correct option is (c) Assertion (A) is true but reason (R) is false.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Solve for x and y: 2x + 3y = 7; 4x + 3y = 11

Ans: Given equation are

2x + 3y = 7 ...(i)

4x + 3y = 11 ...(ii)

Here coefficients of y in both the equations are equal

Subtracting (i) and (ii), we get 2x = 4

⇒ x = 2

when x = 2, equation (i) becomes

2 × 2 + 3y = 7 ⇒ 3y = 3 ⇒ y = 1

Hence, the required solution is x = 2, y = 1

12. Find the values of a and b for which the following pair of linear equations has infinitely many solutions:

2x + 3y = 7; (a + b)x + (2a – b)y = 21

Ans: Consider equations 2x + 3y = 7 and (a + b)x + (2a – b)y = 21

For infinitely many solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{2}{a+b} = \frac{3}{2a-b} = \frac{7}{21}$ ...(i)

$\Rightarrow \frac{2}{a+b} = \frac{1}{3}$ *and* $\frac{3}{2a-b} = \frac{1}{3}$

⇒ a + b = 6 and 2a – b = 9

Adding both we get 3a = 15

⇒ a = 5

⇒ b = 1

Hence, for a = 5 and b = 1, pair of equations has infinite solutions.

13. Find the value(s) of k so that the pair of equations x + 2y = 5 and 3x + ky + 15 = 0 has a unique solution

Ans: x + 2y – 5 = 0 ...(i)

3x + ky + 15 = 0 ...(ii)

$a_1 = 1, b_1 = 2, c_1 = -5$

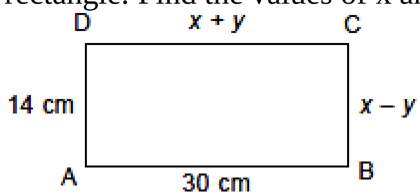
$a_2 = 3, b_2 = k, c_2 = 15$

For unique solution, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\Rightarrow \frac{1}{3} \neq \frac{2}{k} \Rightarrow k \neq 6$

So, given system of equations is consistent with unique solution for all values of k other than 6.

14. In the below Figure, ABCD is a rectangle. Find the values of x and y.



Ans: We know that the opposite sides of rectangle are equal.

∴ x + y = 30 and x – y = 14

Adding both equations we get, 2x = 44

⇒ x = 22 cm

Putting x = 22 in eq. (i), we have

22 + y = 30

⇒ y = 30 – 22 = 8

∴ x = 22 cm and y = 8 cm

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. The sum of the digits of a two digit number is 9. The number obtained by reversing the order of digits of the given number exceeds the given number by 27. Find the given number.

Ans: Let the tens digit be x and unit place digit be y.

Number = 10x + y

According to the Question, x + y = 9 ...(i)

and 10y + x = 10x + y + 27 –9x + 9y = 27

– x + y = 3 ...(ii)

Adding (i) and (ii), we get 2y = 12

⇒ y = 6

Putting value of y in equation (i), we get x + 6 = 9

⇒ x = 9 – 6

⇒ x = 3

So, the given number is 36.

16. Solve for x and y: $\frac{x}{4}+\frac{2y}{3}=7;\ \frac{x}{6}+\frac{3y}{5}=11$

Ans: $\frac{x}{4}+\frac{2y}{3}=7 \Rightarrow \frac{3x+8y}{12}=7 \Rightarrow 3x+8y=84$ ……….. (i)

$\frac{x}{6}+\frac{3y}{5}=11 \Rightarrow \frac{5x+18y}{30}=11 \Rightarrow 5x+18y=330$ ……….. (ii)

Multiplying (i) by 5 and (ii) by 3, we get

15x + 40y = 420

15x + 54y = 990

Subtracting both we get 14y = 570 $\Rightarrow y=\frac{570}{14}=\frac{285}{7}$

$\Rightarrow 3x+8\times\frac{285}{7}=84 \Rightarrow 21x+2280=588$

$\Rightarrow 21x=588-2280=-1692$

$\Rightarrow x=\frac{-1692}{21}=\frac{-564}{7}$

17. Solve for x and y: $\frac{x}{a}-\frac{y}{b}=0;\ ax+by=a^2+b^2$

Ans: $bx-ay=0$ ………. (i)

$ax+by=a^2+b^2$ ………… (ii)

Multiplying (i) by b and (ii) by a, we get

$b^2x+aby=0$

$a^2x+aby=a(a^2+b^2)$

Adding both equations we get, $(a^2+b^2)x=a(a^2+b^2) \Rightarrow x=a$

$\Rightarrow ab-ay=0 \Rightarrow ab=ay \Rightarrow y=b$

SECTION – D

Questions 18 carry 5 marks.

18. Solve the following system of equations graphically for x and y: 3x + 2y = 12; 5x – 2y = 4. Find the co-ordinates of the points where the lines meet the y-axis.

Ans: $3x+2y=12 \Rightarrow 2y=12-3x$

$\Rightarrow y=\frac{12-3x}{2}$

The solution table for 3x + 2y = 12 is

x	0	1	2
y	6	4.5	3

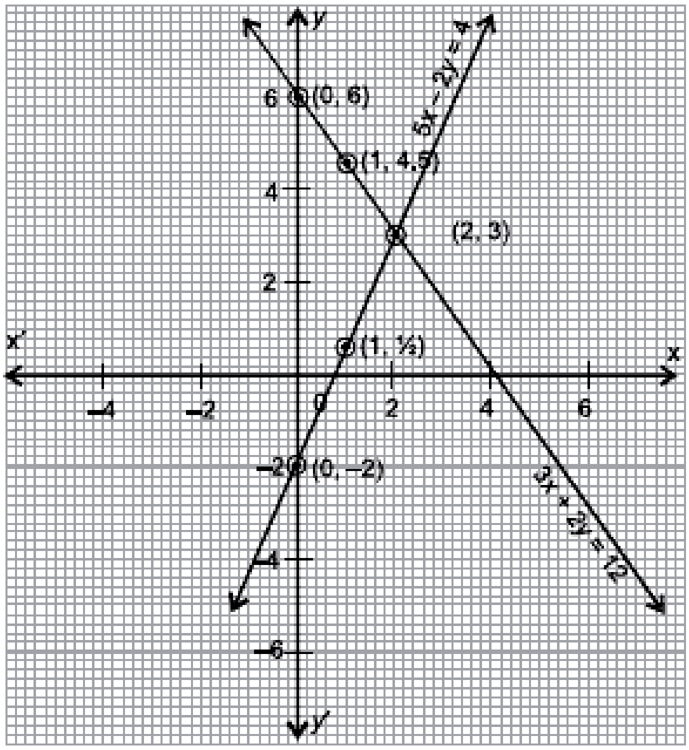
$5x-2y=4 \Rightarrow 2y=5x-4$

$\Rightarrow y=\frac{5x-4}{2}$

The solution table for 5x – 2y = 4

x	0	1	2
y	-2	½	3

Points where lines meet the y-axis are (0, 6), (0, –2).



SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.

Type of Question	Marks given for correct answer	Marks deducted for wrong answer
True/False	1	0.25

(a) If answer to all questions he attempted by guessing were wrong, then how many questions did he answer correctly?

(b) How many questions did he guess?

(c) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got?

(d) If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?

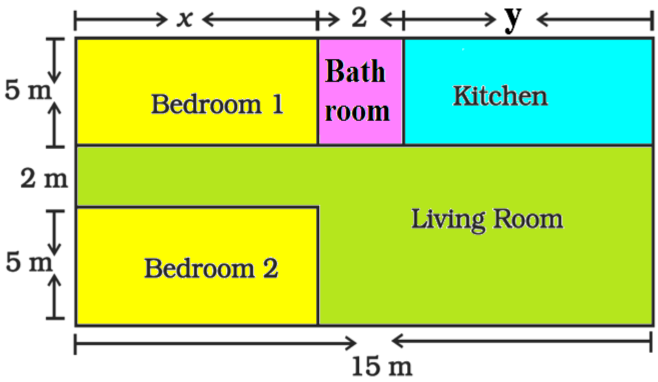
Ans: Let the no. of questions whose answer is known to the student x and questions attempted by cheating be y

According to the question, x + y = 120 and $\frac{x-1}{4y}$ = 90

Solving these two we get x = 96 and y = 24

(a) He answered 96 questions correctly.
(b) He attempted 24 questions by guessing.
(c) Marks = $80 - \frac{1}{4}$ of $40 = 70$
d) $x - \frac{1}{4}$ of $(120 - x) = 95$
$5x = 500$, $x = 100$

20. Amit is planning to buy a house and the layout is given below. The design and the measurement has been made such that areas of two bedrooms and kitchen together is 95 sq.m.



Based on the above information, answer the following questions:
(a) Form the pair of linear equations in two variables from this situation.
(b) Find the length of the outer boundary of the layout.
(c) Find the area of each bedroom and kitchen in the layout.
(d) Find the area of living room in the layout.
Ans: (a) Area of two bedrooms = $10 \times$ sq m
Area of kitchen = $5y$ sq m
$10x + 5y = 95$
$2x + y = 19$
Also, $x + 2 + y = 15$
$x + y = 13$
(b) Length of outer boundary = $12 + 15 + 12 + 15 = 54$ m
(c) On solving two equations part (a)
$x = 6$ m and $y = 7$ m
Area of bedroom = $5 \times 6 = 30$ m^2
Area of kitchen = $5 \times 7 = 35$ m^2
(d) Area of living room = $(15 \times 7) - 30 = 105 - 30 = 75$ sq m