CBSE Class 10 Mathematics
Important Questions
Chapter 3
Pair of Linear Equations

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1 Marks Questions

1. A pair of linear equation in two variables which has a common point i.e., which has only one solution is called a

(a) Consistent pair

(b) Inconsistent pair

(c) Dependent pair

(d) None of these

Ans. a) Consistent pair

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2. If a pair of linear equation $a_1x+b_1y+c_1=0$ **and** $a_2x+b_2y+c_2=0$ **represents coincident lines, then**

(a) $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$

(b) $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

(c) $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

(d) None of these

Ans. (c) $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

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3. The value of 'k' for which the system of equation 2x + 3y = 5 and 4x + ky = 10 has infinite number of solutions is

(a) k = 1

(b) k = 3

(c) k = 6

(d) k = 0

Ans. (c) k = 6

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4. If the system of equation 2x + 3y = 7 and 29x + (a + b) y = 28 has infinitely many solutions, then

(a) a = 2b

(b) b = 2a

(c) a + 2b = 0

(d) 2a + b = 0

Ans. (b) b = 2a

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5. If am $\neq$ bl, then the system of equation ax + by = c and lx + my = n

(a) has a unique solution

(b) has no solution

(c) has infinitely many solution

(d) may or may not have a solution

Ans. (a) has a unique solution

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6. The graphical representation of the linear equation y – 5 = 0 is

(a) a line

(b) a point

(c) a curve

(d) None of these

Ans. (a) a line

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7. A system of simultaneous linear equations is said to be inconsistent, if it has

(a) One solution

(b) Two solutions

(c) Three solutions

(d) No solution

Ans. (d) No solution

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8. The system of equation $2x + 3y - 7 = 0$ and $6x + 5y - 11 = 0$ has

(a) unique solution

(b) No solution

(c) Infinitely many solutions

(d) None of these

Ans. (a) unique solution

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9. The value of 'k' for which the system of equation $x + 2y - 3 = 0$ and $5x + ky + 7 = 0$ has no solution is

(a) $k = 10$

(b) $k = 6$

(c) $k = 3$

(d) $k = 1$

Ans. (a) $k = 10$

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10. The equation $ax^n + by^n + c = 0$ represents a straight line if

(a) $n \geq 1$

(b) $n \leq 1$

(c) $n=1$

(d) None of these

Ans. (c) $n=1$

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11. The value of 'k' for which the system of equation $kx - y = 2$ and $6x - 2y = 3$ has a unique solution is

(a) k = 3

(b) k ≠

(c) k = 0

(d) k ≠ 0

Ans. (b) k ≠ 3

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12. The value of 'k' for which the system of equations x + 2y = 5 and 3x + ky + 15 = 0 has no solution, if

(a) k = 6

(b) k = −6

(c) −k = $\frac{3}{2}$

(d) None of these

Ans. (a) k = 6

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13. In the equation $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ then the equation will represents

(a) coincident lines

(b) parallel lines

(c) intersecting lines

(d) None of these

Ans. (c) intersecting lines

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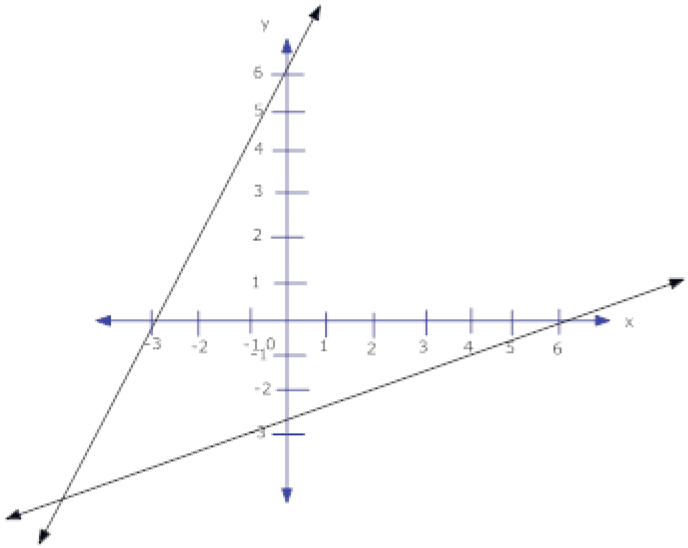
14. Solve graphically 2x – 3y + 13 = 0 and 3x – 2y + 12 = 0

Ans. 2x - 3y + 13 = 0



$3x-2y+12=0$

$when\ x=\frac{13+3y}{2}$

$when\ y=\frac{3x+12}{2}$

x	0	-3
y	6	3

X	13/2	5
y	0	-1

2 Marks Questions

1. Half the perimeter of a rectangle garden, whose length is 4 m more than its width, is 36 m. Find the dimensions of the garden.

Ans. Let length of rectangular garden = x metres

Let width of rectangular garden = y metres

According to given conditions, perimeter = 36 m

$\Rightarrow$ x + y = 36 ……(i)

And x = y+4

$\Rightarrow x-y=4$ ……..(ii)

Adding eq. (i) and (ii),

2x = 40

$\Rightarrow$ x = 20 m

Subtracting eq. (ii) from eq. (i),

2y = 32

$\Rightarrow$ y = 16 m

Hence, length = 20 m and width = 16 m

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3. The age of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 years. Find the ages of Ani and Biju.

Ans. Let the age of Ani and Biju be x years and y years respectively.

Age of Dharam = 2x years and Age of Cathy = $\frac{y}{2}$ years
According to question,

x − y = 3 ... (1)

And $2x - \frac{y}{2} = 30$

$\Rightarrow$ 4x − y = 60 ... (2)

Subtracting (1) from (2), we obtain:
3x = 60 − 3 = 57

$\Rightarrow$ x = Age of Ani = 19 years

Age of Biju = 19 − 3= 16 years
Again, According to question, y − x= 3 ... (3)

And $2x - \frac{y}{2} = 30$

$\Rightarrow$ 4x − y = 60 ... (4)

Adding (3) and (4), we obtain:

3x = 63

$\Rightarrow$ x = 21
Age of Ani = 21 years
Age of Biju = 21 + 3 = 24 years

4. One says, "Give me a hundred, friend! I shall then become twice as rich as you." The other replies, "If you give me ten, I shall be six times as rich as you." Tell me what is the amount of their (respective) capital? [From the Bijaganita of Bhaskara II]

Ans. Let the money with the first person and second person be Rs x and Rs y respectively.
According to the question,
$x + 100 = 2(y - 100)$

$\Rightarrow x + 100 = 2y - 200$

$\Rightarrow x - 2y = 300$ ... (1)
Again, $6(x - 10) = (y + 10)$

$\Rightarrow 6x - 60 = y + 10$

$\Rightarrow 6x - y = 70$ ... (2)
Multiplying equation (2) by 2, we obtain:
$12x - 2y = 140$ ... (3)
Subtracting equation (1) from equation (3), we obtain:
$11x = 140 + 300$

$\Rightarrow 11x = 440$

$\Rightarrow x = 40$
Putting the value of x in equation (1), we obtain:
$40 - 2y = -300$

$\Rightarrow 40 + 300 = 2y$

$\Rightarrow 2y = 340$
$\Rightarrow y = 170$
Thus, the two friends had Rs 40 and Rs 170 with them.

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5. The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.

Ans. Let the number of rows be x and number of students in a row be y.
Total number of students in the class = Number of rows x Number of students in a row = xy

According to the question,

Total number of students = $(x - 1)(y + 3)$

$\Rightarrow xy = (x - 1)(y + 3)$

$\Rightarrow xy = xy - y + 3x - 3$

$\Rightarrow$ 3x − y − 3 = 0

$\Rightarrow$ 3x − y = 3 ... (1)

Total number of students = (x + 2) (y − 3)

$\Rightarrow$ xy = xy + 2y − 3x − 6

$\Rightarrow$ 3x − 2y = −6 ... (2)
Subtracting equation (2) from (1), we obtain:

y = 9
Substituting the value of y in equation (1), we obtain:
3x − 9 = 3

$\Rightarrow$ 3x = 9 + 3 = 12

$\Rightarrow$ x = 4
Number of rows = x = 4
Number of students in a row = y = 9
Hence, Total number of students in a class = xy = 4 x 9 = 36

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6. Find the values of α and β for which the following system of linear equations has infinite number of solutions, 2x + 3y = 7, 2α x + $(\alpha+\beta)$ y = 28.

Ans. $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}(\text{Infinite solution})$

$$\frac{2}{2\alpha}=\frac{3}{\alpha+\beta}=\frac{-7}{-28}$$
$$\Rightarrow \alpha=4, \text{ and } \beta=8$$

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7. Find the condition for which the system of equations $\frac{x}{a}+\frac{y}{b}=c$ and bx + ay = 4ab (a, b$\neq$0) is inconsistent.

Ans. Inconsistent

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$$
$$\frac{1/a}{b}=\frac{1/b}{a}\neq\frac{c}{4ab}$$
$$\text{i.e. } \frac{1}{ab}=\frac{1}{ab}\neq\frac{c}{4ab}$$
$$\text{or } c\neq 4$$

8. Find the value of 'α' so that the following linear equations have no solution

$(3\alpha+1)x+3y-2=0, (\alpha^2+1)x+(\alpha-2)y-5=0$

Ans. No solution

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$$

$$\text{i.e. } \frac{3\alpha+1}{\alpha^2+1}=\frac{3}{\alpha-2}\neq\frac{-2}{-5}$$

$$3\alpha^2-6\alpha+\alpha-2=3\alpha^2+3$$

$$-5\alpha=5$$

$$\text{or } \alpha=-1$$

$$\text{or } \frac{3}{\alpha-2}\neq\frac{2}{5}$$

$$\Rightarrow \alpha\neq\frac{19}{2}$$

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9. Solve for x and y: ax + by = a − b and bx − ay = a + b

Ans. $ax+by=a-b\ ]\times a$

$bx-ay=a+b\ ]\times b$

$$a^2x+aby=a^2-ab$$

$$bx-aby=ab+b^2$$

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

$$\Rightarrow x=1$$

$$\therefore a+by=a-b$$

$$by=-b$$

$$y=-1$$

$$\therefore x=1$$

$$y=-1$$

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10. For what value of 'α' the system of linear equations α .x + 3y = α - 3, 12x + α y = α has no solution.

Ans. $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

$i.e.\ \frac{\alpha}{12}=\frac{3}{\alpha}\neq\frac{\alpha-3}{\alpha}$

$If\ \frac{\alpha}{12}=\frac{3}{\alpha}\Rightarrow\alpha^2=36$

or $\alpha=\pm6\ \rightarrow\ (i)$

$If\ \frac{3}{\alpha}\neq\frac{\alpha-3}{\alpha}$

$\Rightarrow\alpha^2-3\alpha\neq3\alpha$

or $\alpha^2\neq6\alpha$

or $\alpha=0$ and $\alpha=6\ \rightarrow\ (ii)$

$\therefore$ from eq (i) and (ii)

The value of α is 6.

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12. Find the values of 'a' and 'b' for which the following system of linear equations has infinite number of solutions. 2x + 3y = 7, (a + b + 1) x +(a + 2b + 2) y = 4 (a + b) +1

Ans. If infinite number of number of solutions

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

or $\frac{2}{a+b+1}=\frac{3}{a+2b+2}=\frac{7}{4a+4b+1}$

If $\frac{2}{a+b+1}=\frac{3}{a+2b+2}$

$\Rightarrow\ a-b=1$

and if $\frac{3}{a+2b+2}=\frac{7}{4a+4b+1}$

$\Rightarrow\ 5a-2b=11$

on solving we get,

$a=3$ and $b=2$

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13. Solve for 'x' and 'y' where x + y = a – b, ax – by = a^2 + b^2

Ans. $x+y=a-b$

and $ax-by=a^2+b^2$

$$bx + by = ab - b^2$$
$$ax - by = a^2 + b^2$$
$$(a+b)x = a(a+b)$$

$x = a$

$x + y = a - b$

$a + y = a - b$

$y = -b$

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14. The cost of two kg of apples and 1 kg of grapes on a day was found to be Rs. 160. After a month the cost of 4 kg apples and 2 kg grapes is Rs. 300. Represent the situation algebraically and graphically.

Ans. Let the cost of one Kg of apple is x and one Kg of grapes is y.
According to question,
2x + y = 160 and 4x + 2y = 300
2x + y = 160

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15. Find the value of 'k' for which the system of equation kx + 3y = k – 3 and 12x + ky = k will have no solution.

Ans. $kx + 3y = k - 3$

$12x + ky = k$

The system has no solution.

If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\frac{k}{12} = \frac{3}{k} \neq \frac{k-3}{k}$

$k^2 = 36$

$\Rightarrow k = \pm 6$ (i)

If $\frac{3}{k} \neq \frac{k-3}{k}$

$3k \neq k^2 - 3k$

$k^2 - 6k \neq 0$

$k(k-6) \neq 0$

$k \neq 6$ (ii)

$\therefore\ k = -6$

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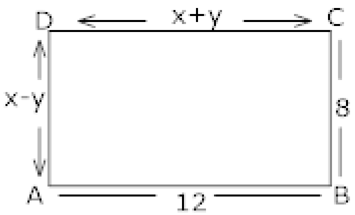
16. ABCD is a rectangle, find the values of x and y.



Ans. $x+y=12...(i)$

$x-y=8...(ii)$

on adding (i) and (ii),

$2x=20$

$\Rightarrow x=10$

$\therefore\ 10+y=12$

$\Rightarrow y=2$

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17. Given the linear equation 2x + 3y – 8 = 0, write another linear equation in two variable such that the geometrical representation of the pair so formed is

(a) intersecting lines

(b) parallel lines

(c) overlapping

Ans. 2x + 3y – 8 = 0 another linear equation representing.

(i) Intersecting lines is $x+3y=8$

(ii) Parallel lines is $4x+6y=3$

(iii) Overlapping lines is $6x+9y=24$

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18. Find the value of 'k' for which the system of equation has infinitely many solutions 2x + (k – 2) y = k and 6x + (2k – 1) y = 2k + 5

Ans. for infinitely many solution

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$$

i.e. $\frac{2}{6}=\frac{k-2}{2k-1}=\frac{k}{2k+5}$

if $\frac{1}{3}=\frac{k-2}{2k-1}$

$2k-1=3k-6$

$k=5$

or if $\frac{k}{2k+5}=\frac{1}{3}$

or $3k=2k+5$

$k=5$

if $\frac{k-2}{2k-1}=\frac{k}{2k+5}$

$\Rightarrow\ 2k^2+5k-4k-10$

$=2k^2-k$

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19. Find the relation between a, b, c and d for which the equations ax + by = c and cx + dy = a have a unique solution.

Ans. $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$ i.e. $\frac{a}{c}\neq\frac{b}{d}$

or $ad\neq bc$

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20. Solve for 'x' and 'y':

(a − b) x + (a + b) y = a² − b² − 2ab

(a + b) (x + y) = a² + b²

Ans.

$$(a-b)x+(a+b)y=a^2-b^2-2ab$$

$$\underset{-}{(}a+b)x\underset{-}{+}(a+b)y\underset{-}{=}a^2+b^2$$

$$-2bx \qquad =-2b(b+a)$$

$x=a+b$

$\therefore\ (a-b)(a+b)+(a+b)y=a^2-b^2-2ab$

$a^2-b^2+(a+b)y$

$=a^2-b^2-2ab$

$y=\frac{-2ab}{a+b}$

3 Marks Questions

1. Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be." (Isn't this interesting?) Represent this situation algebraically and graphically.

Ans. Let the present age of Aftab and his daughter be x and y respectively.
Seven years ago, Age of Aftab = x - 7 and Age of his daughter = y - 7
According to the given condition,

$(x-7)=7(y-7)$

$\Rightarrow x-7=7y-49$

$\Rightarrow x-7y=-42$

Again, Three years hence, Age of Aftab = x + 3 and Age of his daughter = y + 3
According to the given condition,

$(x+3)=3(y+3)$

$\Rightarrow x+3=3y+9$

$\Rightarrow x-3y=6$

Thus, the given conditions can be algebraically represented as:
x - 7y = −42

- ⇒ x = −42 + 7y
- ⇒ **6. (i) For which values of a and b does the following pair of linear equations have an infinite number of solutions?**
- ⇒ **$2x + 3y = 7$**
- ⇒ **$(a - b)x + (a + b)y = 3a + b - 2$**
- ⇒ **(ii) For which value of k will the following pair of linear equations have no solution?**
- ⇒ **$3x + y = 1$**
- ⇒ **$(2k - 1)x + (k - 1)y = 2k + 1$**
- ⇒ **Ans. (i)** Comparing equation $2x + 3y - 7 = 0$ with $a_1x + b_1y + c_1 = 0$ and $(a - b)x + (a + b)$
- ⇒ $y - 3a - b + 2 = 0$ with $a_2x + b_2y + c_2 = 0$
- ⇒ We get $a_1 = 2$, $b_1 = 3$ and $c_1 = -7$, $a_2 = (a - b)$, $b_2 = (a + b)$ and $c_2 = 2 - b - 3a$
- ⇒ Linear equations have infinite many solutions if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$
- ⇒ $\Rightarrow \frac{2}{a-b}=\frac{3}{a+b}=\frac{-7}{2-b-3a}$
- ⇒ $\Rightarrow \frac{2}{a-b}=\frac{3}{a+b}\ and\ \frac{3}{a+b}=\frac{-7}{2-b-3a}$
- ⇒ $\Rightarrow 2a + 2b = 3a - 3b$ and $6 - 3b - 9a = -7a - 7b$
- ⇒ $\Rightarrow a = 5b$ … (1) and $-2a = -4b - 6$ … (2)
- ⇒ Putting (1) in (2), we get
- ⇒ $-2(5b) = -4b - 6$
- ⇒ $\Rightarrow -10b + 4b = -6$

⇒ ⇒ $-6b = -6$ ⇒ $b = 1$
⇒ Putting value of b in (1), we get
⇒ $a = 5b = 5(1) = 5$
⇒ Therefore, $a = 5$ and $b = 1$
⇒ **(ii)** Comparing $(3x + y - 1 = 0)$ with $a_1x + b_1y + c_1 = 0$ and $(2k - 1)x + (k - 1)y - 2k - 1 = 0$) with $a_2x + b_2y + c_2 = 0$,
⇒ We get $a_1 = 3, b_1 = 1$ and $c_1 = -1$, $a_2 = (2k - 1)$, $b_2 = (k - 1)$ and $c_2 = -2k - 1$
⇒ Linear equations have no solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
⇒ ⇒ $\frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{-1}{-2k-1}$
⇒ ⇒ $\frac{3}{2k-1} = \frac{1}{k-1}$
⇒ ⇒ $3(k - 1) = 2k - 1$
⇒ ⇒ $3k - 3 = 2k - 1$
⇒ ⇒ $k = 2$
⇒

⇒ **7. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h, it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.**
⇒ **Ans.** Let the speed of the train be x km/h and the time taken by train to travel the given distance be t hours and the distance to travel be d km.
⇒ Since Speed = $\frac{\text{Distance travelled}}{\text{Time taken to travel that distance}}$
⇒ ⇒ $x = \frac{d}{t}$
⇒ ⇒ $d = xt$ ... (1)
According to the question
⇒ $x + 10 = \frac{d}{t-2}$
⇒ ⇒ $(x+10)(t-2) = d$
⇒ ⇒ $xt + 10t - 2x - 20 = d$
⇒ ⇒ $-2x + 10t = 20$ ......(2) [Using eq. (1)]
⇒ Again, $x - 10 = \frac{d}{t+3}$
⇒ ⇒ $(x-10)(t+3) = d$
⇒ ⇒ $xt - 10t + 3x - 30 = d$
⇒ ⇒ $3x - 10t = 30$ ......(3) [Using eq. (1)]
⇒ Adding equations (2) and (3), we obtain:
$x = 50$
Substituting the value of x in equation (2), we obtain:
$(-2) \times (50) + 10t = 20$
⇒ ⇒ $-100 + 10t = 20$
⇒ ⇒ $10t = 120$ $t = 12$
From equation (1), we obtain:

d = xt = 50 x 12 = 600
Thus, the distance covered by the train is 600 km.

6. (i) For which values of a and b does the following pair of linear equations have an infinite number of solutions?

$2x + 3y = 7$

$(a - b)x + (a + b)y = 3a + b - 2$

(ii) For which value of k will the following pair of linear equations have no solution?

$3x + y = 1$

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

Ans. (i) Comparing equation $2x + 3y - 7 = 0$ with $a_1x + b_1y + c_1 = 0$ and $(a - b)x + (a + b)$

$y - 3a - b + 2 = 0$ with $a_2x + b_2y + c_2 = 0$

We get $a_1 = 2$, $b_1 = 3$ and $c_1 = -7$, $a_2 = (a - b)$, $b_2 = (a + b)$ and $c_2 = 2 - b - 3a$

Linear equations have infinite many solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{2}{a-b} = \frac{3}{a+b} = \frac{-7}{2-b-3a}$

$\Rightarrow \frac{2}{a-b} = \frac{3}{a+b} \text{ and } \frac{3}{a+b} = \frac{-7}{2-b-3a}$

$\Rightarrow 2a + 2b = 3a - 3b$ and $6 - 3b - 9a = -7a - 7b$

$\Rightarrow a = 5b$ ... (1) and $-2a = -4b - 6$ ... (2)

Putting (1) in (2), we get

$-2(5b) = -4b - 6$

$\Rightarrow -10b + 4b = -6$

$\Rightarrow -6b = -6 \Rightarrow b = 1$

Putting value of b in (1), we get

$a = 5b = 5(1) = 5$

Therefore, $a = 5$ and $b = 1$

(ii) Comparing ($3x + y - 1 = 0$) with $a_1x + b_1y + c_1 = 0$ and $(2k - 1)x + (k - 1)y - 2k - 1 = 0$) with $a_2x + b_2y + c_2 = 0$,

We get $a_1 = 3, b_1 = 1$ and $c_1 = -1$, $a_2 = (2k - 1)$, $b_2 = (k - 1)$ and $c_2 = -2k - 1$

Linear equations have no solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Rightarrow \frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{-1}{-2k-1}$

$\Rightarrow \frac{3}{2k-1} = \frac{1}{k-1}$

$\Rightarrow 3(k - 1) = 2k - 1$

$\Rightarrow 3k - 3 = 2k - 1$

$\Rightarrow k = 2$

7. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h, it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

Ans. Let the speed of the train be x km/h and the time taken by train to travel the given distance be t hours and the distance to travel be d km.

Since Speed = $\frac{\text{Distance travelled}}{\text{Time taken to travel that distance}}$

$\Rightarrow x = \frac{d}{t}$

$\Rightarrow d = xt$ ... (1)

According to the question

$x + 10 = \frac{d}{t-2}$

$\Rightarrow (x+10)(t-2) = d$

$\Rightarrow xt + 10t - 2x - 20 = d$

$\Rightarrow -2x + 10t = 20$ ......(2) [Using eq. (1)]

Again, $x - 10 = \frac{d}{t+3}$

$\Rightarrow (x-10)(t+3)=d$

$\Rightarrow xt-10t+3x-30=d$

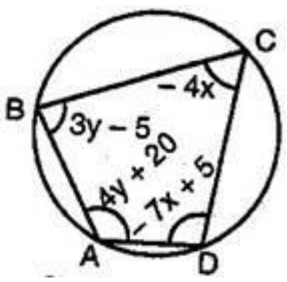
$\Rightarrow 3x-10t=30$ ......(3) [Using eq. (1)]

Adding equations (2) and (3), we obtain:
x = 50
Substituting the value of x in equation (2), we obtain:
(−2) x (50) + 10t = 20

$\Rightarrow$ −100 + 10t = 20

$\Rightarrow$ 10t = 120 t = 12
From equation (1), we obtain:
d = xt = 50 x 12 = 600
Thus, the distance covered by the train is 600 km.

9. ABCD is a cyclic quadrilateral (see figure). Find the angles of the cyclic quadrilateral.



Ans. We know that the sum of the measures of opposite angles in a cyclic quadrilateral is 180°.

$\therefore \angle A + \angle C = 180°$

$\Rightarrow 4y+20-4x=180°$

$\Rightarrow -4x+4y=160°$

$\Rightarrow x-y=-40°$ ....(1)

Also $\angle B + \angle D = 180°$

$\Rightarrow 3y-5-7x+5=180°$

$\Rightarrow -7x+3y=180°$ ....(2)

Multiplying equation (1) by 3, we obtain:
$3x-3y=-120°$ ....(3)

Adding equations (2) and (3), we obtain:

$-4x = 60°$

$\Rightarrow \ x = -15°$

Substituting the value of x in equation (1), we obtain:

$-15 - y = -40°$

$\Rightarrow \ y = -15 + 40 = 25$

$\therefore \angle$A = $4y + 20 = 4 \times 25 + 20 = 120°$

$\angle$B = $3y - 5 = 3 \times 25 - 5 = 70°$

$\angle$C = $-4x = -4 \times (-15) = 60°$

$\angle$D = $-7x + 5 = -7(-15) + 5 = 110°$

12. The sum of a two-digit number and the number obtained by reversing the order of digits is 99. If the digits differ by 3, find the number.

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

According to question,

$(10y + x) + (10x + y) = 99$

or $x + y = 9 \ \rightarrow \ (i)$

and $x - y = 3 \ \rightarrow \ (ii)$

or $y - x = 3 \ \rightarrow \ (iii)$

on solving eq (i) and (ii), we get

$x = 6$ and $y = 3$

then the original number is 36.

on solving eq (i) and (iii), we get,

$x = 3$ and $y = 6$

$\therefore$ The number is '63'

13. In a cyclic quadrilateral ABCD, $\angle A = (2x+4)°$, $\angle B = (y+3)°$, $\angle C = (2y+10)°$ and $\angle D = (4x-5)°$ Find the four angles.

Ans. In cyclic quadrilateral

$\angle A+\angle C=180$ and $\angle B+\angle D=180$

$\Rightarrow 2x+4+2y+10=180$

$\Rightarrow\ x+y=83\ \rightarrow\ (i)$

and $\angle B+\angle D=180$

$\Rightarrow y+3+4x-5=180$

$\Rightarrow\ 4x+y=182\ \rightarrow\ (ii)$

on solving eq (i) and (ii), we get,

$x=33$ and $y=50$

$\therefore$ Angles are

$\angle A=2x+4=2\times33+4=70^{o}$

$\angle B=y+3=50+3=53^{o}$

$\angle C=2y+10=2\times50+10=110^{o}$

$\angle D=4x-5=4\times33-5=127^{o}$

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14. A two-digit number is obtained by either multiplying the sum of the digits by 8 and adding 1 or by multiplying number. How many such numbers are there?

Ans. Let digit at unit place x and tens place y then

original number $=(10y+x)$

According to question,

$10y+x=8(x+y)+1$

or $7x-2y+1=0\ \rightarrow\ (i)$

or $13(x-y)+2=10y+x$

or $12x-23y+2=0\ \rightarrow\ (ii)$

on solving eq (i) and (ii), we get,

$y=\dfrac{2}{16y}$

which is not possible

$\therefore\ 13(y-3)+2=10y+x$

or $14x-3y=2\ \rightarrow\ (iii)$

on solving eq (i) and (ii) we get,

$x=1,\ y=4$

$\therefore$ original number $=41$

only one number exist.

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15. A leading library has a fixed charge for the first three days and an additional charge for each day thereafter Sarika paid Rs. 27 for a book kept for seven days, while Sury paid

Rs. 21 for the book she kept for five days, find the fixed charge and the charge for each extra day.

Ans. Let the fixed charge be Rs x and additional charge be Rs y.

According to question,

$x+(7-3)y=27$

or $x+4y=27 \rightarrow (i)$

and $x+(5-3)y=21$

$x+2y=21 \rightarrow (ii)$

on solving eq (i) and (ii), we get

$x=15,\ y=3$

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16. If 2 is added to the numerator of a fraction, it reduces to $\frac{1}{2}$ and if 1 is subtracted from the denominator, it reduces to $\frac{1}{3}$. Find the fraction.

Ans. Let the fraction be $\frac{x}{y}$

According to question,

$\frac{x+2}{y}=\frac{1}{2}$

or $2x-y=-4 \rightarrow (i)$

and $\frac{x}{y-1}=\frac{1}{3}$

or $3x-y=-1 \rightarrow (ii)$

on solving eq (i) and (ii), we get,

$x=3,\ y=10$

$\therefore$ fraction is $\frac{3}{10}$

18. Solve 23x – 29y = 98 and 29x – 23y = 110.

Ans. $23x-29y=98 \rightarrow (i)$

$29x-23y=110 \rightarrow (ii)$

on adding eq (i) and (ii)

$52x-52y=208$

or $x-y=4 \rightarrow (iii)$

on subtracting

$$\begin{array}{r} 23x-29y=98 \\ \underset{-}{}29x\underset{+}{-}23y=\underset{-}{}110 \\ \hline -6x-6y=-12 \end{array}$$

$x+y=2 \rightarrow (iv)$

on adding (iii) and (iv) we get

$2x=6$ i.e. $x=3$

$\therefore\ 3+y=2$

$y=-1$

$\therefore\ x=3$ and $y=-1$

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19. A man has only 20 paise coins and 25 paisea coins in his purse. If he has 50 coins in all totaling Rs 11.25. How many coins of each kind does he have?

Ans. Let the number of coin of

20 paise be 'x' and

25 paise be 'y'

According to question

$x+y=50 \rightarrow (i)$

and $20x+25y=1125 \rightarrow (ii)$

or

$$\begin{array}{r} 4x+5y=225 \\ \underset{-}{}4x\underset{-}{+}4y=\underset{-}{}200 \quad \left[\text{from } (i)\right] \\ \hline y=25 \end{array}$$

$x+y=50$

$\Rightarrow x+25=50=25$

$\therefore$ Number of 20 paise coin $=25$

and number of 25 paise coin $=25$

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20. A says to B my present age is five times your that age when I was an old as you are now. It the sum of their present ages is 48 years, find their present ages.

Ans. Let the present age of A $=x$ years

and B $=y$ years

According to question,

$x+y=48 \rightarrow (i)$

$x = 5[y-(x-y)]$
$x = 5[2y-x]$
$x = 10y-5x$

$3x = 5y$

$3(48-y) = 5y$
$\Rightarrow\ y = 18$ years
and $x = 48-18$ years
$x = 30$ years

23. Father's age is three times the sum of ages of his two children. After 5 years, his age will be twice the sum of ages of two children. Find the age of father.

Ans. Let the present age of father be x years and sum of present age of two son's be y years.

According to question,
after five years
$x+5 = 2(y+5+5)$
$x+5 = 2y+20$
$x-2y = 15 \rightarrow (i)$
and $x = 3y \rightarrow (ii)$
$\therefore\ 3y-2y = 15$
or $y = 15$
$\therefore$ age of father $x = 3y$
$= 3\times 15$
$= 45$ years

HOTS

1. **At a certain time in a deer park, the number of heads and the number of legs of deer and human visitors were counted and it was found there were 39 heads & 132 legs. Find the number of deer and human visitors in the park.**
   Ans: Let the no. of deers be x
   And no. of humans be y
   ASQ:
   x + y = 39 …….. (1)
   4 x + 2 y = 132 ……. (2)
   Multiply (1) and (2)
   On solving, we get …
   x = 27 and y= 12
   ∴ No. of deers = 27 and No. of humans = 12
2. **Students are made to stand in rows. If one student is extra in a row there would be 2 rows less. If one student is less in a row there would be 3 rows more. Find the number of students in the class.**
   Ans: No. of rows be y

Let the number of students be x
Number of students in the class will be = xy
One student extra, 2 rows less
(x + 1) (y – 2) = xy
xy – 2x + y -2 = xy
-(-2x + y -2) = 0
+2x – y = -2 ……….. (1)
One student less, three more rows
(x - 1) (y + 3) = xy
xy + 3x - y -3 = xy
3x - y = 3 ………(2)
From (1) & (2)
2x – y = -2 × 3
3x - y = 3 × -2
Solve it, to get … y = 12 and x = 5
∴ Number of student = xy
= 12 × 5
= 60 students

3. **A train covered a certain distance at a uniform speed. If the train would have been 6km/hr faster, it would have taken 4 hours less than the scheduled time. And if the train were slower by 6km/hr, it would have taken 6 hours more than the scheduled time. Find the distance of the journey.**
Ans: Let the speed of the train by x km/hr
And the time taken by it by y
Now distance traveled by it is x x y = xy
APQ:
I--- (x + 6) (y - 4) = xy
4x – 6y = -24
=> 2x – 3y = -12 ……….(1)
II--- (x - 6) (y+ 6) = xy
6x – 6y= 36
=> x– y= 6 ………. (2)
Solving for x and y we get y = 24, x = 30
So the distance =30 × 24 = 720 km

4. **In an election contested between A and B, A obtained votes equal to twice the no. of persons on the electoral roll who did not cast their votes & this later number was equal to twice his majority over B. If there were 18000 persons on the electoral roll. How many voted for B.**
Ans: Let x and y be the no. of votes for A & B respectively.
The no. of persons who did not vote = (18000 – x – y)
APQ:
x = 2(18000 – x – y)
⇒ 3x + 2y = 36000 ………. (1)
&
(18000 – x – y) = (2) (x – y)
⇒ 3x – y = 18000 ………. (2)
On solving we get, y = 6000 and x = 8000
Vote for B = 6000

5. **When the son will be as old as the father today their ages will add up to 126 years. When the father was old as the son is today, their ages add upto 38 years. Find their present ages.**
Ans: let the son's present age be x
Father's age be y
Difference in age (y – x)
Of this difference is added to the present age of son, then son will be as old as the father now and at that time, the father's age will be [y + (y – x)]
APQ:
$[x + (y - x)] + [y (y - x)] = 126$
$[y + (x - y)] + [x + (x - y)] = 38$
Solving we get the value of x and y