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CLASS – 10

MATHEMATICS

CH – 3
Pair of Linear Equations in two Variables

CBSE Board

Previous Year Questions – 2

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16. The sum of the numerator and the denominator of a fraction is 18. If the denominator is increased by 2, the fraction reduces to $\frac{1}{3}$. Find the fraction. (CBSE 2021 C)

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

$x + y = 18$ — (1)

$\frac{x}{y+2} = \frac{1}{3}$ — (2)

$3x = y + 2$

$3x - y = 2$

$x + y = 18$

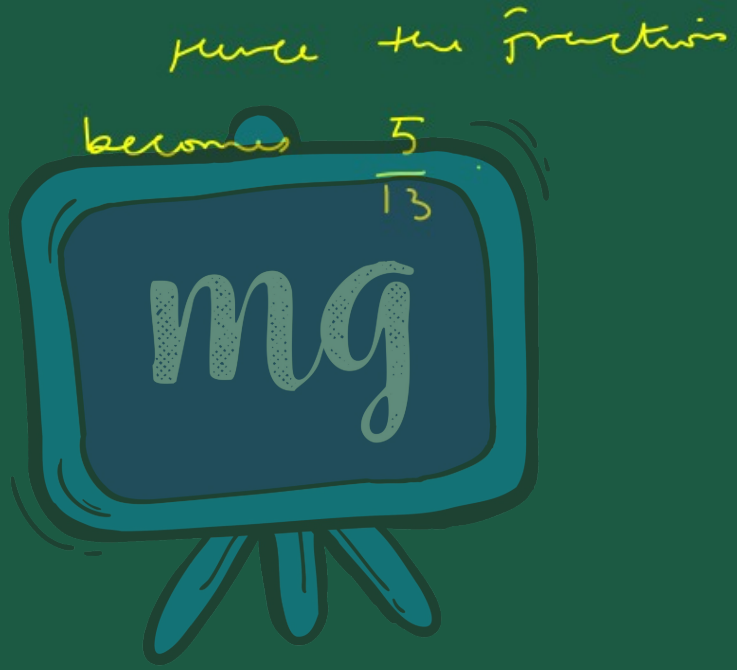
$4x = 20$

$x = 5$

$5 + y = 18$

$y = 18 - 5$

$y = 13$



17. The larger of two supplementary angles exceeds the smaller by 18°. Find the angles. (CBSE 2019)

Sol. Let the larger angle be 'x'.
and the smaller angle be 'y'.

$x + y = 180$ — (1)

$x = y + 18$ — (2)

$x - y = 18$ — (3)

$x + y = 180$
$x - y = 18$

$2x = 198$

$x = \frac{198}{2}$

$x = 99°$

$x - y = 18$

$99 - y = 18$

$99 - 18 = y$

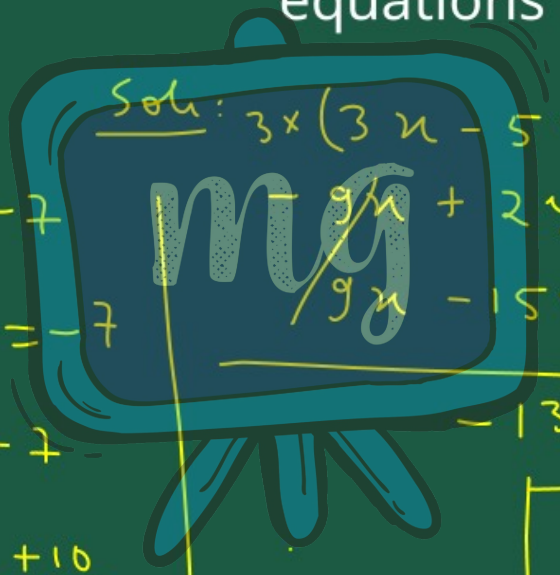
$81^\circ = y$

Hence the longer angle is 99°

and the smaller angle is 81°

18. Solve the following pair of linear equations : $3x - 5y = 4$, $2y + 7 = 9x$

(CBSE 2019)



Sol: $3x - 5y = 4$ — (1)

$-9x + 2y = -7$ — (2)

$9x - 15y = 12$ — (3)

$-13y = 5$

$y = \frac{-5}{13}$

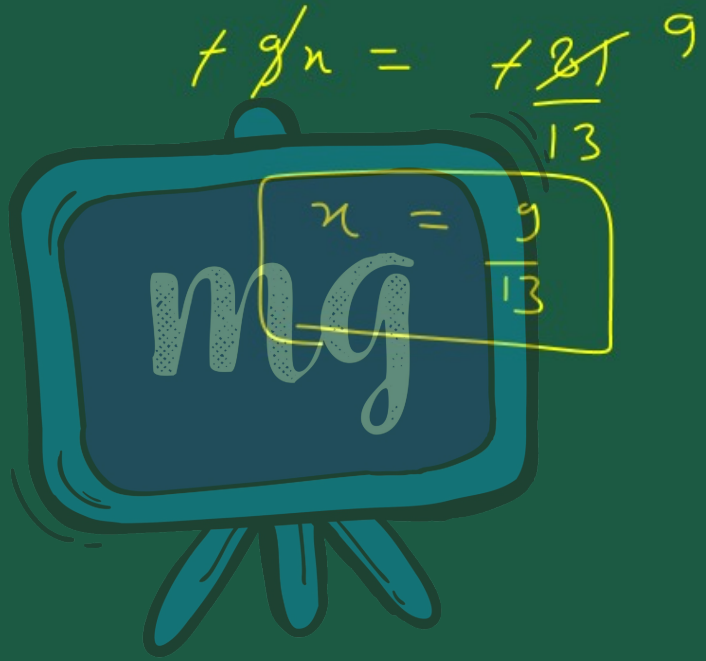
$-9x + 2y = -7$

$-9x + 2\left(\frac{-5}{13}\right) = -7$

$-\frac{10}{13} = -7$

$= -7 + \frac{10}{13}$

$-9x = -\frac{91+10}{13}$



19. Half of the difference between two numbers is 2. The sum of the greater number and twice the smaller number is 13. Find the numbers. (CBSE 2023)

Solu. Let the numbers be x and y.

$$\frac{x-y}{2} = 2 \quad -(1)$$

$$x + 2y = 13 \quad -(2)$$

$$x - y = 4 \quad -(3)$$

$$x + 2y = 13 \quad -(2)$$

$$-3y = -9$$

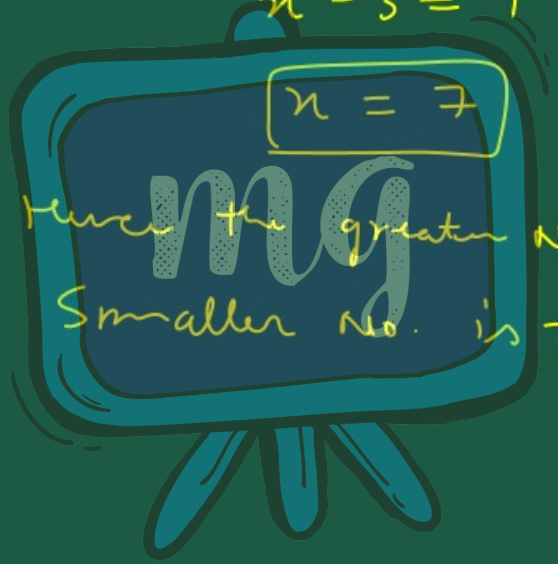
$$y = \frac{-9}{-3}$$

$$\boxed{y = 3}$$

$x - y = 4$

$x - 3 = 4$

$x = 7$



Hence the greater No. is 7 and the Smaller No. is 3.

20. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from the numerator and it becomes $\frac{1}{4}$ when 8 is added to its denominator. Find the fraction. (CBSE 2020)

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

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

$$3(x-1) = y$$

$$3x - 3 = y \quad \text{—— (1)}$$

$$\frac{x}{y+8} = \frac{1}{4}$$

$$4x = y + 8$$

$$4x - y = 8 \quad \text{—— (2)}$$

$$4x - (3x - 3) = 8$$

$$4x - 3x + 3 = 8$$

$$x = 8 - 3$$

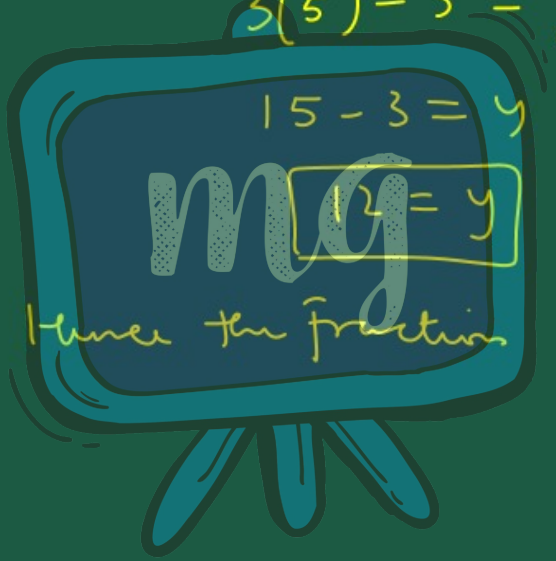
$$\boxed{x = 5}$$

$3x - 3 = y$

$3(5) - 3 = y$

$15 - 3 = y$

$12 = y$



Hence the fraction becomes $\frac{5}{12}$.

21. The present age of a father is three years more than three times the age of his son. Three years hence the father's age will be 10 years more than twice the age of the son. Determine their present ages.

(CBSE 2020)

F S

$x = 3y + 3$ — (1)

$x + 3 = 2(y + 3) + 10$ — (2)

$x = 3y + 3$ — (3)

$x + 3 = 2y + 6 + 10$

$x + 3 = 2y + 16$

$x = 2y + 16 - 3$

$x = 2y + 13$ — (4)

From eq (5) and eq (4)

$$3y + 3 = 2y + 13$$

$$3y - 2y = 13 - 3$$

$$\boxed{y = 10}$$

By placing $y = 10$ in eq (3)

$$x = 3y + 3$$

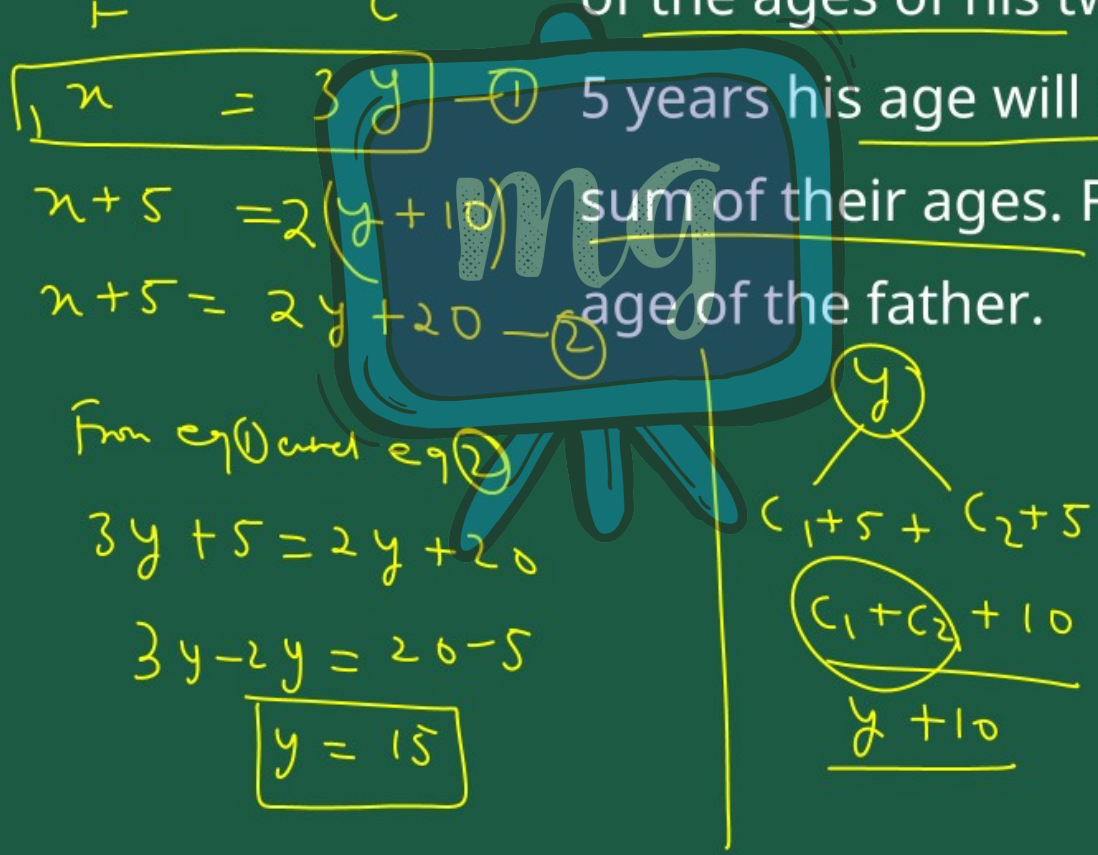
$$x = 3(10) + 3$$

$$x = 30 + 3$$

$$\boxed{x = 33}$$

Therefore the present age of Father and son are 33 years and 10 years respectively

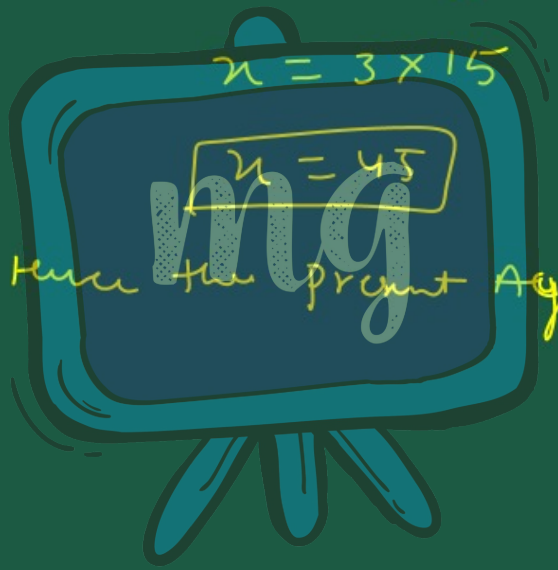
22. A father's age is three times the sum of the ages of his two children. After 5 years his age will be two times the sum of their ages. Find the present age of the father. (CBSE Delhi 2019)



$x = 3y$

$x = 3 \times 15$

$x = 45$



Hence the present Age of Father is 45 years.

23. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator. Find the fraction.

(CBSE Delhi 2019)

24. Find the value of k for which the system of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has no solution.

(CBSE 2021 C)

Here the value of $k = 6$

Solution:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ for no solution

$\frac{1}{3} = \frac{2}{k} \neq \frac{-5}{15}$

$\frac{-1}{3}$

$k = 6$

From the given eq.

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

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

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

$6 \neq -k$

$k \neq -6$

25. Find the value(s) of k so that the pair of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has a unique solution. (CBSE 2019)

Soln.

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

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

$k \neq 6$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

all real values exist except $k = 6$.

26. Find the relation between p and q if x = 3 and y = 1 is the solution of the pair of equations x – 4y + p = 0 and 2x + y – q – 2 = 0 (CBSE 2019)

Sol.

From eq (2)

$2x + y - q - 2 = 0$

$2 \times 3 + (1) - q - 2 = 0$

$7 - q - 2 = 0$

$5 - q = 0$

$5 = q$

Here the Relation will be

$p + q = 6$

From eq (1)

$x - 4y + p = 0$

$3 - 4(1) + p = 0$

$3 - 4 + p = 0$

$-1 + p = 0$

$p = 1$

27. Find c if the system of equations

$cx + 3y + (3 - c) = 0$; $12x + cy - c = 0$

has infinitely many solutions?

(CBSE 2019)

Sol^n :

$a_1 = c$, $b_1 = 3$, $c_1 = 3 - c$

$a_2 = 12$, $b_2 = c$, $c_2 = -c$

According to the condition of infinite sol^n.

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

$$\frac{c}{12} = \frac{3}{c}$$

$$c^2 = 36$$

$$c = \pm 6$$

$$\frac{3}{c} = \frac{3-c}{-c}$$

$$-3 = 3 - c$$

$$+3 + 3 = +c$$

$$6 = c$$

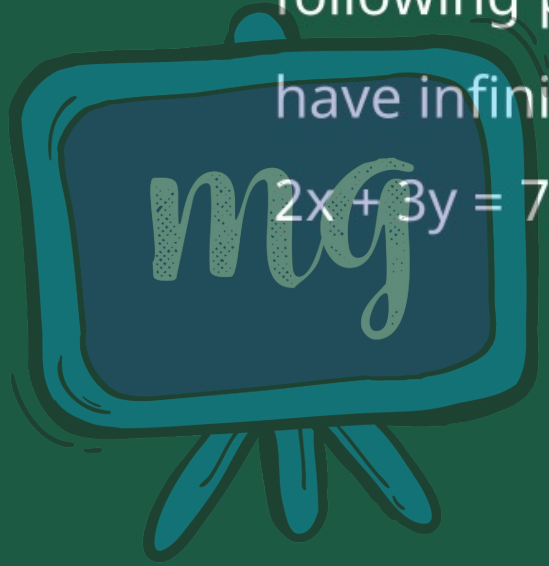
Hence the value of c that

Verifies the given condⁿ is $c = 6$.

28. Find the value of k for which the following pair of linear equations have infinitely many solutions.

$2x + 3y = 7, (k + 1)x + (2k - 1)y = 4k + 1$

(CBSE Delhi, 2019)



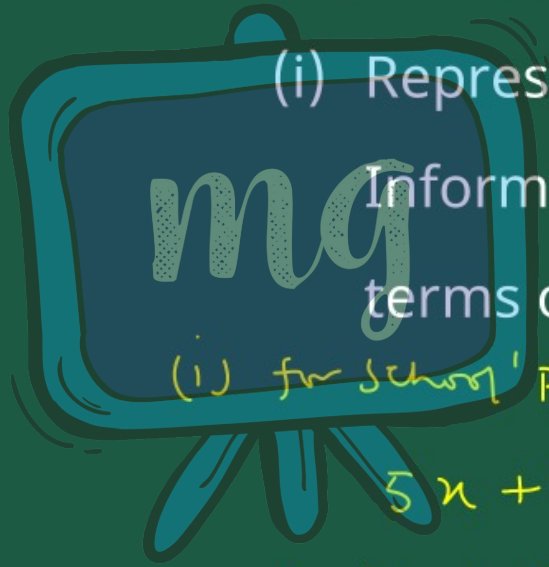
29. Find the value(s) of k for which the pair of equations $\begin{cases} kx + 2y = 3 \\ 3x + 6y = 10 \end{cases}$ has a unique solution. (CBSE 2019)

30. Case Study

Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey x per student and Cricket y per student. School 'P' decided to award a total of 9,500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award 7,370 for the two games to 4 and 3 students respectively.

Based on the given information, answer the following questions:

(i) Represent the following Information algebraically (in terms of x and y).



(i) for School 'P'.

$5x + 4y = 9500$ — (1)

for School 'Q'

$4x + 3y = 7370$ — (2)

(ii) (a) What is the prize amount for hockey?

$3 \times (5x + 4y = 9500)$

$4 \times (4x + 3y = 7370)$

$15x + 12y = 28500$

$16x + 12y = 29480$

$-x = -980$

$x = 980$

OR

(b) Prize amount on which game is more and by how much?

$5x + 4y = 9500$

$5 \times 980 + 4y = 9500$

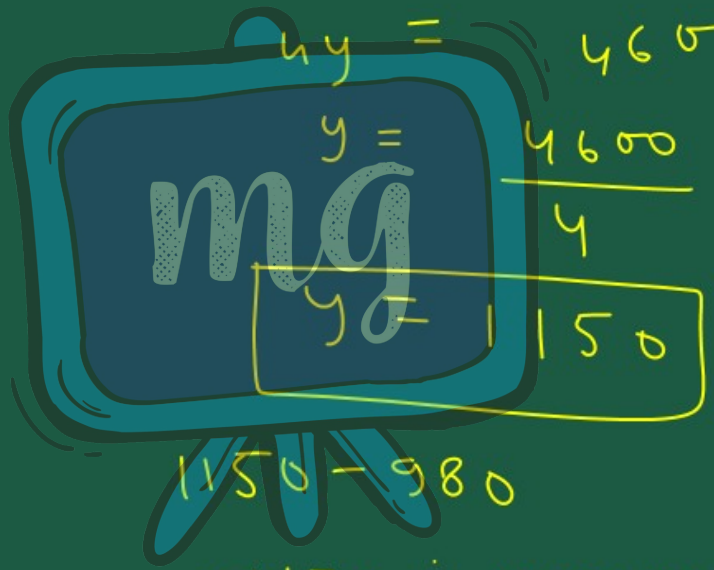
$4900 + 4y = 9500$

$4y = 9500 - 4900$

$4y = 4600$

$y = \frac{4600}{4}$

$y = 1150$

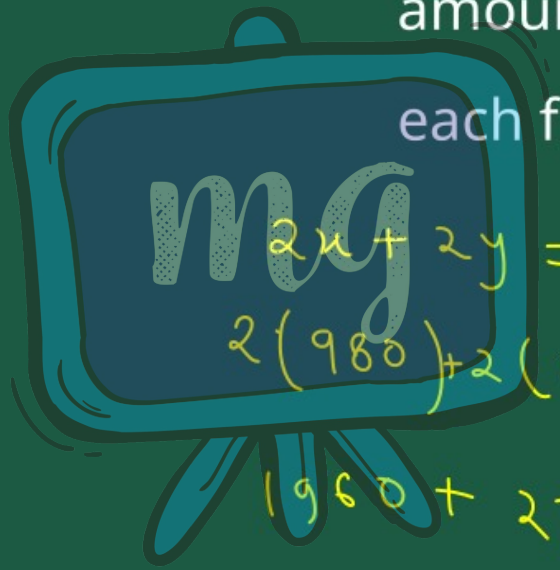


$1150 - 980$

$= ₹170$ is more on Cricket than hockey.

(iii) What will be the total prize amount if there are 2 students each from two games?

(CBSE 2019)



$2x + 2y =$

$2(980) + 2(1150) =$

$1960 + 2300 = \boxed{4260}$

31. Case study

The residents of a housing society, on the occasion of environment day, decided to build two straight paths in the central park of the society and also plant trees along the boundary lines of each path.

Taking one corner of the park as origin and the two mutually perpendicular lines as the x-axis and y-axis, the paths were represented by the two linear equations $2x - 3y = 5$ and $-6x + 9y = 7$.

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

$\frac{a_1}{a_2} = \frac{2}{-6} = \frac{-1}{3}$

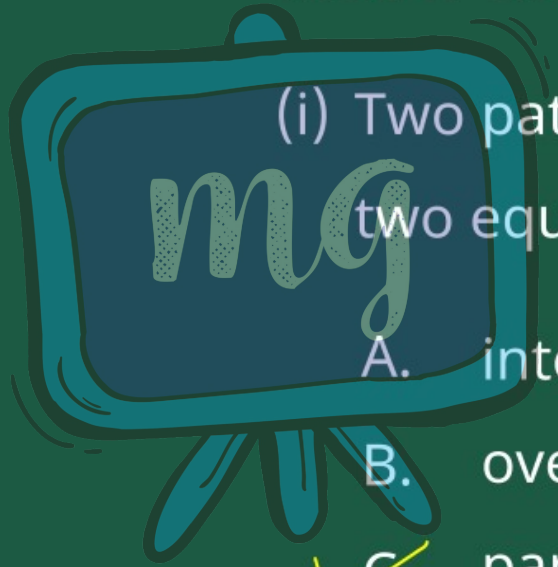
$\frac{b_1}{b_2} = \frac{-3}{9} = \frac{-1}{3}$

$\frac{c_1}{c_2} = \frac{-5}{-7} = \frac{5}{7}$

$a_1 = 2, b_1 = -3, c_1 = -5$

$a_2 = -6, b_2 = 9, c_2 = -7$

Based on the given information, answer the following questions:



(i) Two paths represented by the two equations here are

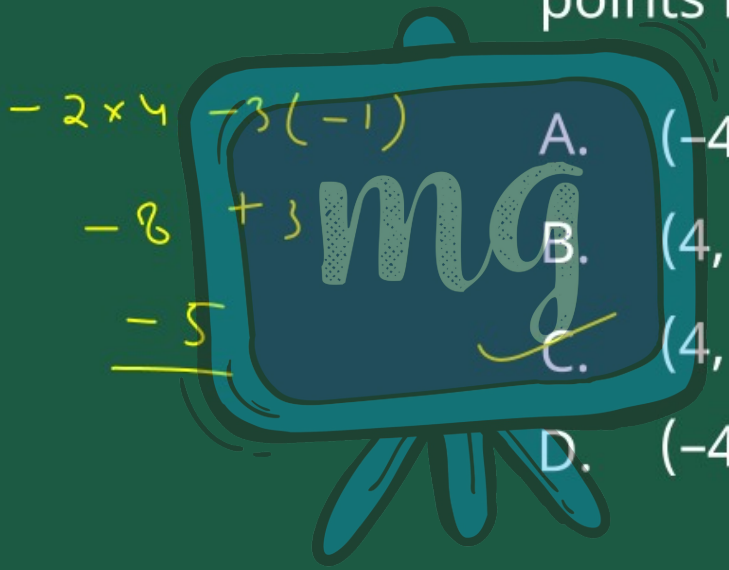
A. intersecting

B. overlapping

C. parallel

D. mutually perpendicular

(ii) Which one of the following points lie on the line $2x - 3y = 5$?



A. (–4, 1)

B. (4, –1)

C. (4, 1)

D. (–4, –1)

$-2 \times 4 \quad -3(-1)$

$-8 \quad +3$

-5

$2x - 3y = 5$

$-8 - 3$

-11

$8 - 3(-1)$

$8 + 3$

$8 - 3$

$5 = 5$

(iii) If the line -6x + 9y = 7 intersects the y-axis at a point, then its coordinates are

A. $\left(0, \frac{7}{9}\right)$

B. $\left(\frac{7}{9}, 0\right)$

C. $\left(-\frac{7}{6}, 0\right)$

D. $\left(0, -\frac{7}{6}\right)$

$x = 0$

$-6(0) + 9y = 7$

$9y = 7$

$y = \frac{7}{9}$

(iv) If a pair of equations

$a_1x + b_1y + c_1 = 0$ and

$a_2x + b_2y + c_2 = 0$ has a unique solution, then

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

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

C. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

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

(v) If, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then the two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are

A. parallel

B. coincident

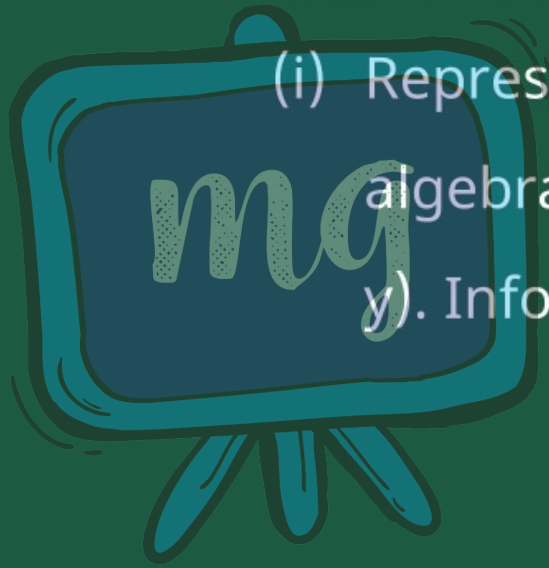
C. intersecting

D. perpendicular to each other

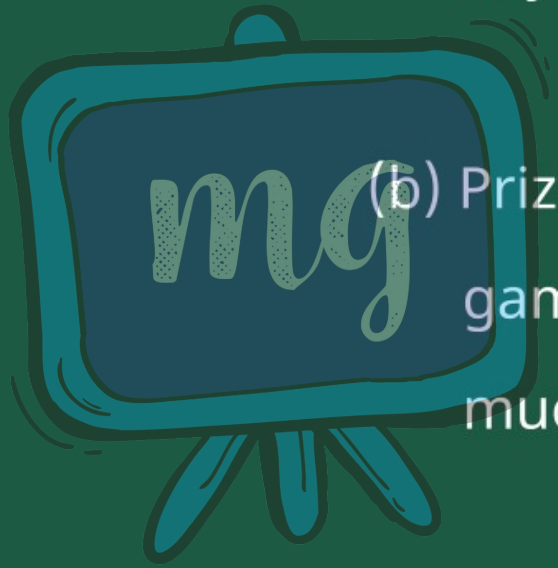
(CBSE 2021 C)

Based on the given information, answer the following questions.

(i) Represent the following algebraically (in terms of x and y). Information



(ii) (a) What is the prize amount for hockey?



OR

(b) Prize amount on which game is more and by how much?

(iii) What will be the total prize amount if there are 2 students each from two games?

(CBSE 2019)

31. Case study

The residents of a housing society, on the occasion of environment day, decided to build two straight paths in the central park of the society and also plant trees along the boundary lines of each path.

Taking one corner of the park as origin and the two mutually perpendicular lines as the x-axis and y-axis, the paths were represented by the two linear equations $2x - 3y = 5$ and $-6x + 9y = 7$.

Based on the above, answer the following questions:

(i) Two paths represented by the two equations here are

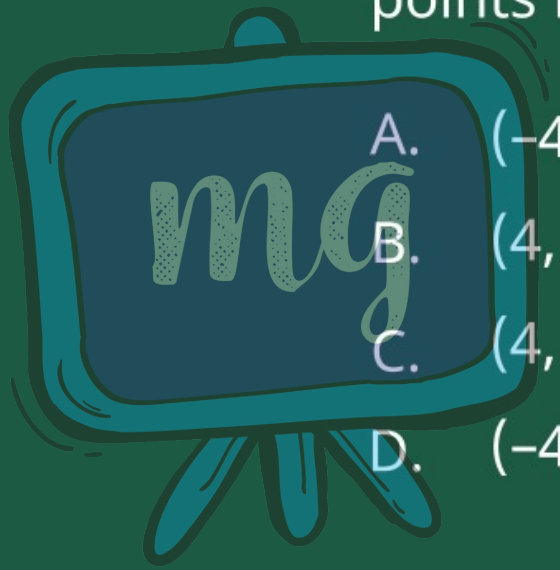
A. intersecting

B. overlapping

C. parallel

D. mutually perpendicular

(ii) Which one of the following points lie on the line $2x - 3y = 5$?



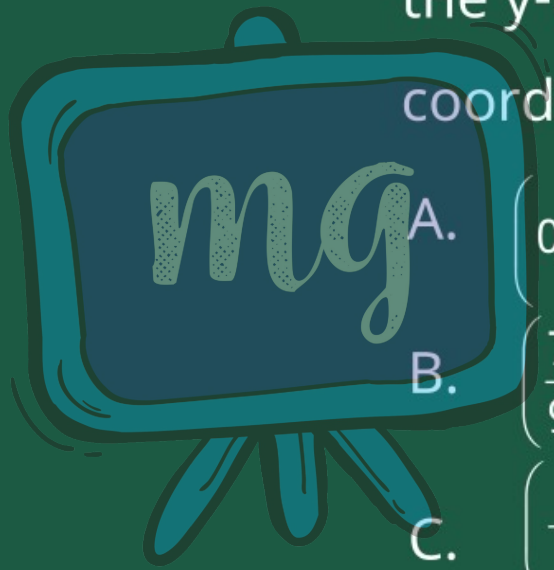
A. $(-4, 1)$

B. $(4, -1)$

C. $(4, 1)$

D. $(-4, -1)$

(iii) If the line -6x + 9y = 7 intersects the y-axis at a point, then its coordinates are



A. $\left(0, \frac{7}{9}\right)$

B. $\left(\frac{7}{9}, 0\right)$

C. $\left(-\frac{7}{6}, 0\right)$

D. $\left(0, -\frac{7}{6}\right)$

(CBSE 2021 C)

(iv) If a pair of equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solution, then

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

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

C. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

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

(v) If, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then the two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are

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B. coincident

C. intersecting

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