Chapter 3 Systems of Linear Equations and Inequalities

Ex 3.2

Answer 1e.

Number the equations.

$3x + y = 11 \qquad (1)$

$x - 2y = -8 \qquad (2)$

Write equation (1) in the slope-intercept form. For this, subtract $3x$ from each side.

$3x - 3x + y = -3x + 11$

$y = -3x + 11 \qquad (3)$

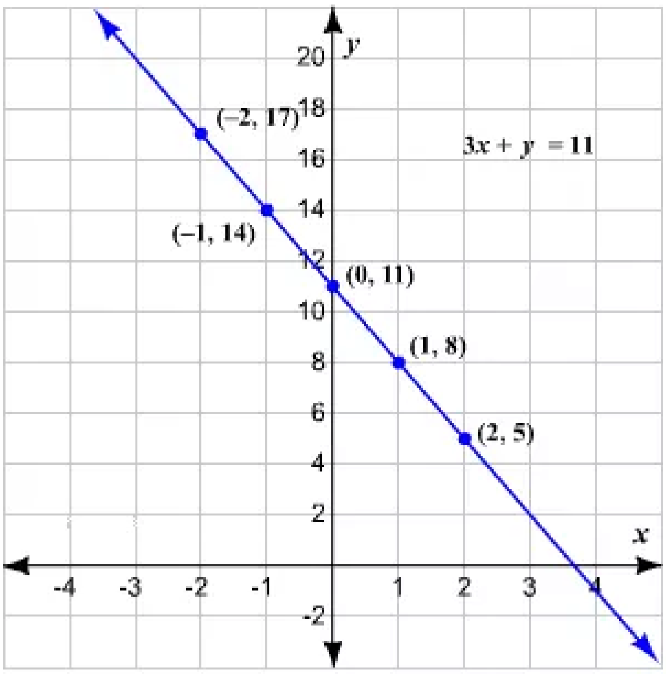
Find some points that are solutions of equation (3). For this, choose some values for x and find the corresponding values of y.

Organize the results in a table.

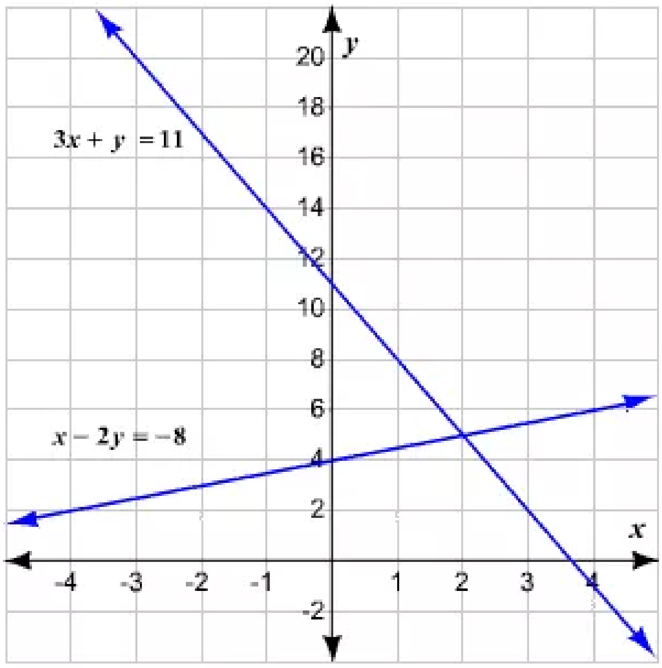
x	-2	-1	0	1	2
y	17	14	11	8	5

The points are (–2, 17), (–1, 14), (0, 11), (1, 8), and (2, 5).

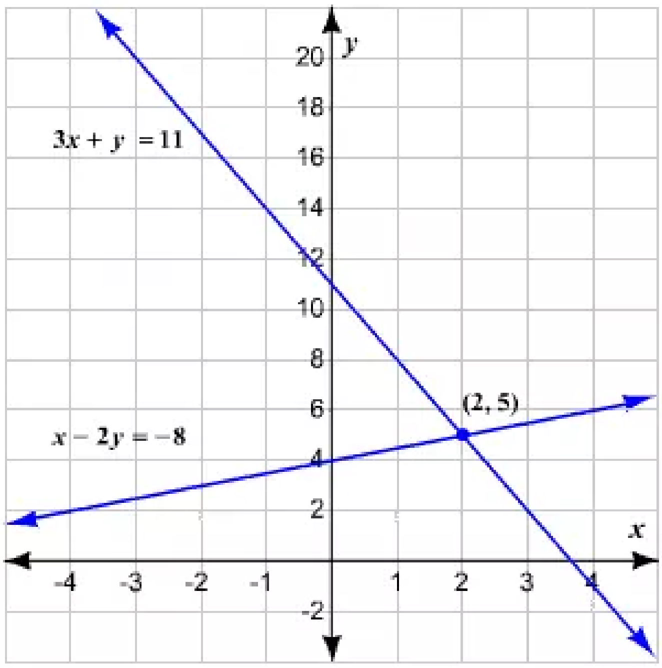
Now, plot the points on a coordinate plane and connect them with a straight line.



Similarly, graph equation (2) on the same set of axes.



Identify the point of intersection of the graphs.



From the graph, the lines appear to intersect at (2, 5).

Check

In order to check the solution, substitute 2 for x, and 5 for y in equations (1) and (2).

$$3x + y = 11 \qquad\qquad x - 2y = -8$$

$$3(2) + (5) \stackrel{?}{=} 11 \qquad\qquad 2 - 2(5) \stackrel{?}{=} -8$$

$$6 + 5 \stackrel{?}{=} 11 \qquad\qquad 2 - 10 \stackrel{?}{=} -8$$

$$11 = 11 \ \checkmark \qquad\qquad -8 = -8 \ \checkmark$$

Therefore, the solution is (2, 5).

Answer 1gp.

Number the equations.

$4x + 3y = -2$ Equation 1

$x + 5y = -9$ Equation 2

Since the coefficient of x in the second equation is 1, use the substitution method to solve the system.

STEP 2 Substitute $-9 - 5y$ for x in Equation 1.

$4(-9 - 5y) + 3y = -2$

Clear the parentheses using the distributive property.

$$\begin{aligned} 4(-9) + 4(-5y) + 3y &= -2 \\ -36 - 20y + 3y &= -2 \\ -36 - 17y &= -2 \end{aligned}$$

Solve for y. For this, add 36 to both the sides.

$$\begin{aligned} -36 - 17y + 36 &= -2 + 36 \\ -17y &= 34 \end{aligned}$$

Divide both the sides by -17.

$$\begin{aligned} \frac{-17y}{-17} &= \frac{34}{-17} \\ y &= -2 \end{aligned}$$

STEP 3 Substitute -2 for y in Revised Equation 2.

$$\begin{aligned} x &= -9 - 5(-2) \\ &= -9 + 10 \\ &= 1 \end{aligned}$$

CHECK Let us check the solution by substituting 1 for x, and -2 for y in the original equations.

$$\begin{aligned} 4x + 3y &= -2 \\ 4(1) + 3(-2) &\stackrel{?}{=} -2 \\ 4 - 6 &\stackrel{?}{=} -2 \\ -2 &= -2 \ \checkmark \end{aligned}$$

$$\begin{aligned} x + 5y &= -9 \\ 1 + 5(-2) &\stackrel{?}{=} -9 \\ 1 - 10 &\stackrel{?}{=} -9 \\ -9 &= -9 \ \checkmark \end{aligned}$$

The solution is $(1, -2)$.

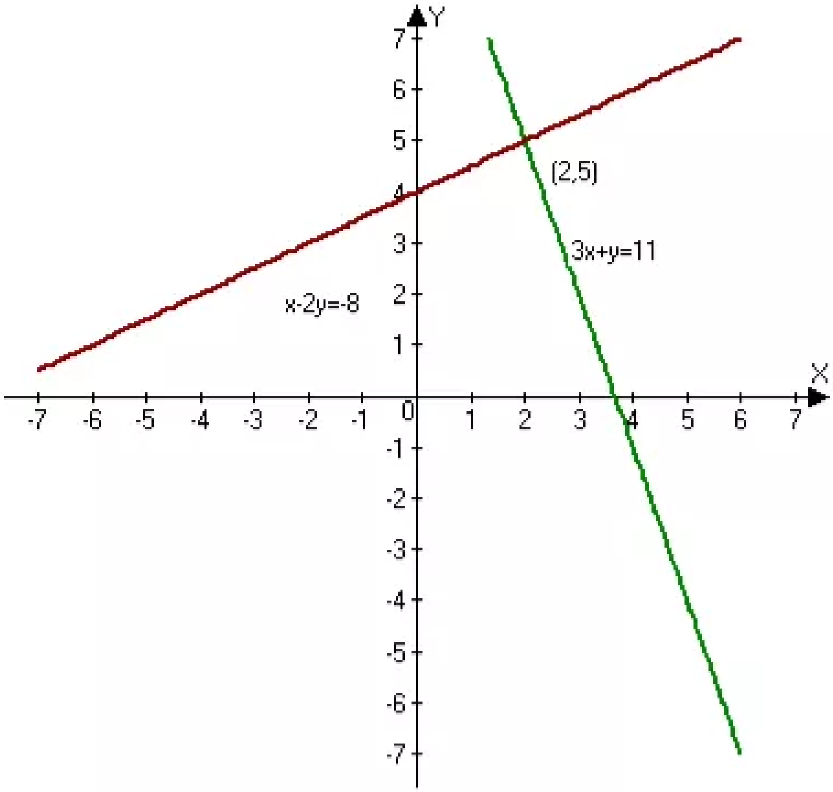
Answer 1q.

Given system is

$3x + y = 11$ ...... (1)

$x - 2y = -8$ ...... (2)

We begin by graphing both equations.



From the graph, the lines appear to intersect at $(2,5)$.
Also we can check this algebraically as follows

Equation (1): $3x+y=11$

$3(2)+5=11$	substitute 2 for x, 5 for y
$6+5=11$	simplify
$11=11$	true

Equation (2): $x-2y=-8$

$2-2(5)=-8$	substitute 2 for x, 5 for y
$2-10=-8$	simplify
$-8=-8$	true

Therefore the solution is $\boxed{(2,5)}$.

Answer 2e.

Elimination method:

If no coefficient in equations is 1 or -1.

Use this method, and use the following steps.

Step (1): Multiply one or both of the equations by a constant to obtain coefficients that differ only in sign for one of the variables.

Step (2): add the revised equations from step (1).
Combining like terms will eliminate one of the variables, solve for remaining variable.

Step (3): Substitute the value obtained in step (2) into either of the original equations and solve for the other variable.

Answer 2gp.

Consider

$$3x+3y=-15 \quad \ldots\ldots (1)$$
$$5x-9y=3 \quad \ldots\ldots (2)$$

Solve the system use elimination method.
Multiply equation (1) by 3 so that the coefficients of y differ only in sign and add the revised equations

$$(1)\times 3 \quad \Rightarrow 9x+9y=-45$$
$$(2) \quad \Rightarrow \underline{\ 5x-9y=3\ }$$

$$14x \quad =42 \qquad \text{Add the equations}$$
$$x=-3 \qquad \text{Divide on both sides by 14}$$

Therefore, $\boxed{x=-3}$

Now substitute the value of x into one of the original equations. Solve for y

$3x+3y=-15$ Equation (1)

$3(-3)+3y=-15$ Substitute -3 for x

$-9+3y=-15$ Simplify

$3y=-6$

$\boxed{y=-2}$ Divide on both sides by 3

Therefore, the solution is $\boxed{(-3,-2)}$.

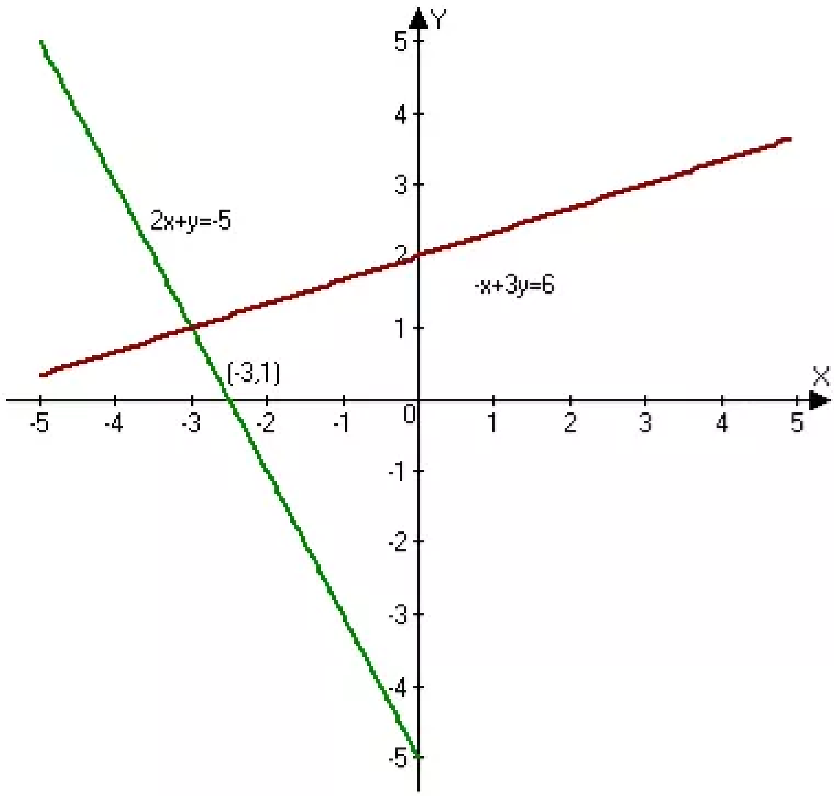
Answer 2q.

Given system is

$2x+y=-5$ ...... (1)

$-x+3y=6$ ...... (2)

We begin by graphing both equations.



From the graph, the lines appear to intersect at $(-3,1)$.
Also we can check this algebraically as follows

Equation (1): $2x+y=-5$

$2(-3)+1=-5$	substitute -3 for x, 1 for y
$-6+1=-5$	simplify
$-5=-5$	true

Equation (2): $-x+3y=6$

$-(-3)+3(1)=6$	substitute -3 for x, 1 for y
$3+3=6$	simplify
$6=6$	true

Therefore the solution is $\boxed{(-3,1)}$.

Answer 3e.

Number the equations.

$2x + 5y = 7$ Equation 1

$x + 4y = 2$ Equation 2

STEP 1 Solve Equation 2 for x.

Subtract $4y$ from both the sides.

$$x + 4y - 4y = 2 - 4y$$

$$x = 2 - 4y \quad \text{Revised Equation 2}$$

STEP 2 Substitute $2 - 4y$ for x in Equation 1.

$$2(2 - 4y) + 5y = 7$$

Clear the parentheses using the distributive property.

$$4 - 8y + 5y = 7$$

Solve for y. For this, subtract 4 from both the sides.

$$4 - 4 - 8y + 5y = 7 - 4$$

$$-3y = 3$$

Divide both the sides by -3.

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

$$y = -1$$

STEP 3 Substitute −1 for y in Revised Equation 2.

$$x = 2 - 4(-1)$$
$$x = 2 + 4$$
$$x = 6$$

CHECK Let us check the solution by substituting 6 for x, and −1 for y in the original equations.

$2x + 5y = 7$	$x + 4y = 2$
$2(6) + 5(-1) \stackrel{?}{=} 7$	$6 + 4(-1) \stackrel{?}{=} 2$
$12 - 5 \stackrel{?}{=} 7$	$6 - 4 \stackrel{?}{=} 2$
$7 = 7$ ✓	$2 = 2$ ✓

The solution is (6, −1).

Answer 3gp.

Number the equations.

$3x - 6y = 9$ Equation 1

$-4x + 7y = -16$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 4, and Equation 2 by 3 as the first step in eliminating x.

$$3x - 6y = 9 \xrightarrow{\times\ 4} 12x - 24y = 36 \quad \text{Equation 3}$$
$$-4x + 7y = -16 \xrightarrow{\times\ 3} -12x + 21y = -48 \quad \text{Equation 4}$$

STEP 2 Add Equation 3 and Equation 2 to eliminate x.

$$\begin{aligned} 12x - 24y &= 36 \\ -12x + 21y &= -48 \\ \hline -3y &= -12 \end{aligned}$$

Divide both the sides by −3.

$$\frac{-3y}{-3} = \frac{-12}{-3}$$
$$y = 4$$

STEP 3 Substitute 4 for x in either equations of the system, say, Equation 2 and simplify.

$$-4x + 7(4) = -16$$
$$-4x + 28 = -16$$

Subtract 28 from both the sides.

$$-4x + 28 - 28 = -16 - 28$$
$$-4x = -44$$

Divide both the sides by −4.

$$\frac{-4x}{-4} = \frac{-44}{-4}$$
$$x = 11$$

CHECK Let us check the solution by substituting 11 for x, and 4 for y in the original equations.

$$3x - 6y = 9$$
$$3(11) - 6(4) \stackrel{?}{=} 9$$
$$33 - 24 \stackrel{?}{=} 9$$
$$9 = 9 \checkmark$$

$$-4x + 7y = -16$$
$$-4(11) + 7(4) \stackrel{?}{=} -16$$
$$-44 + 28 \stackrel{?}{=} -16$$
$$-16 = -16 \checkmark$$

The solution is (11, 4).

Answer 3q.

Number the equations.

$$x - 2y = -2 \qquad (1)$$
$$3x + y = -20 \qquad (2)$$

Write equation (1) in the slope-intercept form. For this, subtract x from each side first.

$$x - 2y - x = -2 - x$$
$$-2y = -2 - x$$

Divide each side by −2.

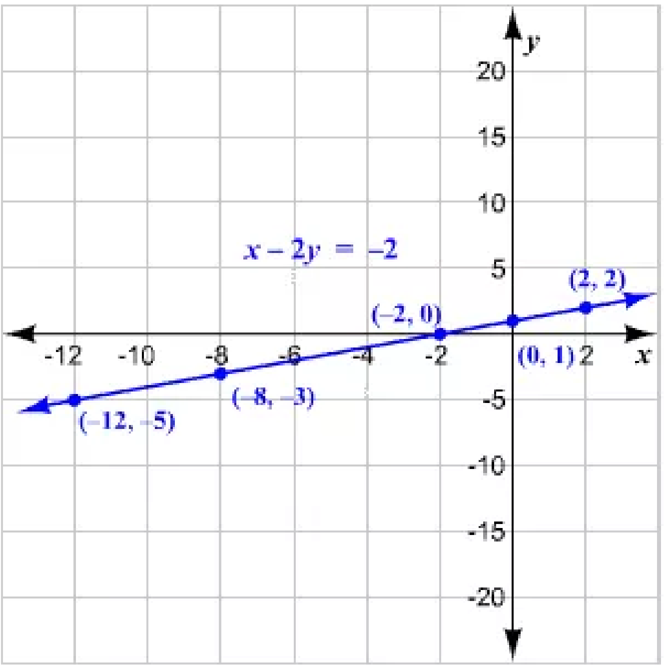
$$\frac{-2y}{-2} = \frac{-2 - x}{-2}$$
$$y = 1 + \frac{1}{2}x \qquad (3)$$

Find some points with coordinates that are solutions of equation (3). For this, choose some values for x and find the corresponding values of y.

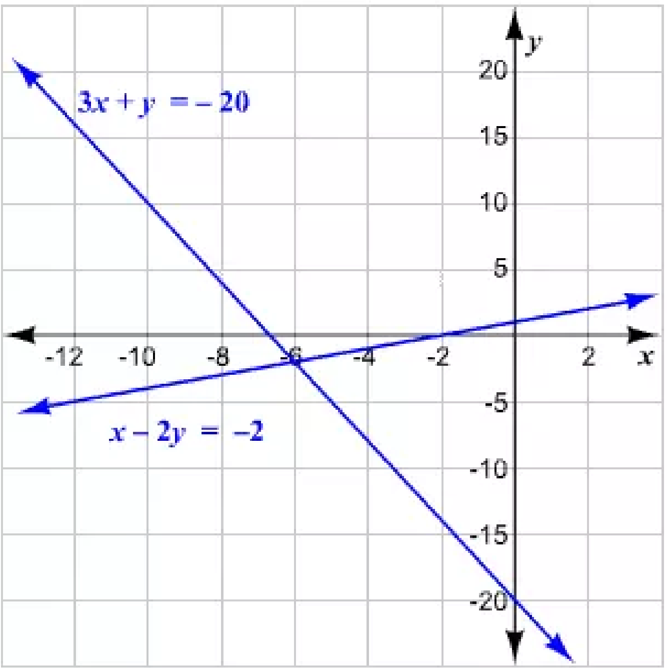
Organize the results in a table.

x	−12	−8	−2	0	2
y	−5	−3	0	1	2

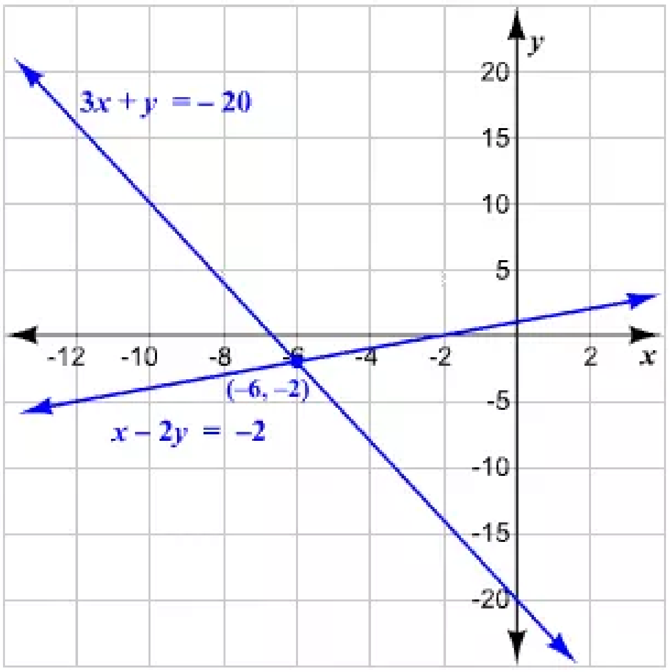
Now, plot the points on a coordinate plane and connect them with a straight line.



Similarly, graph equation (2) on the same set of axes.



Identify the point of intersection of the graphs.



From the graph, the lines appear to intersect at about (–6, –2).

Check

In order to check the solution, substitute –6 for x, and –2 for y in equations (1) and (2).

$$\begin{aligned} x - 2y &= -2 \\ -6 - 2(-2) &\stackrel{?}{=} -2 \\ -6 + 4 &\stackrel{?}{=} -2 \\ -2 &= -2 \quad \checkmark \end{aligned} \qquad \begin{aligned} 3x + y &= -20 \\ 3(-6) + (-2) &\stackrel{?}{=} -20 \\ -18 - 2 &\stackrel{?}{=} -20 \\ -20 &= -20 \quad \checkmark \end{aligned}$$

Therefore, the solution is (–6, –2).

Answer 4e.

Consider

$$3x + y = 16 \qquad \text{...... (1)}$$
$$2x - 3y = -4 \qquad \text{...... (2)}$$

First solve equation (1) for y

$$y = 16 - 3x$$

Substitute the expression in equation (2) and solve for x .

$$2x - 3y = -4 \qquad \text{Equation (2)}$$

$$2x - 3(16 - 3x) = -4 \qquad \text{Substitute } 16 - 3x \text{ for } y$$

$$2x - 48 + 9x = -4$$
$$11x - 48 = -4$$
$$11x = 44$$

$$x = 4 \qquad \text{Divide on both sides by 11}$$

Therefore, $x = 4$

Substitute the value of x into one of the revised equation (1) and solve for y

$$y = 16 - 3x \qquad \text{Equation (2)}$$

$$y = 16 - 3(4) \qquad \text{Substitute } 4 \text{ for } x$$

$$y = 16 - 12 \qquad \text{Simplify}$$

$$y = 4$$

Therefore, the solution is $\boxed{(4, 4)}$.

Answer 4gp.

Consider

$$5x+7y=3715 \quad \ldots\ldots (1)$$
$$8x+12y=6160 \quad \ldots\ldots (2)$$

Solve the system use elimination method.
Multiply equation (1) by -8 and equation (2) by 5
So that the coefficient of x differ only in sign

$$(1)\times -8 \Rightarrow -40x-56y=-29720$$
$$(2)\times 5 \Rightarrow 40x+60y=30800$$

$$4y=1080 \quad \text{Add the equations}$$
$$y=270 \quad \text{Divide on both sides by 4}$$

Therefore, $y=\boxed{270}$.

Now substitute the value of y into one of the original equations. Solve for x

$$5x+7y=3715 \quad \text{Equation (1)}$$

$$5x+7(270)=3715 \quad \text{Substitute 270 for } y$$

$$5x+1890=3715 \quad \text{Simplify}$$

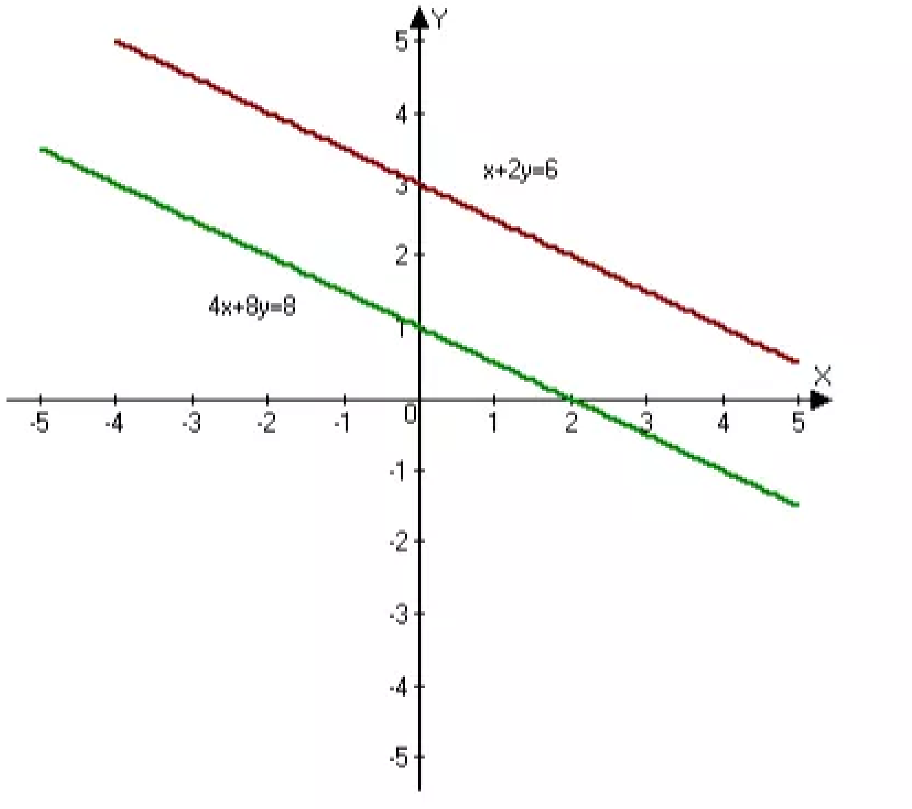
$$5x=1825$$

$$x=\boxed{365}. \quad \text{Divide on both sides by 5}$$

Therefore,
The school 365 short sleeve T-shirts and 270 long sleeve T-shirts.

Answer 4q.

Given system is
$4x+8y=8 \quad \ldots\ldots (1)$
$x+2y=6 \quad \ldots\ldots (2)$
We begin by graphing both equations.



From the graph, the lines are parallel to each other
Hence the system has no solution
Therefore the system is inconsistent.

Answer 5e.

Number the equations.

$$-5x + 3y = -5 \qquad (1)$$

$$y = \frac{5}{3}x + 1 \qquad (2)$$

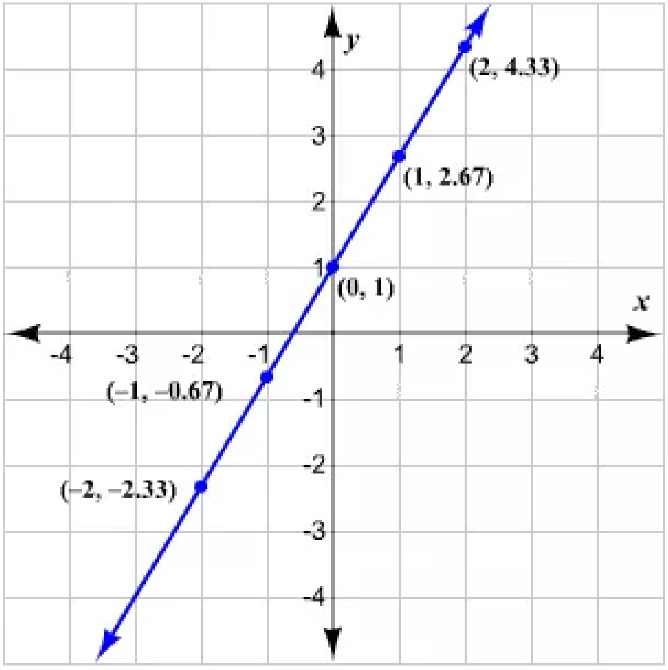
Equation (2) is in the slope-intercept form.
Find some points that are solutions of equation (2). For this, choose some values for x and find the corresponding values of y.

Organize the results in a table.

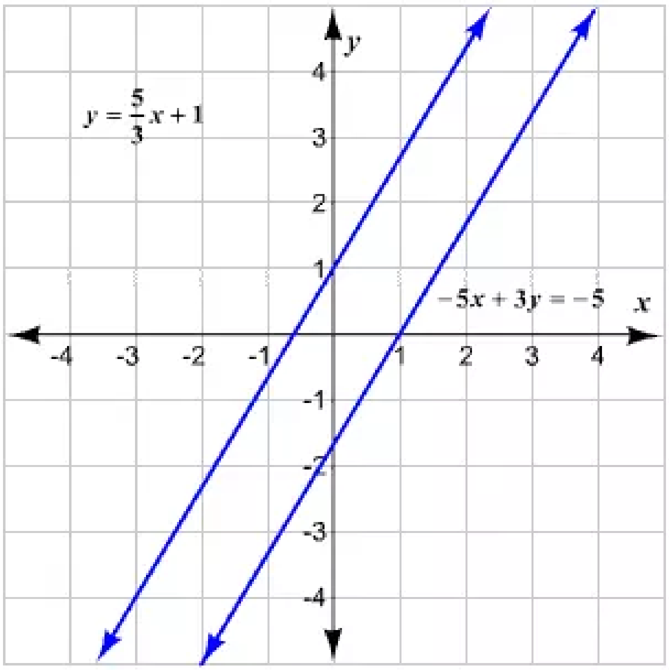
x	−2	−1	0	1	2
y	−2.33	−0.67	1	2.67	4.33

The points are (−2, −2.33), (−1, −0.67), (0, 1), (1, 2.67), and (2, 4.33).

Now, plot the points on a coordinate plane and connect them with a straight line.



Similarly, graph equation (2) on the same set of axes.



Since the two lines have no point of intersection, the system has no solution.

Therefore, the given system is inconsistent.

Answer 5gp.

Number the equations.

$12x - 3y = -9$	Equation 1
$-4x + y = 3$	Equation 2

Since the coefficient of x in the second equation is 1, use the substitution method to solve the system.

Solve Equation 2 for y.

Add $4x$ to both the sides.

$$-4x + y + 4x = 3 + 4x$$

$$y = 3 + 4x \qquad \text{Revised Equation 2}$$

Substitute $3 + 4x$ for y in Equation 1.

$$12x - 3(3 + 4x) = -9$$

Clear the parentheses using the distributive property.

$$12x - 9 - 12x = -9$$

$$-9 = -9$$

The statement $-9 = -9$ is true. Thus, the given system of equations has infinitely many solutions.

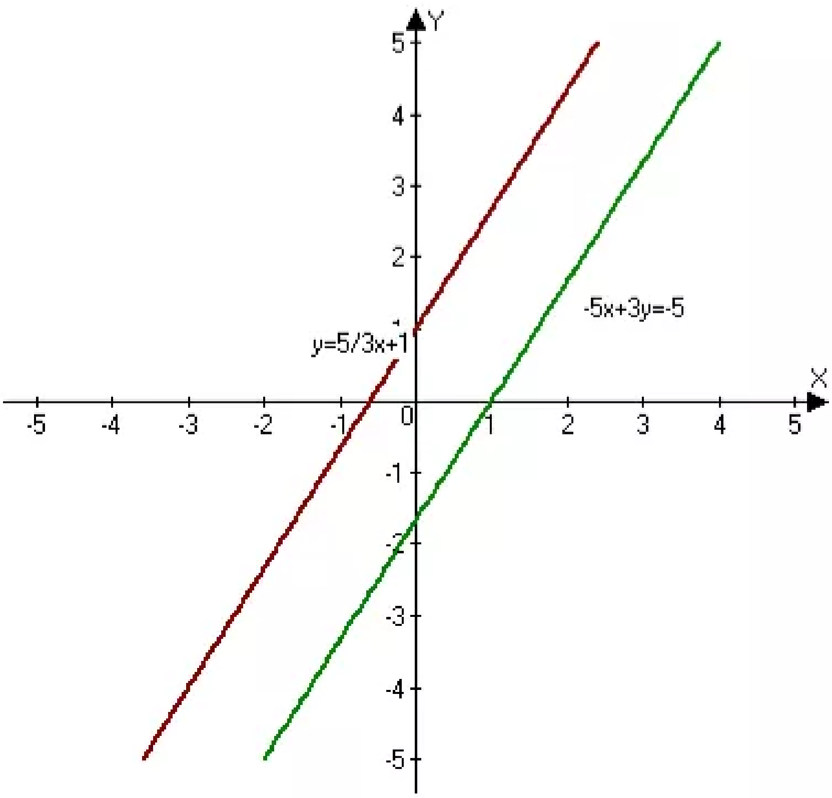
Answer 5q.

Given system is

$-5x + 3y = -5 \qquad \ldots\ldots (1)$

$y = \frac{5}{3}x + 1 \qquad \ldots\ldots (2)$

We begin by graphing both equations.



From the graph, the lines are parallel to each other
Hence the system has no solution
Therefore the system is inconsistent.

Answer 6e.

Consider

$$x+4y=1 \quad \ldots\ldots (1)$$
$$3x+2y=-12 \quad \ldots\ldots (2)$$

Since the coefficient of x in equation (1) is 1,
First solve equation (1) for x

$$x=1-4y$$

Substitute the expression in equation (2) and solve for y.

$$3x+2y=-12 \quad \text{Equation (2)}$$

$$3(1-4y)+2y=-12 \quad \text{Substitute } 1-4y \text{ for } x$$

$$3-12y+2y=-12$$
$$3-10y=-12$$
$$-10y=-15$$

$$y=\frac{3}{2} \quad \text{Divide on both sides by 10}$$

Therefore, $y=\frac{3}{2}$

Now substitute the value of y into the revised equation (1) and solve for x

$$x=1-4y \quad \text{Equation (2)}$$

$$x=1-4\left(\frac{3}{2}\right) \quad \text{Substitute } \frac{3}{2} \text{ for } y$$

$$=1-6$$
$$=-5 \quad \text{Simplify}$$

$$x=-5$$

Therefore, the solution is $\boxed{\left(-5,\frac{3}{2}\right)}$.

Answer 6gp.

Consider

$$6x + 15y = -12 \quad \ldots\ldots (1)$$
$$-2x - 5y = 4 \quad \ldots\ldots (2)$$

Because no coefficient is 1 or -1, use the elimination method
Multiply equation (2) by 3 and add this to the equation (1).

$$(1) \Rightarrow 6x + 15y = -12$$
$$(2)\times 3 \Rightarrow -6x - 15y = 27$$
$$0 = 15 \quad \text{Add the equations}$$

Because the statement $0 = 15$ is never true, there is no solution.

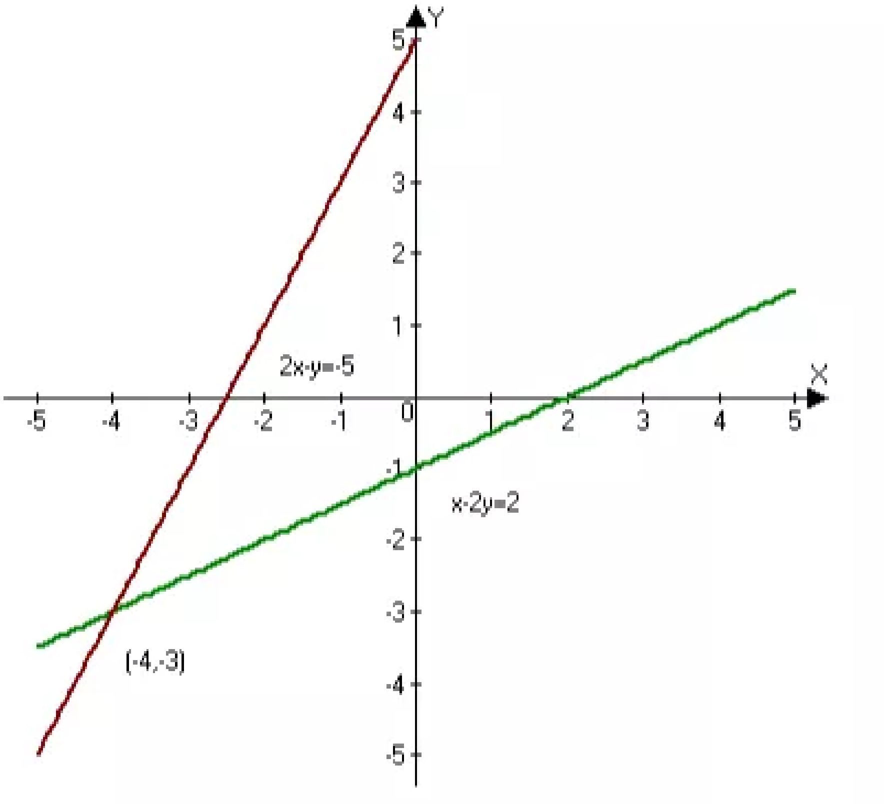
Answer 6q.

Given system is

$x - 2y = 2 \quad \ldots\ldots (1)$

$2x - y = -5 \quad \ldots\ldots (2)$

We begin by graphing both equations.



From the graph, the lines intersect at a single point $(-4, -3)$.
Since the lines intersect at one point, the system is consistent and independent.

Answer 7e.

Number the equations.

$3x - y = 2$ Equation 1

$6x + 3y = 14$ Equation 2

STEP 1 Solve Equation 1 for y.

Subtract $3x$ from both the sides.

$$3x - 3x - y = 2 - 3x$$
$$-y = 2 - 3x$$

Divide both the sides by -1.

$$\frac{-y}{-1} = \frac{2 - 3x}{-1}$$
$$y = 3x - 2$$ Revised Equation 1

STEP 2 Substitute $3x - 2$ for y in Equation 2.

$$6x + 3(3x - 2) = 14$$

Clear the parentheses using the distributive property.

$$6x + 9x - 6 = 14$$

Solve for x. For this, add 6 to both the sides.

$$15x - 6 + 6 = 14 + 6$$
$$15x = 20$$

Divide both the sides by 15.

$$\frac{15x}{15} = \frac{20}{15}$$
$$x = \frac{4}{3}$$

STEP 3 Substitute $\frac{4}{3}$ for x in Revised Equation 1.

$$y = 3\left(\frac{4}{3}\right) - 2$$
$$y = 4 - 2$$
$$y = 2$$

CHECK Let us check the solution by substituting $\frac{4}{3}$ for x, and 2 for y in the original equations.

$$\begin{aligned} 3x - y &= 2 \\ 3\left(\frac{4}{3}\right) - 2 &\stackrel{?}{=} 2 \\ 4 - 2 &\stackrel{?}{=} 2 \\ 2 &= 2 \ \checkmark \end{aligned}$$

$$\begin{aligned} 6x + 3y &= 14 \\ 6\left(\frac{4}{3}\right) + 3(2) &\stackrel{?}{=} 14 \\ 2(4) + 6 &\stackrel{?}{=} 14 \\ 8 + 6 &\stackrel{?}{=} 14 \\ 14 &= 14 \ \checkmark \end{aligned}$$

The solution is $\left(\frac{4}{3}, 2\right)$.

Answer 7gp.

Number the equations.

$5x + 3y = 20$ Equation 1

$-x - \frac{3}{5}y = -4$ Equation 2

We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In order to clear the fractions, multiply the equation by the least common denominator (LCD).

Multiply the second equation by its LCD, 5, as the first step in eliminating x.

$5x + 3y = 20 \longrightarrow 5x + 3y = 20$ Equation 1

$-x - \frac{3}{5}y = -4 \xrightarrow{\times\ 5} -5x - 3y = -20$ Equation 3

Add Equation 1 and Equation 3 to eliminate x.

$$\begin{aligned} 5x + 3y &= 20 \\ -5x - 3y &= -20 \\ \hline 0 &= 0 \quad \text{TRUE} \end{aligned}$$

The statement $0 = 0$ is true. Thus, the given system of equations has infinitely many solutions.

Answer 7q.

Number the equations.

$3x - y = -4$ Equation 1

$x + 3y = -28$ Equation 2

STEP 1 Solve Equation 2 for x. Subtract $3y$ from both the sides.

$$\begin{aligned} x + 3y - 3y &= -28 - 3y \\ x &= -28 - 3y \quad \text{Revised Equation 2} \end{aligned}$$

STEP 2 Substitute $-28 - 3y$ for x in Equation 1.

$3(-28 - 3y) - y = -4$

Clear the parentheses using the distributive property.

$$3(-28) + 3(-3y) - y = -4$$
$$-84 - 9y - y = -4$$
$$-84 - 10y = -4$$

Solve for y. For this, add 84 to both the sides.

$$-84 - 10y + 84 = -4 + 84$$
$$-10y = 80$$

Divide both the sides by -10.

$$\frac{-10y}{-10} = \frac{80}{-10}$$
$$y = -8$$

STEP 3 Substitute -8 for y in Revised Equation 2.

$$x = -28 - 3(-8)$$
$$= -28 + 24$$
$$= -4$$

CHECK Let us check the solution by substituting -4 for x, and -8 for y in the original equations.

$3x - y = -4$	$x + 3y = -28$
$3(-4) - (-8) \stackrel{?}{=} -4$	$-4 + 3(-8) \stackrel{?}{=} -28$
$-12 + 8 \stackrel{?}{=} -4$	$-4 - 24 \stackrel{?}{=} -28$
$-4 = -4$ ✓	$-28 = -28$ ✓

The solution is $(-4, -8)$.

Answer 8e.

Consider

$$3x-4y=-5 \qquad \text{...... (1)}$$
$$-x+3y=-5 \qquad \text{...... (2)}$$

Since the coefficient of x in equation (2) is -1,
First solve equation (2) for x

$$-x+3y=-5$$
$$x=3y+5$$

Substitute the expression in equation (1) and solve for y.

$$3x-4y=-5 \qquad \text{Equation (1)}$$
$$3(3y+5)-4y=-5 \qquad \text{Substitute } 3y+5 \text{ for}$$
$$9y+15-4y=-5 \; x \; \text{Distributive}$$
$$5y+15=-5$$
$$5y=-20$$
$$y=-4 \qquad \text{Divide on both sides by 5}$$

Now substitute the value of y into the revised equation (1) and solve for x

$$x=3y+5 \qquad \text{Revised equation}$$

$$=3(-4)+5 \qquad \text{Substitute } -4 \text{ for } y$$
$$=-12+5$$
$$=-7$$
$$\boxed{x=-7}$$

Therefore, the solution is $\boxed{(-7,-4)}$.

Answer 8gp.

Consider

$$12x - 2y = 21 \qquad \text{...... (1)}$$
$$3x + 12y = -4 \qquad \text{...... (2)}$$

Because no coefficient is 1 or -1, use the elimination method

Multiply equation (1) by 6 and add the revised equation to equation (2), to eliminate y.

$$(1)\times 6 \quad \Rightarrow 72x - 12y = 126$$
$$(2) \quad \Rightarrow \underline{3x + 12y = -4}$$
$$75x = 122 \qquad \text{Add the equations}$$
$$x = \frac{122}{75} \qquad \text{Divide on both sides by 75}$$

Therefore, $x = \frac{122}{75}$

Substitute the value of x into one of the original equations and solve for y

$$3x + 12y = -4 \qquad \text{Equation (2)}$$
$$3\left(\frac{122}{75}\right) + 12y = -4 \qquad \text{Substitute } \frac{122}{75} \text{ for } x$$
$$\frac{122}{25} + 12y = -4 \qquad \text{Simplify}$$
$$\frac{122}{25} + 4 = -12y \qquad \text{Rewrite}$$
$$\frac{222}{25} = -12y$$
$$y = \frac{-37}{25} \qquad \text{Divide on both sides by 12}$$

Therefore, the solution is $\boxed{\left(\frac{122}{75}, \frac{-37}{25}\right)}$.

Answer 8q.

Given system is

$x+5y=1$ ...... (1)

$-3x+4y=16$ ...... (2)

Because the coefficient of x in equation (1) is 1, we write

$x=1-5y$

Substitute this expression into equation (2) and solve for y.

$-3x+4y=16$ equation (2)

$-3(1-5y)+4y=16$ substitute $1-5y$ for x

$-3+15y+4y=16$ simplify

$-3+19y=16$

$19y=19$

$\boxed{y=1}$

Now substitute 1 for y into the revised equation (1), solve for x,

$x=1-5y$

$=1-5(1)$

$=1-5$

$=-4$

$\boxed{x=-4}$

Therefore the solution is $\boxed{(-4,1)}$.

Answer 9e.

First, number the equations.

$6x+y=-6$ Equation 1

$4x+3y=17$ Equation 2

STEP 1 Solve Equation 1 for y.

Subtract $6x$ from both the sides.

$6x-6x+y=-6-6x$

$y=-6-6x$ Equation 3

STEP 2 Substitute $-6-6x$ for y in Equation 2.

$4x+3(-6-6x)=17$

Clear the parentheses using the distributive property.

$4x-18-18x=17$

Solve for y. For this, add 18 to both the sides and simplify.

$4x-18+18-18x=17+18$

$-14x=35$

Divide both the sides by -14.

$$\frac{-14x}{-14}=\frac{35}{-14}$$

$$x=-\frac{5}{2}$$

STEP 3 Substitute $\frac{-5}{2}$ for y in Equation 3.

$$y = -6 - 6\left(\frac{-5}{2}\right)$$
$$y = -6 + 15$$
$$y = 9$$

The solution is $\left(\frac{-5}{2}, 9\right)$.

CHECK Let us check the solution by substituting $\frac{-5}{2}$ for x and 9 for y in the original equations.

$6x + y = -6$	$4x + 3y = 17$
$6\left(\frac{-5}{2}\right) + 9 \stackrel{?}{=} -6$	$4\left(\frac{-5}{2}\right) + 3(9) \stackrel{?}{=} 17$
$-15 + 9 \stackrel{?}{=} -6$	$-10 + 27 \stackrel{?}{=} 17$
$-6 = -6$ ✓	$17 = 17$

The solution checks.

Answer 9gp.

Number the equations.

$8x + 9y = 15$ Equation 1

$5x - 2y = 17$ Equation 2

We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

STEP 1 Multiply Equation 1 by 5, and Equation 2 by −8 as the first step in eliminating x.

$8x + 9y = 15 \xrightarrow{\times 5} 40x + 45y = 75$ Equation 3

$5x - 2y = 17 \xrightarrow{\times -8} -40x + 16y = -136$ Equation 4

STEP 2 Add Equation 3 and Equation 4 to eliminate x.

$$\begin{aligned} 40x + 45y &= 75 \\ -40x + 16y &= -136 \\ \hline 61y &= -61 \end{aligned}$$

Divide both the sides by 61.

$$\frac{61y}{61} = \frac{-61}{61}$$
$$y = -1$$

STEP 3 Substitute -1 for y in either equations of the system, say, Equation 2 and simplify.

$$5x - 2(-1) = 17$$
$$5x + 2 = 17$$

Subtract 2 from both the sides.

$$5x + 2 - 2 = 17 - 2$$
$$5x = 15$$

Divide both the sides by 5.

$$\frac{5x}{5} = \frac{15}{5}$$
$$x = 3$$

CHECK Let us check the solution by substituting 3 for x, and -1 for y in the original equations.

$8x + 9y = 15$	$5x - 2y = 17$
$8(3) + 9(-1) \stackrel{?}{=} 15$	$5(3) - 2(-1) \stackrel{?}{=} 17$
$24 - 9 \stackrel{?}{=} 15$	$15 + 2 \stackrel{?}{=} 17$
$15 = 15$ ✓	$17 = 17$ ✓

The solution is $(3, -1)$.

Answer 9q.

Given system is

$6x + y = -6$ ...... (1)

$4x + 3y = 17$ ...... (2)

Because the coefficient of y in equation (1) is 1, we write

$y = -6 - 6x$

Substitute this expression into equation (2) and solve for x.

$4x + 3y = 17$ equation (2)

$4x + 3(-6 - 6x) = 17$ substitute $-6 - 6x$ for y

$4x - 18 - 18x = 17$ simplify

$-14x = 35$

$$\boxed{x = \frac{-35}{14}}$$

Now substitute the value of x into the revised equation.

$$y = -6 - 6x$$
$$= -6 - 6\left(\frac{-35}{14}\right)$$
$$= -6 + 6\left(\frac{35}{14}\right)$$
$$= 9$$
$$\boxed{y = 9}$$

Therefore the solution is $\boxed{\left(\frac{-35}{14}, 9\right)}$.

Answer 10e.

Consider

$$6x - 3y = 15 \qquad \ldots\ldots (1)$$
$$-2x + y = -5 \qquad \ldots\ldots (2)$$

Since the coefficient of y in equation (2) is 1,
First solve equation (2) for y

$$-2x + y = -5$$

Add on both sides with $2x$

$$y = 2x - 5$$

Substitute the expression in equation (1) and solve for x.

$6x - 3y = 15$ Equation (1)

$6x - 3(2x - 5) = 15$ Substitute $2x - 5$ for y

$6x - 6x + 15 = 15$

$15 = 15$ True

Because the statement $15 = 15$ is always true, there are $\boxed{\text{infinitely many solutions}}$.

Answer 10gp.

Consider

$$5x+5y=5 \quad \ldots\ldots (1)$$
$$5x+3y=4.2 \quad \ldots\ldots (2)$$

Because the coefficient of x in both equations are same,
Write from equation (1)

$$5x=5-5y \quad \ldots\ldots (3)$$

Substitute this in equation (2) to get y.

$$5x+3y=4.2$$
$$5-5y+3y=4.2$$
$$5-2y=4.2 \quad \text{Simplify}$$
$$2y=5-4.2$$
$$2y=0.8$$
$$y=0.4 \quad \text{Divide by } 2$$

Substitute the value of y in equation (3),

$$5x=5-5y$$
$$5x=5-5(0.4)$$
$$5x=5-2$$
$$5x=3$$
$$x=0.6 \quad \text{Divide by } 5$$

Therefore, the solution is $\boxed{(0.6,0.4)}$.

Answer 10q.

Given system is

$2x-3y=-1$ ...... (1)

$2x+3y=-19$ ...... (2)

Adding the equation (1) and equation (2)

$(1) \Rightarrow 2x-3y=-1$

$(2) \Rightarrow \underline{2x+3y=-19}$

$4x=-20$

$\boxed{x=-5}$

Now substitute the value of x into one of the given equations and solve for y.

$2x-3y=-1$ equation (1)

$2(-5)-3y=-1$ substitute -5 for x

$-10-3y=-1$

$-3y=9$

$\boxed{y=-3}$

Therefore the solution is $\boxed{(-5,-3)}$.

Answer 11e.

Number the equations.

$3x + y = -1$ Equation 1

$2x + 3y = 18$ Equation 2

STEP 1 Solve Equation 1 for y.

Subtract $3x$ from both the sides.

$3x - 3x + y = -1 - 3x$

$y = -1 - 3x$ Revised Equation 1

STEP 2 Substitute $-1 - 3x$ for y in Equation 2.

$2x + 3(-1 - 3x) = 18$

Clear the parentheses using the distributive property.

$2x - 3 - 9x = 18$

Solve for x. For this, add 3 to both the sides.

$$-7x - 3 + 3 = 18 + 3$$
$$-7x = 21$$

Divide both the sides by -7.

$$\frac{-7x}{-7} = \frac{21}{-7}$$
$$x = -3$$

STEP 3 Substitute -3 for x in Revised Equation 1.

$$y = -1 - 3(-3)$$
$$y = -1 + 9$$
$$y = 8$$

CHECK Let us check the solution by substituting -3 for x, and 8 for y in the original equations.

$3x + y = -1$	$2x + 3y = 18$
$3(-3) + 8 \stackrel{?}{=} -1$	$2(-3) + 3(8) \stackrel{?}{=} 18$
$-9 + 8 \stackrel{?}{=} -1$	$-6 + 24 \stackrel{?}{=} 18$
$-1 = -1$ ✓	$18 = 18$ ✓

The solution is $(-3, 8)$.

Answer 11q.

Number the equations.

$3x - 2y = 10$ Equation 1

$-6x + 4y = -20$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 2 as the first step in eliminating x.

$$3x - 2y = 10 \xrightarrow{\times 2} 6x - 4y = 20 \quad \text{Equation 3}$$
$$-6x + 4y = -20 \longrightarrow -6x + 4y = -20 \quad \text{Equation 2}$$

STEP 2 Add Equation 3 and Equation 2 to eliminate x.

$$\begin{aligned} 6x - 4y &= 20 \\ -6x + 4y &= -20 \\ \hline 0 &= 0 \quad \text{TRUE} \end{aligned}$$

Therefore, the given system of equations has infinitely many solutions.

Answer 12e.

Consider the system

$2x - y = 1$ ...... (1)

$8x + 4y = 6$ ...... (2)

Now, solve the above system using substitution method

Since the coefficient of y in equation (1) is -1,

First solve equation (1) for y

$$2x - y = 1$$
$$y = 2x - 1$$

Substitute the expression for y in equation (2) and solve for x.

$8x + 4y = 6$ Equation (2)

$8x + 4(2x - 1) = 6$ Substitute $2x - 1$ for y

$8x + 8x - 4 = 6$ Multiply

$$16x = 10$$
$$x = \frac{10}{16}$$
$$x = \frac{5}{8}$$

Therefore, $\boxed{x = \frac{5}{8}}$

Now substitute the value of x into the revised equation (1) and solve for y.

$$y = 2x - 1$$

$y = 2\left(\frac{5}{8}\right) - 1$ Substitute $\frac{5}{8}$ for x

$$y = \frac{5}{4} - 1$$
$$= \frac{1}{4}$$

Therefore, $\boxed{y = \frac{1}{4}}$

Check:

Now, check the solution by substituting x and y values into the original equations

Substitute, $x=\frac{5}{8}$ and $y=\frac{1}{4}$ into equation (1)

$$2x-y=1$$
$$2\left(\frac{5}{8}\right)-\frac{1}{4}\overset{?}{=}1$$
$$\frac{5}{4}-\frac{1}{4}\overset{?}{=}1$$
$$1\overset{?}{=}1 \qquad \text{True}$$

Substitute, $x=\frac{5}{8}$ and $y=\frac{1}{4}$ into equation (2)

$$8x+4y=6$$
$$8\left(\frac{5}{8}\right)+4\left(\frac{1}{4}\right)\overset{?}{=}6$$
$$5+1\overset{?}{=}6$$
$$6\overset{?}{=}6 \qquad \text{True}$$

Hence, the solution is $\boxed{\left(\frac{5}{8},\frac{1}{4}\right)}$.

Answer 12q.

Consider the system

$$2x+3y=17 \qquad \text{......(1)}$$
$$5x+8y=20 \qquad \text{......(2)}$$

Multiply equation (1) by -5 and equation (2) by 2 and add the revised equations.

$$(1)\times-5 \quad \Rightarrow -10x-15y=-85$$
$$(2)\times2 \quad \Rightarrow \ 10x+16y=40$$
$$y=-45 \quad \text{add}$$

Therefore $\boxed{y=-45}$

Substitute the value of y into one of the equations

$2x+3y=17$	Equation (1)
$2x+3(-45)=17$	Substitute -45 for y
$2x-135=17$	Add 135 on both sides
$2x=152$	
$\boxed{x=76}$	Divide 2 on both sides

Therefore, solution is $\boxed{(76,-45)}$

Answer 13e.

STEP 1 Write verbal model for the situation.

Let x be the cost of 1 foot cable and y the cost of the two connectors.

It is given that the total cost of a 6 foot cable is \$15.50. The total cost of the cable is the sum of the cost of the connectors and the cost of the cable.

Cost of 6 foot cable	+	Cost of the connectors	=	Total cost of the cable
$\Downarrow$		$\Downarrow$		$\Downarrow$
$6x$	+	y	=	15.50

Similarly, model the second equation.

Cost of 3 foot cable	+	Cost of the connectors	=	Total cost of the cable
$\Downarrow$		$\Downarrow$		$\Downarrow$
$3x$	+	y	=	10.25

STEP 2 Write a system of equations.

Equation 1 $6x + y = 15.50$

Equation 2 $3x + y = 10.25$

STEP 3 Solve the system using the elimination method. We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 2 by -1 as the first step in eliminating y.

$$6x + y = 15.50 \longrightarrow 6x + y = 15.50 \quad \text{Equation 1}$$

$$3x + y = 10.25 \xrightarrow{\times -1} -3x - y = -10.25 \quad \text{Equation 3}$$

Substitute 1.75 for x in either equations of the system, say, Equation 1.

$6(1.75) + y = 15.50$

Simplify.

$10.5 + y = 15.50$

$y = 5$

Thus, the cost of the 1 foot cable is \$1.75 and cost of the two connectors is \$5.

In order to find the total cost of 4 foot cable, substitute 1.75 for x and 5 for y in the equation $4x+y$ and simplify.

$$4(1.75)+5 = 12$$

Therefore, we are expected to pay $12 for 4 foot cable.

Answer 14e.

Consider the system

$$2x+5y=10 \qquad \ldots\ldots (1)$$

$$-3x+y=36 \qquad \ldots\ldots (2)$$

Now, solve the above equation using substitution method

Since the coefficient of y in equation (2) is 1,

First solve equation (2) for y

$$-3x+y=36$$

$$y=3x+36$$

Substitute the expression for y in equation (1) and solve for x.

$$2x+5y=10 \qquad \text{Equation (1)}$$

$$2x+5(3x+36)=10 \qquad \text{Substitute } 3x+36 \text{ for } y$$

$$2x+15x+180=10 \qquad \text{Multiply}$$

$$17x=-170$$

$$x=\frac{-170}{17}$$

$$x=-10$$

Therefore, $\boxed{x=-10}$

Now substitute the value of x into the revised equation (1) and solve for y.

$$y=3x+36$$

$$=3(-10)+36 \qquad \text{Substitute, } x=-10$$

$$=-30+36$$

$$=6$$

Therefore $\boxed{y=6}$

Check:

Check the solution by substituting into the original equations

Substitute, $x=-10$ and $y=6$ into equation (1)

$$2x+5y=10$$

$$2(-10)+5(6)\stackrel{?}{=}10$$

$$-20+30\stackrel{?}{=}10$$

$$10\stackrel{?}{=}10 \quad \text{True}$$

Substitute, $x=-10$ and $y=6$ into equation (2)

$$-3x+y=36$$

$$-3(-10)+6\stackrel{?}{=}36$$

$$30+6\stackrel{?}{=}36$$

$$36\stackrel{?}{=}36 \quad \text{True}$$

Hence, the solution is $\boxed{(-10,6)}$.

.Answer 15e.

Number the equations.

$2x + 6y = 17$ Equation 1

$2x - 10y = 9$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by -1 as the first step in eliminating x.

$$2x + 6y = 17 \xrightarrow{\times -1} -2x - 6y = -17 \quad \text{Equation 3}$$

$$2x - 10y = 9 \longrightarrow 2x - 10y = 9 \quad \text{Equation 2}$$

STEP 2 Add Equation 3 and Equation 2.

$$-2x - 6y = -17$$

$$\underline{2x - 10y = 9}$$

$$-16y = -8$$

Divide both the sides by -16.

$$\frac{-16y}{-16} = \frac{-8}{-16}$$

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

STEP 3 Substitute $\frac{1}{2}$ for y in either of the equations, say, Equation 1.

$$2x + 6y = 17$$
$$2x + 6\left(\frac{1}{2}\right) = 17$$

Simplify.

$$2x + 3 = 17$$
$$2x = 14$$
$$x = 7$$

CHECK Let us check the solution by substituting 7 for x, and $\frac{1}{2}$ for y in the original equations.

$2x + 6y = 17$	$2x - 10y = 9$
$2(7) + 6\left(\frac{1}{2}\right) \stackrel{?}{=} 17$	$2(7) - 10\left(\frac{1}{2}\right) \stackrel{?}{=} 9$
$14 + 3 \stackrel{?}{=} 17$	$14 - 5 \stackrel{?}{=} 9$
$17 = 17$ ✓	$9 = 9$ ✓

The solution is $\left(7, \frac{1}{2}\right)$.

Answer 16e.

Consider the system

$$4x - 2y = -16 \quad \ldots\ldots (1)$$
$$-3x + 4y = 12 \quad \ldots\ldots (2)$$

Now, solve the above system by using elimination method

Multiply equation (1) by 2 and add to the equation (2), and solve for y.

$8x - 4y = -32$	Multiply equation (1) by 2
$-3x + 4y = 12$	Equation (2)
$5x + 0y = -20$	Add
$5x = -20$	
$x = -4$	

Substitute the value of x into the one of the original equations and solve for y.

$-3x + 4y = 12$	Equation (2)
$-3(-4) + 4y = 12$	Substitute -4 for x
$12 + 4y = 12$	
$4y = 0$	
$y = 0$	

Therefore, $\boxed{y = 0}$

Check:

Check the solution by substituting into the original equations

Substitute, $x=-4$ and $y=0$ into equation (1)

$$4x-2y=-16$$
$$4(-4)-2(0)\overset{?}{=}-16$$
$$-16-0\overset{?}{=}-16$$
$$-16\overset{?}{=}-16 \qquad \text{True}$$

Substitute, $x=-4$ and $y=0$ into equation (2)

$$-3x+4y=12$$
$$-3(-4)+4(0)\overset{?}{=}12$$
$$12+0\overset{?}{=}12$$
$$12\overset{?}{=}12 \qquad \text{True}$$

Hence, the solution is $\boxed{(-4,0)}$.

Answer 17e.

Number the equations.

$3x-4y=-10$ Equation 1

$6x+3y=-42$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by -2 as the first step in eliminating x.

$$3x-4y=-10 \xrightarrow{\times -2} -6x+8y=20 \quad \text{Equation 3}$$
$$6x+3y=-42 \longrightarrow 6x+3y=-42 \quad \text{Equation 2}$$

STEP 2 Add Equation 3 and Equation 2 to eliminate x.

$$-6x+8y=20$$
$$6x+3y=-42$$
$$\overline{\quad 11y=-22 \quad}$$

Divide both the sides by 11.

$$\frac{11y}{11}=\frac{-22}{11}$$
$$y=-2$$

STEP 3 Substitute -2 for y in either equations of the system, say, Equation 1 and simplify.

$$3x-4(-2)=-10$$
$$3x+8=-10$$

Subtract 8 from both the sides.

$$3x + 8 - 8 = -10 - 8$$
$$3x = -18$$

Divide both the sides by 3.

$$\frac{3x}{3} = \frac{-18}{3}$$
$$x = -6$$

CHECK Let us check the solution by substituting -6 for x, and -2 for y in the original equations.

$$3x - 4y = -10$$
$$3(-6) - 4(-2) \stackrel{?}{=} -10$$
$$-18 + 8 \stackrel{?}{=} -10$$
$$-10 = -10 \checkmark$$

$$6x + 3y = -42$$
$$6(-6) + 3(-2) \stackrel{?}{=} -42$$
$$-36 - 6 \stackrel{?}{=} -42$$
$$-42 = -42 \checkmark$$

The solution is $(-6, -2)$.

Answer 18e.

Consider the system

$$4x - 3y = 10 \quad \ldots\ldots (1)$$
$$8x - 6y = 20 \quad \ldots\ldots (2)$$

Now, solve the above system using elimination method

Multiply equation (1) by -2 and add to the equation (2).

$-8x + 6y = -20$	Multiply equation (1) by 2
$\underline{8x - 6y = 20}$	Equation (2)
$0 \cdot x + 0 \cdot y = 0$	Add
$0 = 0$	

Because the statement $0 = 0$ is always true, it has infinitely many solutions.

Answer 19e.

Number the equations.

$5x - 3y = -3$ Equation 1

$2x + 6y = 0$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 2 as the first step in eliminating y.

$$5x - 3y = -3 \xrightarrow{\times 2} 10x - 6y = -6 \quad \text{Equation 3}$$
$$2x + 6y = 0 \longrightarrow 2x + 6y = 0 \quad \text{Equation 2}$$

STEP 2 Add Equation 3 and Equation 2.

$$\begin{array}{l} 10x - 6y = -6 \\ \underline{\ \ 2x + 6y = 0} \\ 12x \qquad = -6 \end{array}$$

Divide both the sides by −16.

$$\frac{12x}{12} = \frac{-6}{12}$$
$$x = \frac{-1}{2}$$

STEP 3 Substitute $-\frac{1}{2}$ for x in either of the equations, say, Equation 1.

$$5\left(\frac{-1}{2}\right) - 3y = -3$$

Simplify.

$$\frac{-5}{2} - 3y = -3$$
$$-3y = -3 + \frac{5}{2}$$
$$-3y = -\frac{1}{2}$$
$$y = \frac{1}{6}$$

CHECK Let us check the solution by substituting $\frac{-1}{2}$ for x, and $\frac{1}{6}$ for y in the original equations.

$5x - 3y = -3$	$2x + 6y = 0$
$5\left(\frac{-1}{2}\right) - 3\left(\frac{1}{6}\right) \stackrel{?}{=} -3$	$2\left(\frac{-1}{2}\right) + 6\left(\frac{1}{6}\right) \stackrel{?}{=} 0$
$-\frac{5}{2} - \frac{1}{2} \stackrel{?}{=} -3$	$-1 + 1 \stackrel{?}{=} 0$
$-3 = -3$ ✓	$0 = 0$ ✓

The solution is $\left(-\frac{1}{2}, \frac{1}{6}\right)$.

Answer 20e.

Consider the system

$$10x-2y=16 \quad \ldots\ldots (1)$$

$$5x+3y=-12 \quad \ldots\ldots (2)$$

Now, solve the above system using elimination method

Multiply equation (2) by -2 and add to the equation (2),

$$10x-2y=16 \qquad \text{Equation } (1)$$

$$-10x-6y=24 \qquad \text{Multiply equation } (2) \text{ by } -2$$

$$0\cdot x-8y=40 \qquad \text{Add}$$

$$-8y=40$$

$$y=-5$$

Therefore, $\boxed{y=-5}$

Now substitute the value of y into one of the original equations and solve for x.

$$10x-2y=16 \qquad \text{Equation (1)}$$

$$10x-2(-5)=16 \qquad \text{Substitute } -5 \text{ for } y$$

$$10x+10=16$$

$$10x=6$$

$$x=\frac{3}{5}$$

Therefore, $\boxed{x=\frac{3}{5}}$

Check:

Check the solution by substituting into the original equations

Substitute, $x=\frac{3}{5}$ and $y=-5$ into equation (1)

$$10x-2y=16$$

$$10\left(\frac{3}{5}\right)-2(-5)\stackrel{?}{=}16$$

$$6+10\stackrel{?}{=}16$$

$$16\stackrel{?}{=}16 \qquad \text{True}$$

Substitute, $x=\frac{3}{5}$ and $y=-5$ into equation (2)

$$5x+3y=-12$$

$$5\left(\frac{3}{5}\right)+3(-5)\stackrel{?}{=}-12$$

$$3-15\stackrel{?}{=}-12$$

$$-12\stackrel{?}{=}-12 \qquad \text{True}$$

Hence, the solution is $\boxed{\left(\frac{3}{5},-5\right)}$.

Answer 21e.

Number the equations.

$2x + 5y = 14$ Equation 1

$3x - 2y = -36$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 3 and Equation 2 by –3 as the first step in eliminating x.

$$2x + 5y = 14 \xrightarrow{\times\ 3} 6x + 15y = 42 \quad \text{Equation 3}$$

$$3x - 2y = -36 \xrightarrow{\times -2} -6x + 4y = 72 \quad \text{Equation 4}$$

STEP 2 Add Equation 3 and Equation 4 to eliminate x.

$$\begin{array}{r} 6x + 15y = 42 \\ -6x + 4y = 72 \\ \hline 19y = 114 \end{array}$$

Divide both the sides by 19.

$$\frac{19y}{19} = \frac{114}{19}$$

$$y = 6$$

STEP 3 Substitute 6 for y in either equations of the system, say, Equation 1 and simplify.

$$2x + 5(6) = 14$$

$$2x + 30 = 14$$

Subtract 30 from both the sides.

$$2x + 30 - 30 = 14 - 30$$

$$2x = -16$$

Divide both the sides by 2.

$$\frac{2x}{2} = \frac{-16}{2}$$

$$x = -8$$

CHECK Let us check the solution by substituting –8 for x, and 6 for y in the original equations.

$$\begin{aligned} 2x + 5y &= 14 \\ 2(-8) + 5(6) &\stackrel{?}{=} 14 \\ -16 + 30 &\stackrel{?}{=} 14 \\ 14 &= 14 \ \checkmark \end{aligned}$$

$$\begin{aligned} 3x - 2y &= -36 \\ 3(-8) - 2(6) &\stackrel{?}{=} -36 \\ -24 - 12 &\stackrel{?}{=} -36 \\ -36 &= -36 \ \checkmark \end{aligned}$$

The solution is (–8, 6).

Answer 22e.

Consider the system

$7x+2y=11$ ...... (1)

$-2x+3y=29$ ...... (2)

Now, solve the above system by using elimination method

Multiply equation (1) by -3 and add to the equation (2),

$$\begin{aligned}
-21x-6y&=-33 && \text{Multiply equation (1) by 3}\\
\underline{-4x+6y=58} && &\text{Multiply equation (2) by 2}\\
-25x+0\cdot y&=25 && \text{Add}\\
-25x&=25\\
x&=-1
\end{aligned}$$

Therefore, $\boxed{x=-1}$

Now substitute the value of x into one of the original equations and solve for y.

$$\begin{aligned}
-2x+3y&=29 && \text{Equation (2)}\\
-2(-1)+3y&=29 && \text{Substitute } -1 \text{ for } x\\
2+3y&=29\\
3y&=27\\
y&=9
\end{aligned}$$

Therefore, $\boxed{y=9}$

Check:

Now, check the solution by substituting x and y values into the original equations

Substitute, $x=-1$ and $y=9$ into equation (1)

$$\begin{aligned}
7x+2y&=11\\
7(-1)+2(9)&\overset{?}{=}11\\
-7+18&\overset{?}{=}11\\
11&\overset{?}{=}11 && \text{True}
\end{aligned}$$

Also, substitute $x=-1$ and $y=9$ into equation (2)

$$\begin{aligned}
-2x+3y&=29\\
-2(-1)+3(9)&\overset{?}{=}29\\
2+27&\overset{?}{=}29\\
29&\overset{?}{=}29 && \text{True}
\end{aligned}$$

Hence, the solution is $\boxed{(-1,9)}$.

Answer 23e.

Number the equations.

$3x + 4y = 18$ Equation 1

$6x + 8y = 18$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by -2 as the first step in eliminating x.

$3x + 4y = 18 \xrightarrow{\times -2} -6x - 8y = -36$ Equation 3

$6x + 8y = 18 \longrightarrow 6x + 8y = 18$ Equation 2

STEP 2 Add Equation 3 and Equation 2.

$$\begin{aligned} -6x - 8y &= -36 \\ 6x + 8y &= 18 \\ \hline 0 &= -18 \end{aligned}$$ FALSE

Thus, the given system of equations has no solution.

Consider the system

$2x + 5y = 13$ ...... (1)

$6x + 2y = -13$ ...... (2)

Now, solve the above system by using elimination method

Multiply equation (1) by -3 and add to the equation (2).

$-6x - 15y = -39$ Multiply equation (1) by -3

$6x + 2y = -13$ Equation (2)

$0 \cdot x - 13y = -52$ Add

$-13y = -52$

$y = 4$

Therefore, $\boxed{y = 4}$

Answer 24e.

Now substitute the value of y into one of the original equations and solve for x.

$6x + 2y = -13$ Equation (2)

$6x + 2(4) = -13$ Substitute 4 for y

$6x + 8 = -13$

$6x = -21$

$x = -\frac{7}{2}$

Therefore, $\boxed{x = -\frac{7}{2}}$

Now substitute the value of y into one of the original equations and solve for x.

$$6x+2y=-13 \qquad \text{Equation (2)}$$
$$6x+2(4)=-13 \qquad \text{Substitute 4 for } y$$
$$6x+8=-13$$
$$6x=-21$$
$$x=-\frac{7}{2}$$

Therefore, $\boxed{x=-\frac{7}{2}}$

Check:
Now, check the solution by substituting x and y values into the original equations

Substitute, $x=-\frac{7}{2}$ and $y=4$ into equation (1)

$$2x+5y=13$$
$$2\left(-\frac{7}{2}\right)+5(4)\overset{?}{=}13$$
$$-7+20\overset{?}{=}13$$
$$13\overset{?}{=}13 \qquad \text{True}$$

Substitute, $x=-\frac{7}{2}$ and $y=4$ into equation (2)

$$6x+2y=-13$$
$$6\left(-\frac{7}{2}\right)+2(4)\overset{?}{=}-13$$
$$-21+8\overset{?}{=}-13$$
$$-13\overset{?}{=}-13 \qquad \text{True}$$

Hence, the solution is $\boxed{\left(-\frac{7}{2},4\right)}$.

Answer 25e.

Number the equations.

$$4x-5y=13 \qquad \text{Equation 1}$$
$$6x+2y=48 \qquad \text{Equation 2}$$

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 2 and Equation 2 by as the first step in eliminating y.

$$4x - 5y = 13 \xrightarrow{\times\ 2} 8x - 10y = 26 \qquad \text{Equation 3}$$

$$6x + 2y = 48 \xrightarrow{\times\ 5} 30x + 10y = 240 \qquad \text{Equation 4}$$

STEP 2 Add Equation 3 and Equation 4 to eliminate y.

$$\begin{array}{rcl} 8x - 10y &=& 26 \\ 30x + 10y &=& 240 \\ \hline 38x &=& 266 \end{array}$$

Divide both the sides by 38.

$$\frac{38x}{38} = \frac{266}{38}$$

$$x = 7$$

STEP 3 Substitute 7 for x in either equations of the system, say, Equation 2 and simplify.

$$6(7) + 2y = 48$$

$$42 + 2y = 48$$

Subtract 42 from both the sides.

$$42 + 2y - 42 = 48 - 42$$

$$2y = 6$$

Divide both the sides by 2.

$$\frac{2y}{2} = \frac{6}{2}$$

$$y = 3$$

CHECK Let us check the solution by substituting 7 for x, and 3 for y in the original equations.

$4x - 5y = 13$	$6x + 2y = 48$
$4(7) - 5(3) \stackrel{?}{=} 13$	$6(7) + 2(3) \stackrel{?}{=} 48$
$28 - 15 \stackrel{?}{=} 13$	$42 + 6 \stackrel{?}{=} 48$
$13 = 13$ ✓	$48 = 48$ ✓

The solution is (7, 3).

Answer 26e.

Consider the system

$6x-4y=14$ ...... (1)

$2x+8y=21$ ...... (2)

Now, solve the above system by using elimination method

Multiply equation (2) by -3 and add to the equation (1).

$$\begin{aligned} 6x-4y&=14 && \text{Equation (1)} \\ -6x-24y&=-63 && \text{Multiply equation (2) by} -2 \\ \hline 0\cdot x-28y&=-49 && \text{Add} \\ -28y&=-49 \\ y&=\frac{7}{4} \end{aligned}$$

Therefore, $\boxed{y=\frac{7}{4}}$

Now substitute the value of y into one of the original equations and solve for x.

$$\begin{aligned} 6x-4y&=14 && \text{Equation (1)} \\ 6x-4\left(\frac{7}{4}\right)&=14 && \text{Substitute } \frac{7}{4} \text{ for } y \\ 6x-7&=14 \\ 6x&=21 \\ x&=\frac{7}{2} \end{aligned}$$

Therefore, $\boxed{x=\frac{7}{2}}$

Check:

Now, check the solution by substituting x and y values into the original equations

Substitute, $x=\frac{7}{2}$ and $y=\frac{7}{4}$ into equation (1)

$$\begin{aligned} 6x-4y&=14 \\ 6\left(\frac{7}{2}\right)-4\left(\frac{7}{4}\right)&\stackrel{?}{=}14 \\ 21-7&\stackrel{?}{=}14 \\ 14&\stackrel{?}{=}14 && \text{True} \end{aligned}$$

Substitute, $x=\frac{7}{2}$ and $y=\frac{7}{4}$ into equation (2)

$$\begin{aligned} 2x+8y&=21 \\ 2\left(\frac{7}{2}\right)+8\left(\frac{7}{4}\right)&\stackrel{?}{=}21 \\ 7+14&\stackrel{?}{=}21 \\ 21&\stackrel{?}{=}21 && \text{True} \end{aligned}$$

Hence, the solution is $\boxed{\left(\frac{7}{2},\frac{7}{4}\right)}$.

Answer 27e.

Elimination method is used to solve the system of equations.
The error is that only the left hand side of the first equation is multiplied by -2. The constant term is not multiplied by -2.

In order to correct the error, let us first number the equations.

$3x + 2y = 7$ Equation 1

$5x + 4y = 15$ Equation 2

We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

Multiply each side of Equation 1 by -2.

$3x + 2y = 7 \xrightarrow{\times -2} -6x - 4y = -14$ Equation 3

$5x + 4y = 15 \longrightarrow 5x + 4y = 15$ Equation 2

Add Equation 3 and 2.

$$\begin{aligned} -6x - 4y &= -14 \\ 5x + 4y &= 15 \\ \hline -x &= 1 \end{aligned}$$

Divide both the sides by -1.

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

$$x = -1$$

Thus, the value of x is -1.

Answer 28e.

Consider the system

$3x + 2y = 11$ ...... (1)

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

Now, solve the above system

Because the coefficient of y in equation (2) is 1, use substitution method to solve the system.

Solve equation (2) for y

$4x + y = -2$

$y = -2 - 4x$ Solve for y

Substitute the expression into the equation (1), and solve for x.

$3x + 2y = 11$ Equation (1)

$3x + 2(-2 - 4x) = 11$ Substitute $-2 - 4x$ for y

$3x - 4 - 8x = 11$ Multiply

$-5x - 4 = 11$

$-5x = 15$

$x = -3$

Therefore, $\boxed{x = -3}$

Now substitute the value of x in the revised equation (2),

$y=-2-4x$ Revised equation (2)

$y=-2-4(-3)$ Substitute, $x=-3$

$y=-2+12$

$y=10$

Therefore, $\boxed{y=10}$

Check:

Now, check the solution by substituting x and y values into the original equations

Substitute, $x=-3$ and $y=10$ into equation (1)

$$3x+2y=11$$

$$3(-3)+2(10)\stackrel{?}{=}11$$

$$-9+20\stackrel{?}{=}11$$

$$11\stackrel{?}{=}11 \quad \text{True}$$

Substitute, $x=-3$ and $y=10$ into equation (2)

$$4x+y=-2$$

$$4(-3)+10\stackrel{?}{=}-2$$

$$-12+10\stackrel{?}{=}-2$$

$$-2\stackrel{?}{=}-2 \quad \text{True}$$

Hence, the solution is $\boxed{(-3,10)}$.

Answer 29e.

Number the equations.

$2x - 3y = 8$ Equation 1

$-4x + 5y = -10$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 2 as the first step in eliminating x.

$2x - 3y = 8 \xrightarrow{\times\ 2} 4x - 6y = 16$ Equation 3

$-4x + 5y = -10 \longrightarrow -4x + 5y = -10$ Equation 2

STEP 2 Add Equation 3 and Equation 2 to eliminate x.

$$\begin{array}{r} 4x - 6y = 16 \\ -4x + 5y = -10 \\ \hline -y = 6 \end{array}$$

Divide both the sides by −1.

$$\frac{-y}{-1} = \frac{6}{-1}$$
$$y = -6$$

STEP 3 Substitute −6 for x in either equations of the system, say, Equation 2 and simplify.

$$-4x + 5(-6) = -10$$
$$-4x - 30 = -10$$

Add 30 to both the sides.

$$-4x - 30 + 30 = -10 + 30$$
$$-4x = 20$$

Divide both the sides by −4.

$$\frac{-4x}{-4} = \frac{20}{-4}$$
$$x = -5$$

CHECK Let us check the solution by substituting −5 for x, and −6 for y in the original equations.

$2x - 3y = 8$	$-4x + 5y = -10$
$2(-5) - 3(-6) \stackrel{?}{=} 8$	$-4(-5) + 5(-6) \stackrel{?}{=} -10$
$-10 + 18 \stackrel{?}{=} 8$	$20 - 30 \stackrel{?}{=} -10$
$8 = 8$ ✓	$-10 = -10$ ✓

The solution is (−5, −6).

Answer 30e.

Consider the system

$3x+7y=-1$ ...... (1)

$2x+3y=6$ ...... (2)

Now, solve the above system

Because no coefficient is 1 or -1, use elimination method to solve the system

Multiply equation (1) by -2 and equation (2) by 3 and add the equations.

$$\begin{aligned} -6x-14y&=2 && \text{Multiply equation (1) by } -2\\ 6x+9y&=18 && \text{Multiply equation (2) by } 3\\ \hline 0\cdot x-5y&=20 && \text{Add}\\ -5y&=20\\ y&=-4 \end{aligned}$$

Therefore, $\boxed{y=-4}$

Now substitute the value of y into one of the equations and solve for x.

$$\begin{aligned} 2x+3y&=6 && \text{Equation (2)}\\ 2x+3(-4)&=6 && \text{Substitute } -4 \text{ for } y\\ 2x-12&=6\\ 2x&=18\\ x&=9 \end{aligned}$$

Therefore, $\boxed{x=9}$

Check:

Now, check the solution by substituting x and y values into the original equations

Substitute, $x=9$ and $y=-4$ into equation (1)

$$\begin{aligned} 3x+7y&=-1\\ 3(9)+7(-4)&\stackrel{?}{=}-1\\ 27-28&\stackrel{?}{=}-1\\ -1&\stackrel{?}{=}-1 && \text{True} \end{aligned}$$

Substitute, $x=9$ and $y=-4$ into equation (2)

$$\begin{aligned} 2x+3y&=6\\ 2(9)+3(-4)&\stackrel{?}{=}6\\ 18-12&\stackrel{?}{=}6\\ 6&\stackrel{?}{=}6 && \text{True} \end{aligned}$$

Therefore, the solution is $\boxed{(9,-4)}$.

Answer 31e.

Number the equations.

$4x - 10y = 18$ Equation 1

$-2x + 5y = -9$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 2 by 2 as the first step in eliminating x.

$$4x - 10y = 18 \longrightarrow 4x - 10y = 18 \quad \text{Equation 3}$$

$$-2x + 5y = -9 \xrightarrow{\times 2} -4x + 10y = -18 \quad \text{Equation 2}$$

STEP 2 Add Equation 3 and Equation 2.

$$\begin{aligned} 4x - 10y &= 18 \\ \underline{-4x + 10y} &\underline{= -18} \\ 0 &= 0 \quad \text{TRUE} \end{aligned}$$

Thus, the given system of equations has infinitely many solutions.

Answer 32e.

The given system is $3x - y = -2$ ...... (1)

$5x + 2y = 15$ ...... (2)

Because the coefficient of y in equation (1) is -1, we use substitution method to solve the system.

From equation (1) , we write

$3x - y = -2$

$y = 3x + 2$

Substitute this expression in equation (2) and solve for x

$5x + 2y = 15$ Equation (2)

$5x + 2(3x + 2) = 15$ Substitution $3x + 2$ for y

$5x + 6x + 4 = 15$

$11x + 4 = 15$

$11x = 11$

$\boxed{x = 1}$

Now substitute the value of x into the revised equation (1), and solve for y.

$$\begin{aligned} y &= 3x+2 \\ &= 3(1)+2 \\ &= 3+2 \\ &= 5 \end{aligned}$$

$$\boxed{y=5}$$

Therefore the solution is $\boxed{(1,5)}$

Answer 33e.

Number the equations.

$x + 2y = -8$ Equation 1

$3x - 4y = -24$ Equation 2

Since the coefficient of x in the first equation is 1, use the substitution method to solve the system.

STEP 1 Solve Equation 1 for x.

Subtract $2y$ from both the sides.

$$x + 2y - 2y = -8 - 2y$$

$$x = -8 - 2y \qquad \text{Revised Equation 1}$$

STEP 2 Substitute $-8 - 2y$ for x in Equation 2.

$$3(-8 - 2y) - 4y = -24$$

Clear the parentheses using the distributive property.

$$\begin{aligned} 3(-8) + 3(-2y) - 4y &= -24 \\ -24 - 6y - 4y &= -24 \\ -24 - 10y &= -24 \end{aligned}$$

Solve for y. For this, add 24 to both the sides.

$$\begin{aligned} -24 - 10y + 24 &= -24 + 24 \\ -10y &= 0 \end{aligned}$$

Divide both the sides by -10.

$$\frac{-10y}{-10} = \frac{0}{-10}$$

$$y = 0$$

STEP 3 Substitute 0 for y in Revised Equation 1.

$$x = -8 - 2(0)$$
$$= -8 - 0$$
$$= -8$$

CHECK Let us check the solution by substituting -8 for x, and 0 for y in the original equations.

$x + 2y = -8$	$3x - 4y = -24$
$-8 + 2(0) \stackrel{?}{=} -8$	$3(-8) - 4(0) \stackrel{?}{=} -24$
$-8 = -8$ ✓	$-24 = -24$ ✓

The solution is $(-8, 0)$.

Answer 34e.

The given system is $2x+3y=-6$ ...... (1)

$3x-4y=25$ ...... (2)

Because no coefficient is 1 or -1, we use elimination method, to solve the system.
Multiply equation (1) by -3 and equation (2) by 2 and add the equations.

$(1)\times -3 \Rightarrow -6x-9y=18$

$(2)\times 2 \Rightarrow 6x-8y=50$

$-17y=68$ adding

$\boxed{y=-4}$

Now substitute the value of y into one of the original equations.

$2x+3y=-6$ equation (1)

$2x+3(-4)=-6$ substitution -4 for y

$2x-12=-6$

$2x=6$

$\boxed{x=3}$

Therefore the solution is $\boxed{(3,-4)}$.

Answer 35e.

Let us substitution method.

First, number the equations.

$3x + y = 15$ Equation 1

$-x + 2y = -19$ Equation 2

STEP 1 Solve Equation 2 for x.

Subtract $2y$ from both the sides.

$$-x + 2y - 2y = -19 - 2y$$
$$-x = -19 - 2y$$

Divide both the sides by -1.

$$\frac{-x}{-1} = \frac{-19 - 2y}{-1}$$
$$x = 2y + 19 \qquad \text{Revised Equation 2}$$

STEP 2 Substitute $2y + 19$ for x in Equation 1.

$$3(2y + 19) + y = 15$$

Clear the parentheses using the distributive property.

$$6y + 57 + y = 15$$

Solve for y. For this, subtract 57 from both the sides.

$$6y + 57 - 57 + y = 15 - 57$$
$$7y = -42$$

Divide both the sides by 7.

$$\frac{7y}{7} = \frac{-42}{7}$$
$$y = -6$$

STEP 3 Substitute -6 for y in Revised Equation 2.

$$x = 2(-6) + 19$$
$$x = -12 + 19$$
$$x = 7$$

CHECK Let us check the solution by substituting 7 for x, and -6 for y in the original equations.

$3x + y = 15$	$-x + 2y = -19$
$3(7) + (-6) \stackrel{?}{=} 15$	$-7 + 2(-6) \stackrel{?}{=} -19$
$21 - 6 \stackrel{?}{=} 15$	$-7 - 12 \stackrel{?}{=} -19$
$15 = 15$ ✓	$-19 = -19$

The solution is $(7, -6)$.

Answer 36e.

The given system is $4x-3y=8$ ...... (1)

$-8x+6y=16$ ...... (2)

Because no coefficient is 1 or -1, we use elimination method, to solve the system. Multiply equation (1) by 2 and equation (2) by 2 and add the equations.

$$(1)\times 2 \quad \Rightarrow 8x-6y=16$$
$$(2) \quad \Rightarrow \underline{-8x+6y=16}$$
$$0=32 \quad \text{adding}$$

Because the statement $0=32$ is never true, there is no solution.

Answer 37e.

Number the equations.

$4x - y = -10$ Equation 1

$6x + 2y = -1$ Equation 2

Since the coefficient of y in the first equation is -1, use the substitution method to solve the system.

STEP 1 Solve Equation 1 for y. Subtract $4x$ from both the sides.

$$4x - y - 4x = -10 - 4x$$
$$-y = -10 - 4x$$

Divide both the sides by -1.

$$\frac{-y}{-1} = \frac{-10-4x}{-1}$$
$$y = 10 + 4x \quad \text{Revised Equation 1}$$

STEP 2 Substitute $10+4x$ for y in Equation 2.

$$6x + 2(10+4x) = -1$$

Clear the parentheses using the distributive property.

$$6x + 2(10) + 2(4x) = -1$$
$$6x + 20 + 8x = -1$$
$$14x + 20 = -1$$

Solve for x. For this, subtract 20 from both the sides.

$$14x + 20 - 20 = -1 - 20$$
$$14x = -21$$

Divide both the sides by 14.

$$\frac{14x}{14} = \frac{-21}{14}$$
$$x = -\frac{3}{2}$$

STEP 3 Substitute $-\frac{3}{2}$ for x in Revised Equation 1.

$$y = 10 + 4\left(-\frac{3}{2}\right)$$
$$= 10 - 6$$
$$= 4$$

CHECK Let us check the solution by substituting $-\frac{3}{2}$ for x, and 4 for y in the original equations.

$$4x - y = -10$$
$$4\left(-\frac{3}{2}\right) - 4 \stackrel{?}{=} -10$$
$$-6 - 4 \stackrel{?}{=} -10$$
$$-10 = -10 \checkmark$$

$$6x + 2y = -1$$
$$6\left(-\frac{3}{2}\right) + 2(4) \stackrel{?}{=} -1$$
$$-9 + 8 \stackrel{?}{=} -1$$
$$-1 = -1 \checkmark$$

The solution is $\left(-\frac{3}{2}, 4\right)$.

Answer 38e.

The given system is $7x+5y=-12$ ...... (1)

$3x-4y=1$ ...... (2)

Because no coefficient is 1 or -1, we use elimination method, to solve the system.
Multiply equation (1) by -3 and equation (2) by 7 and add the equations.

$$(1)\times-3 \quad \Rightarrow -21x-15y=36$$
$$(2)\times7 \quad \Rightarrow \underline{21x-28y=7}$$
$$-43y=43 \quad \text{adding}$$
$$\boxed{y=-1}$$

Now substitute the value of y in one of the original equations and solve for x.

$3x-4y=1$ equation (2)

$3x-4(-1)=1$ substitute -1 for y

$3x+4=1$

$3x=-3$

$\boxed{x=-1}$

Therefore the solution is $\boxed{(-1,-1)}$.

Answer 39e.

Number the equations.

$2x + y = -1$ Equation 1

$-4x + 6y = 6$ Equation 2

STEP 1 Solve Equation 1 for y.

Subtract $2x$ from both the sides.

$$2x - 2x + y = -1 - 2x$$

$$y = -1 - 2x \qquad \text{Revised Equation 1}$$

STEP 2 Substitute $-1 - 2x$ for y in Equation 2.

$$-4x + 6(-1 - 2x) = 6$$

Clear the parentheses using the distributive property.

$$-4x - 6 - 12x = 6$$

Solve for x. For this, add 6 to both the sides.

$$-4x - 6 + 6 - 12x = 6 + 6$$

$$-16x = 12$$

Divide both the sides by -16.

$$\frac{-16x}{-16} = \frac{12}{-16}$$

$$= \frac{-3}{4}$$

STEP 3 Substitute $\frac{-3}{4}$ for x in Revised Equation 1.

$$y = -1 - 2\left(\frac{-3}{4}\right)$$

$$y = -1 + \left(\frac{3}{2}\right)$$

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

CHECK Let us check the solution by substituting $\frac{-3}{4}$ for x, and $\frac{1}{2}$ for y in the original equations.

$$2x + y = -1$$

$$2\left(-\frac{3}{4}\right) + \left(\frac{1}{2}\right) \stackrel{?}{=} -1$$

$$-\frac{3}{2} + \frac{1}{2} \stackrel{?}{=} -1$$

$$-1 = -1 \checkmark$$

$$-4x + 6y = 6$$

$$-4\left(-\frac{3}{4}\right) + 6\left(\frac{1}{2}\right) \stackrel{?}{=} 6$$

$$3 + 3 \stackrel{?}{=} 6$$

$$6 = 6 \checkmark$$

The solution is $\left(-\frac{3}{4}, \frac{1}{2}\right)$.

Answer 40e.

The given system is $3x+2y=4$ ...... (1)

$6x-3y=-27$ ...... (2)

Because no coefficient is 1 or -1, we use elimination method, to solve the system.
Multiply equation (1) by -2 and equation (2) and add the equations.

$$(1)\times -2 \quad \Rightarrow -6x-4y=-8$$
$$(2) \quad \Rightarrow 6x-3y=-27$$
$$-7y=-35 \quad \text{adding}$$
$$\boxed{y=5}$$

Now substitute the value of y in one of the original equations .

$6x-3y=-27$ equation (2)

$6x-3(5)=-27$ substitute 5 for y

$6x-15=-27$

$6x=-12$

$\boxed{x=-2}$

Therefore the solution is $\boxed{(-2,5)}$.

Hence the correct answer is B.

Answer 41e.

We can find the coordinates of the point where the two diagonals intersect using the equations of the two diagonals.

Find the equations using the given points. We know that the slope, m, of a line passing through the points (x_1, y_1) and (x_2, y_2) is $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.

We have to evaluate the slope of the line passing through (1, 4) and (5, 0). For this, substitute 0 for y_2, 4 for y_1, 5 for x_2, and 1 for x_1.

$$m = \frac{0-4}{5-1}$$
$$= -1$$

Now, determine the equation of the diagonal passing through (1, 4) and (5, 0).
Substitute −1 for m, 1 for x_1, and 4 for y_1 in $y - y_1 = m(x - x_1)$, which is the point-slope form of a line.

$$y - 4 = -1(x - 1)$$

Use the distributive property to open the parentheses.

$$y - 4 = -1(x) - 1(-1)$$
$$y - 4 = -x + 1$$

Add 4 to both the sides.

$$y - 4 + 4 = -x + 1 + 4$$
$$y = -x + 5$$

Find the slope of the diagonal passing through the points (0, 2) and (4, 4). Substitute 0 for x_1, 2 for y_1, 4 for x_2, and 4 for y_2 in the formula for the slope.

$$m = \frac{4 - 2}{4 - 0}$$
$$= \frac{2}{4}$$
$$= \frac{1}{2}$$

Now, find the equation of the diagonal passing through (0, 2) and (4, 4).

$$y - 2 = \frac{1}{2}(x - 0)$$
$$y - 2 = \frac{1}{2}x$$

Multiply both sides of the equation by the least common denominator 2 to clear the fractions.

$$2(y - 2) = 2\left(\frac{1}{2}x\right)$$
$$2y - 4 = x$$

Thus, we get a system.

$$y = -x + 5 \qquad \text{Equation 1}$$
$$2y - 4 = x \qquad \text{Equation 2}$$

Solve the system using the substitution method. Substitute $-x + 5$ for y in Equation 2.

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

Clear the parentheses using the distributive property.

$$2(-x) + 2(5) - 4 = x$$
$$-2x + 10 - 4 = x$$
$$-2x + 6 = x$$

Solve for x. For this, add $2x$ to both the sides.

$$-2x + 6 + 2x = x + 2x$$
$$6 = 3x$$

Divide both the sides by 2.

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

Substitute 2 for x in Equation 1.

$$y = -2 + 5$$
$$= 3$$

Therefore, the diagonals of the quadrilateral intersect at the point (2, 3).

Answer 42e.

From the given diagram, the edge of one of the diagonal are $(1,6)$ and $(7,4)$.

First find the equation of the diagonals, using point-slope form.

Slope of the diagonal is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{4-6}{7-1} \qquad \text{let } (x_1, y_1) = (1,6) \& (x_2, y_2) = (7,4)$$
$$= \frac{-2}{5}$$

Therefore the equation of diagonal is,

$y - y_1 = m(x - x_1)$ point-slope form

$y - 6 = \frac{-2}{5}(x-1)$ $m = \frac{-2}{5}$

$5(y-6) = -2(x-1)$ simplify

$5y - 30 = -2x + 2$ multiply

$\boxed{2x + 5y = 32}$

Also the edges of other diagonal are $(3,7)$ and $(6,1)$.

Slope of the diagonal is,

$$m=\frac{y_2-y_1}{x_2-x_1}$$

$$=\frac{1-7}{6-3} \qquad \text{Let } (x_1,y_1)=(3,7)\&(x_2,y_2)=(6,1)$$

$$=\frac{-6}{3}$$

$$=-2$$

Therefore equation of the diagonal is

$$y-y_1=m(x-x_1) \qquad \text{point –slope form}$$

$$y-7=(-2)(x-3)$$

$$y-7=-2x+6$$

$$\boxed{2x+y=13}$$

Now consider the system $2x+5y=32$ ...... (1)

$2x+y=13$ ...... (2)

Because the coefficient of y in the equation (2) is 1 , we use substitution method, to solve the system.

$$2x+y=13$$

$$\Rightarrow \quad y=13-2x$$

Substitute the revised equation in equation (1), and solve for x.

$$2x+5y=32 \qquad \text{equation (1)}$$

$$2x+5(13-2x)=32 \qquad \text{substitution } 13-2x \text{ for } y$$

$$2x+65-10x=32$$

$$-8x+65=32$$

$$-8x=-33$$

$$\boxed{x=\frac{33}{8}}$$

Now substitute the value of x into revised equation and solve for y.

$$y=13-2x$$

$$=13-2\left(\frac{33}{8}\right)$$

$$=\frac{19}{4}$$

$$\boxed{y=\frac{19}{4}}$$

Therefore the solution is $\boxed{\left(\frac{33}{8},\frac{19}{4}\right)}$.

Answer 43e.

We can find the coordinates of the point where the two diagonals intersect using the equations of the two diagonals.

Find the equations using the given points. We know that the slope, m, of a line passing through the points (x_1, y_1) and (x_2, y_2) is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

We have to evaluate the slope of the line passing through (1, 3) and (7, 0). For this, substitute 0 for y_2, 3 for y_1, 3 for x_2, and 1 for x_1.

$$\begin{aligned} m &= \frac{0-3}{7-1} \\ &= -\frac{3}{6} \\ &= -\frac{1}{2} \end{aligned}$$

Now, determine the equation of the diagonal passing through (1, 3) and (7, 0).

Substitute $-\frac{1}{2}$ for m, 1 for x_1, and 7 for y_1 in $y - y_1 = m(x - x_1)$, which is the point-slope form of a line.

$$\begin{aligned} y - 7 &= -\frac{1}{2}(x - 0) \\ y - 7 &= -\frac{1}{2}x \end{aligned}$$

Multiply both sides of the equation by the least common denominator 2 to clear the fractions.

$$\begin{aligned} 2(y - 7) &= 2\left(-\frac{1}{2}x\right) \\ 2y - 7 &= -x \end{aligned}$$

Divide both the sides by -1.

$$\begin{aligned} \frac{2y - 7}{-1} &= \frac{-x}{-1} \\ 7 - 2y &= x \end{aligned}$$

Swap the sides of the equation.

$x = 7 - 2y$

Find the slope of the diagonal passing through the points (1, −1) and (5, 5). Substitute 1 for x_1, −1 for y_1, 5 for x_2, and 5 for y_2 in the equation of the slope.

$$\begin{aligned} m &= \frac{5-(-1)}{5-1} \\ &= \frac{6}{4} \\ &= \frac{3}{2} \end{aligned}$$

Similarly, find the equation of the diagonal passing through (1, −1) and (5, 5).

$$\begin{aligned} y-(-1) &= \frac{3}{2}(x-1) \\ y+1 &= \frac{3}{2}x-\frac{3}{2} \end{aligned}$$

Multiply both sides of the equation by the least common denominator 2 to clear the fractions.

$$2(y+1) = 2\left(\frac{3}{2}x-\frac{3}{2}\right)$$

Use the distributive property to open the parentheses.

$$\begin{aligned} 2(y+1) &= 2\left(\frac{3}{2}x-\frac{3}{2}\right) \\ 2y+2 &= 3x-3 \end{aligned}$$

Name the equations.

$x = 7-2y$ Equation 1

$2y+2 = 3x-3$ Equation 2

Solve the system using the substitution method. Substitute $7-2y$ for x in Equation 2.

$2y+2=3(7-2y)-3$

Clear the parentheses using the distributive property.

$$\begin{aligned} 2y+2 &= 3(7)+3(-2y)-3 \\ &= 21-6y-3 \\ &= 18-6y \end{aligned}$$

Solve for x. For this, add $6y - 2$ to both the sides.

$$2y + 2 + 6y - 2 = 18 - 6y + 6y - 2$$

$$8y = 16$$

Divide both the sides by 8.

$$\frac{8y}{8} = \frac{16}{8}$$

$$y = 2$$

Substitute 2 for y in Equation 1.

$$x = 7 - 2(2)$$

$$= 7 - 4$$

$$= 3$$

Therefore, the diagonals of the quadrilateral intersect at the point (3, 2).

Answer 44e.

Given system is

$$0.02x - 0.05y = -0.38$$

$$0.03x + 0.04y = 1.04$$

To simplify the given system multiply both the equations by 100. We get,

$$2x - 5y = -38 \qquad \ldots\ldots (1)$$

$$3x + 4y = 104 \qquad \ldots\ldots (2)$$

Because no coefficient is 1 or -1, we use elimination method.

Multiply equation (1) by -3 and equation (2) by 2 and add the equations.

$$(1)\times -3 \quad \Rightarrow -6x + 15y = 114$$

$$(2)\times 2 \quad \Rightarrow \underline{\ 6x + 8y = 208\ }$$

$$23y = 322 \qquad \text{adding}$$

$$\boxed{y = 14}$$

Now substitute the value of y into one of the original equations.

$$2x - 5y = -38 \qquad \text{equation (1)}$$

$$2x - 5(14) = -38 \qquad \text{substitute 14 for } y$$

$$2x - 70 = -38$$

$$2x = 32$$

$$\boxed{x = 16}$$

Therefore the solution is $\boxed{(16,14)}$.

Answer 45e.

Number the equations.

$0.05x - 0.03y = 0.21$ Equation 1

$0.07x + 0.02y = 0.16$ Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by 2 and Equation 2 by 3 as the first step in eliminating y.

$$0.05x - 0.03y = 0.21 \xrightarrow{\times 2} 0.10x - 0.06y = 0.42 \quad \text{Equation 3}$$

$$0.07x + 0.02y = 0.16 \xrightarrow{\times 3} 0.21x + 0.06y = 0.48 \quad \text{Equation 4}$$

STEP 2 Add Equation 3 and Equation 4.

$$\begin{aligned} 0.10x - 0.06y &= 0.42 \\ 0.21x + 0.06y &= 0.48 \\ \hline 0.31x \qquad &= 0.9 \end{aligned}$$

Divide both the sides by 0.31.

$$\frac{0.31x}{0.31} = \frac{0.9}{0.31}$$

$$x = 2.9$$

STEP 3 Substitute 2.9 for x in either of the equations, say, Equation 1.

$$0.05(2.9) - 0.03y = 0.21$$

$$0.145 - 0.03y = 0.21$$

Simplify.

$$-0.03y = 0.21 - 0.145$$

$$-0.03y = 0.065$$

$$y = -2.17$$

CHECK Let us check the solution by substituting 2.9 for x, and -2.17 for y in the original equations.

$0.05x - 0.03y = 0.21$	$0.07x + 0.02y = 0.16$
$0.05(2.9) - 0.03(-2.17) \stackrel{?}{=} 0.21$	$0.07(2.9) + 0.02(-2.17) \stackrel{?}{=} 0.16$
$0.145 + 0.0651 \stackrel{?}{=} 0.21$	$0.203 - 0.0434 \stackrel{?}{=} 0.16$
$0.21 = 0.21$ ✓	$0.16 = 0.16$ ✓

The solution is $(2.9, -2.17)$.

Answer 46e.

Given system is

$$\frac{2}{3}x+3y=-34$$

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

To simplify the given system multiply both the equations by 3 and the second equation by 2, we get

$2x+9y=-102$ ...... (1)

$2x-y=-2$ ...... (2)

Because the coefficient of y in equation (2) is -1. We use substitution method to solve the system.

$$2x-y=-2$$

$$\Rightarrow \quad y=2x+2$$

Substitution this revised equation into equation (1) ,

$2x+9y=102$ equation (1)

$2x+9(2x+2)=102$ substitute $2x+2$ for y

$$2x+18x+18=102$$

$$20x+18=102$$

$$20x=84$$

$$\boxed{x=\frac{21}{5}}$$

Now substitute the value of x into the revised equation

$$y=2x+2$$

$$=2\left(\frac{21}{5}\right)+2$$

$$=\frac{52}{5}$$

$$\boxed{y=\frac{52}{5}}$$

The solution is $\boxed{\left(\frac{21}{5},\frac{52}{5}\right)}$.

Answer 47e.

Number the equations.

$$\frac{1}{2}x + \frac{2}{3}y = \frac{5}{6} \qquad \text{Equation 1}$$

$$\frac{5}{12}x + \frac{7}{12}y = \frac{3}{4} \qquad \text{Equation 2}$$

In order to clear the fractions, multiply each equation by the least common denominator (LCD).

Multiply the first equation by the LCD, 6, and the second equation by its LCD, 12.

$$\frac{1}{2}x + \frac{2}{3}y = \frac{5}{6} \xrightarrow{\times\ 6} 3x + 4y = 5 \qquad \text{Equation 3}$$

$$\frac{5}{12}x + \frac{7}{12}y = \frac{3}{4} \xrightarrow{\times\ 12} 5x + 7y = 9 \qquad \text{Equation 4}$$

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 3 by -5 and Equation 4 by 3 as the first step in eliminating x.

$$3x + 4y = 5 \xrightarrow{\times\ -5} -15x - 20y = -25 \qquad \text{Equation 5}$$

$$5x + 7y = 9 \xrightarrow{\times\ 3} 15x + 21y = 27 \qquad \text{Equation 6}$$

STEP 2 Add Equation 3 and Equation 4 to eliminate x.

$$\begin{aligned} -15x - 20y &= -25 \\ 15x + 21y &= 27 \\ \hline y &= 2 \end{aligned}$$

STEP 3 Substitute 2 for y in either equations of the system, say, Equation 1 and simplify.

$$\frac{1}{2}x + \frac{2}{3}(2) = \frac{5}{6}$$

$$\frac{1}{2}x + \frac{4}{3} = \frac{5}{6}$$

Solve for x.

$$\frac{1}{2}x = \frac{5}{6} - \frac{4}{3}$$

$$\frac{1}{2}x = -\frac{1}{2}$$

$$x = -1$$

CHECK Let us check the solution by substituting -1 for x and 2 for y in the original equations.

$\frac{1}{2}x + \frac{2}{3}y = \frac{5}{6}$	$\frac{5}{12}x + \frac{7}{12}y = \frac{3}{4}$
$\frac{1}{2}(-1) + \frac{2}{3}(2) \stackrel{?}{=} \frac{5}{6}$	$\frac{5}{12}(-1) + \frac{7}{12}(2) \stackrel{?}{=} \frac{3}{4}$
$-\frac{1}{2} + \frac{4}{3} \stackrel{?}{=} \frac{5}{6}$	$-\frac{5}{12} + \frac{7}{6} \stackrel{?}{=} \frac{3}{4}$
$\frac{5}{6} = \frac{5}{6}$ ✓	$\frac{3}{4} = \frac{3}{4}$ ✓

The solution is $(-1, 2)$.

Answer 48e.

Given system is

$$\frac{x+3}{4} + \frac{y-1}{3} = 3$$

$$2x - y = 12$$

Multiply the first equation with Least Common Multiple 12, we have

$$3(x+3) + 4(y-1) = 36$$

$$3x + 9 + 4y - 4 = 36$$

$$3x + 4y + 5 = 36$$

$$3x + 4y = 31$$

Now consider the system

$3x + 4y = 31$ ...... (1)

$2x - y = 12$ ...... (2)

Because the coefficient of y in equation (2) is -1, we use substitution method, to solve the system.

From equation (2) ,

$$2x - y = 12$$

$$\Rightarrow \quad y = 2x - 12$$

Substitute the revised equation into the equation (1)

$3x+4y=31$ equation (1)

$3x+4(2x-12)=31$ substitute $2x-12$ for y

$3x+8x-48=31$

$11x=79$

$$\boxed{x=\frac{79}{11}}$$

Now substitute the value of x into the revised equation (2) and solve for y

$$y=2x-12$$

$$=2\left(\frac{79}{11}\right)-12$$

$$=\frac{26}{11}$$

$$\boxed{y=\frac{26}{11}}$$

Therefore the solution is $\boxed{\left(\frac{79}{11},\frac{26}{11}\right)}$.

Answer 49e.

Number the equations.

$\frac{x-1}{2}+\frac{y+2}{3}=4$ Equation 1

$x-2y=5$ Equation 2

STEP 1 In order to clear the fractions, multiply equation 1 by the least common denominator (LCD).

Multiply the first equation by the LCD, 6.

$\frac{x-1}{2}+\frac{y+2}{3}=4 \xrightarrow{\times\ 6} 3x+2y=23$ Equation 3

$x-2y=5 \longrightarrow x-2y=5$ Equation 2

STEP 2 Add Equation 3 and Equation 2 to eliminate y.

$$\begin{array}{r} 3x+2y=23 \\ x-2y=5 \\ \hline 4x=28 \end{array}$$

Divide both the sides by 4.

$$\frac{4x}{4}=\frac{28}{4}$$

$$x=7$$

STEP 3 Substitute 7 for x in either equations of the system, say, Equation 2 and simplify.

$$x - 2y = 5$$
$$7 - 2y = 5$$

Solve for x.

$$-2y = -2$$
$$y = 1$$

CHECK Let us check the solution by substituting 7 for x and 1 for y in the original equations.

$$\frac{x-1}{2} + \frac{y+2}{3} = 4$$
$$\frac{7-1}{2} + \frac{1+2}{3} \stackrel{?}{=} 4$$
$$\frac{6}{2} + \frac{3}{3} \stackrel{?}{=} 4$$
$$4 = 4 \checkmark$$

$$x - 2y = 5$$
$$7 - 2(1) \stackrel{?}{=} 5$$
$$7 - 2 \stackrel{?}{=} 5$$
$$5 = 5 \checkmark$$

The solution is (7, 1).

Answer 50e.

We have that $(-1,4)$ is the only solution of the system is

$$3x+2y=5$$
$$2x-y=-6$$

Now consider the system

$$3x+2y=5 \quad \ldots\ldots (1)$$
$$2x-y=-6 \quad \ldots\ldots (2)$$

Because the coefficient of y in equation (2) is -1, we use substitution method, to solve the system.

From equation (2) ,

$$2x-y=-6$$
$$\Rightarrow \quad y=2x+6$$

Substitute the revised equation into the equation (1)

$3x+2y=5$ equation (1)

$3x+2(2x+6)=5$ substitute $2x+6$ for y

$7x+12=5$

$7x=-7$

$\boxed{x=-1}$

Now substitute the value of x into the revised equation (2) and solve for y

$$\begin{aligned} y &= 2x+6 \\ &= 2(-1)+6 \\ &= -2+6 \\ &= 4 \end{aligned}$$

$\boxed{y=4}$

Therefore $(-1,4)$ is the only solution of the above system.

Answer 51e.

Number the equations.

$7y + 18xy = 30$ Equation 1

$13y - 18xy = 90$ Equation 2

STEP 1 This step does not apply since the coefficients of one pair of variable terms are opposites.

STEP 2 Add Equation 1 and Equation 2 to eliminate xy.

$$\begin{aligned} 7y + 18xy &= 30 \\ 13y - 18xy &= 90 \\ \hline 20y \quad\quad &= 120 \end{aligned}$$

Divide both the sides by 20.

$$\frac{20y}{20} = \frac{120}{20}$$

$$y = 6$$

STEP 3 Substitute 6 for y in either equations of the system, say, Equation 1 and simplify.

$$7(6) + 18x(6) = 30$$

$$42 + 108x = 30$$

Subtract 42 from both the sides.

$$42 + 108x - 42 = 30 - 42$$

$$108x = -12$$

Divide both the sides by 108.

$$\frac{108x}{108} = \frac{-12}{108}$$

$$x = -\frac{1}{9}$$

CHECK Let us check the solution by substituting $-\frac{1}{9}$ for x, and 6 for y in the original equations.

$$\begin{aligned} 7y + 18xy &= 30 \\ 7(6) + 18\left(-\frac{1}{9}\right)(6) &\stackrel{?}{=} 30 \\ 42 - 12 &\stackrel{?}{=} 30 \\ 30 &= 30 \quad \checkmark \end{aligned}$$

$$\begin{aligned} 13y - 18xy &= 90 \\ 13(6) - 18\left(-\frac{1}{9}\right)(6) &\stackrel{?}{=} 90 \\ 78 + 12 &\stackrel{?}{=} 90 \\ 90 &= 90 \quad \checkmark \end{aligned}$$

The solution is $\left(-\frac{1}{9}, 6\right)$.

Answer 52e.

Consider the system of equations

$$xy - x = 14 \qquad \ldots\ldots (1)$$

$$5 - xy = 2x \qquad \ldots\ldots (2)$$

Add the above two equations,

Then

$$\begin{aligned} xy - x &= 14 \\ -xy + 5 &= 2x \\ \hline 5 - x &= 14 + 2x \qquad \text{Adding} \\ 3x &= -9 \end{aligned}$$

$$\boxed{x = -3}$$

Now substitute the value of x into one of the given equations and solve for y

$xy - x = 14$	Equation (1)
$(-3)y - (-3) = 14$	Substitute -3 for x
$-3y + 3 = 14$	
$-3y = 11$	

$$\boxed{y = \frac{-11}{3}}$$

Therefore the solution is $\boxed{\left(-3, \frac{-11}{3}\right)}$

Answer 53e.

Number the equations.

$2xy + y = 44$	Equation 1
$32 - xy = 3y$	Equation 2

Rewrite Equation 2. Add xy to both the sides.

$$32 - xy + xy = 3y + xy$$
$$32 = xy + 3y$$

Swap the sides of the equation.

$xy + 3y = 32$ Revised Equation 2

STEP 1 We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Revised Equation 2 by -2 as the first step in eliminating xy.

$2xy + y = 44$	$\longrightarrow$	$2xy + y = 44$	Equation 1
$xy + 3y = 32$	$\xrightarrow{\times -2}$	$-2xy - 6y = -64$	Equation 4

STEP 2 Add Equation 1 and Equation 4.

$$\begin{aligned} 2xy + \quad y &= 44 \\ -2xy - 6y &= -64 \\ \hline -5y &= -20 \end{aligned}$$

Divide both the sides by −5.

$$\frac{-5y}{-5} = \frac{-20}{-5}$$

$$y = 4$$

STEP 3 Substitute 4 for y in Equation 1.

$$\begin{aligned} 2x(4) + 4 &= 44 \\ 8x + 4 &= 44 \\ 8x &= 40 \\ x &= 5 \end{aligned}$$

CHECK Let us check the solution by substituting 5 for x, and 4 for y in the original equations.

$$\begin{aligned} 2xy + y &= 44 \\ 2(5)(4) + 4 &\stackrel{?}{=} 44 \\ 40 + 4 &\stackrel{?}{=} 44 \\ 44 &= 44 \quad \checkmark \end{aligned}$$

$$\begin{aligned} 32 - xy &= 3y \\ 32 - 5(4) &\stackrel{?}{=} 3(4) \\ 32 - 20 &\stackrel{?}{=} 12 \\ 12 &= 12 \quad \checkmark \end{aligned}$$

The solution is (5, 4).

Answer 55e.

STEP 1 Write verbal models for the situation. Then, translate them into equations.

Let x be the number of electric guitars sold and y be the number of acoustic guitars sold. It is given that a total of 9 guitars were sold. This means that the sum of the total number of two guitars will be 9.

Number of electric guitars sold	+	Number of accoustic guitars sold	=	Total number of hours worked
⇓		⇓		⇓
x	+	y	=	9

Similarly, model the second equation.

$$\underset{\text{(dollars)}}{\text{Selling price of each elecric guitar}} \cdot \text{Number of elecric guitars sold} + \underset{\text{(dollars)}}{\text{Selling price of each accoustic guitar}} \cdot \text{Number of accoustic guitars sold} = \underset{\text{(dollars)}}{\text{Total Revenue}}$$

$$\Downarrow \quad \Downarrow \quad \Downarrow \quad \Downarrow \quad \Downarrow$$

$$479 \cdot x + 339 \cdot y = 3611$$

STEP 2 Write a system of equations.

Equation 1	$x + y = 9$	Total number of guitars sold
Equation 2	$479x + 339y = 3611$	Total Revenue

STEP 3 Solve the system using the elimination method. We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by –479 as the first step in eliminating x.

$$x + y = 9 \xrightarrow{\times\ -479} -479x - 479y = -4311 \quad \text{Equation 3}$$

$$479x + 339y = 3611 \longrightarrow 479x + 339y = 3611 \quad \text{Equation 2}$$

Add Equation 3 and Equation 2 to eliminate x.

$$\begin{array}{r} -479x - 479y = -4311 \\ 479x + 339y = 3611 \\ \hline -140y = -700 \end{array}$$

Divide both the sides by −140.

$$\frac{-140y}{-140} = \frac{-700}{-140}$$

$$y = 5$$

Substitute 5 for y in either equations of the system, say, Equation 1 and simplify.

$x + 5 = 9$

Subtract 5 from both the sides.

$$x + 5 - 5 = 9 - 5$$

$$x = 4$$

Therefore, 4 electric guitars and 5 acoustic guitars were sold for a total of $3611.

Answer 56e.

Let x, y be the costs of adult and children passes.

From the given data, write the system of equations as,

$$x - y = 2 \quad \ldots\ldots (1)$$

$$378x + 214y = 2384 \quad \ldots\ldots (2)$$

To solve these equations

Multiply equation (1) with 214 and add to equation (2),

$$(1)\times 214 \quad \Rightarrow 214x - 214y = 428$$

$$(2) \quad \Rightarrow 378x + 214y = 2384$$

$$592x = 2812$$

$$x = 4.75$$

Equation (1)

$$x - y = 2$$

$$4.75 - y = 2 \quad \text{Put } x = 4.75$$

$$y = 2.75 \quad \text{Simplify}$$

Therefore

The cost of adult pass is $\boxed{\$4.75}$

Answer 57e.

STEP 1 Write verbal models for the situation. Then, translate them into equations.

Let x be the number of weeks for which Factory A operates and y be the number of weeks for which Factory B operates. It is given that the company has orders for 2200 gas mowers. This means that the sum of the production capacity of gas mowers per week of these two factories will be equal to 2200.

Production capacity of Factory A (mowers/week)	·	Number of weeks (weeks)	+	Production capacity of Factory B (mowers/week)	·	Number of weeks (weeks)	=	Total order of Gas mowers (mowers)
⇓		⇓		⇓		⇓		⇓
200	·	x	+	400	·	y	=	2,200

Similarly, model the second equation.

$$\underbrace{\begin{pmatrix}\text{Production capacity of Factory A}\\ \text{mowers/week}\end{pmatrix}}_{100} \cdot \underbrace{\begin{pmatrix}\text{Number of weeks}\\ \text{weeks}\end{pmatrix}}_{x} + \underbrace{\begin{pmatrix}\text{Production capacity of Factory B}\\ \text{mowers/week}\end{pmatrix}}_{300} \cdot \underbrace{\begin{pmatrix}\text{Number of weeks}\\ \text{weeks}\end{pmatrix}}_{y} = \underbrace{\begin{pmatrix}\text{Total order of Electric mowers}\\ \text{mowers}\end{pmatrix}}_{1,400}$$

$$100 \cdot x + 300 \cdot y = 1,400$$

STEP 2 Write a system of equations.

Equation 1	$200x + 400y = 2200$	Total order of Gas mowers
Equation 2	$100x + 300y = 1400$	Total order of Electric mowers

STEP 3 Solve the system using the elimination method. We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 2 by -2 as the first step in eliminating x.

$$200x + 400y = 2200 \longrightarrow 200x + 400y = 2200 \quad \text{Equation 1}$$

$$100x + 300y = 1400 \xrightarrow{\times -2} -200x - 600y = -2800 \quad \text{Equation 3}$$

Add Equation 1 and Equation 3 to eliminate x.

$$\begin{array}{r} 200x + 400y = 2200 \\ -200x - 600y = -2800 \\ \hline -200y = -600 \end{array}$$

Divide both the sides by -200.

$$\frac{-200y}{-200} = \frac{-600}{-200}$$

$$y = 3$$

Substitute 3 for y in either equations of the system, say, Equation 1 and simplify.

$$200x + 400(3) = 2200$$

$$200x + 1200 = 2200$$

Subtract 1200 from both the sides.

$$200x + 1200 - 1200 = 2200 - 1200$$

$$200x = 1000$$

Divide both the sides by 200.

$$\frac{200x}{200} = \frac{1000}{200}$$

$$x = 5$$

Therefore, the company can fill its orders by operating Factory A for 5 weeks and Factory B for 3 weeks simultaneously.

Answer 58e.

Let the cost of regular gasoline be x and the cost of premium gasoline is y

Consider that the cost of 11 gallons of regular gasoline and 16 gallons of premium gasoline is \$58.55

That is $11x+16y=58.55$

Also, the premium gasoline costs \$20 more per gallon than regular gasoline

That is $-x+y=0.2$

Now consider the system

$$11x+16y=58.55 \quad \text{...... (1)}$$

$$-x+y=0.2 \quad \text{...... (2)}$$

Because the coefficient of y in equation (2) is 1

Then

$$y=x+0.2$$

Substitute the value of y in equation (1), and solve for x

$$11x+16y=58.55 \quad \text{Equation (1)}$$

$$11x+16(x+0.2)=58.55 \quad \text{Substitute } x+0.2 \text{ for } y$$

$$11x+16x+3.2=58.55$$

$$27x=55.35$$

$$\boxed{x=2.05}$$

From the revised equation (2)

$$y=x+0.2$$

$$=2.05+0.2$$

$$=2.25$$

Therefore

The cost of premium gasoline is $\boxed{y=\$2.25}$

Answer 59e.

STEP 1 Write verbal models for the situation. Then, translate them into equations.

Let x be the number of doubles games and y be the number of singles games. It is given that 26 games were in progress at one time. This means that the sum of the number of doubles games and the number of singles games will be equal to 26.

Number of doubles games	+	Number of accoustic singles games	=	Total number of games
⇓		⇓		⇓
x	+	y	=	26

Similarly, model the second equation.

$$\underset{\Downarrow}{\begin{matrix}\text{Number of}\\ \text{players for the}\\ \text{doubles games}\end{matrix}} \cdot \underset{\Downarrow}{\begin{matrix}\text{Number of}\\ \text{doubles games}\end{matrix}} + \underset{\Downarrow}{\begin{matrix}\text{Number of}\\ \text{players for the}\\ \text{single games}\end{matrix}} \cdot \underset{\Downarrow}{\begin{matrix}\text{Number of}\\ \text{doubles games}\end{matrix}} = \underset{\Downarrow}{\begin{matrix}\text{Total number}\\ \text{of players}\end{matrix}}$$

$$4 \cdot x + 2 \cdot y = 76$$

STEP 2 Write a system of equations.

Equation 1	$x + y = 26$	Total number of games
Equation 2	$4x + 2y = 76$	Total number of players

STEP 3 Solve the system using the elimination method. We can eliminate one of the variables by obtaining coefficients that are opposites of each other.

In this case, multiply Equation 1 by –4 as the first step in eliminating x.

$$x + y = 26 \xrightarrow{\times -4} -4x - 4y = -104 \quad \text{Equation 3}$$

$$4x + 2y = 76 \xrightarrow{} 4x + 2y = 76 \quad \text{Equation 2}$$

Add Equation 3 and Equation 2 to eliminate x.

$$\begin{aligned} -4x - 4y &= -104 \\ 4x + 2y &= 76 \\ \hline -2y &= -28 \end{aligned}$$

Divide both the sides by –2.

$$\frac{-2y}{-2} = \frac{-28}{-2}$$

$$y = 14$$

Substitute 14 for y in either equations of the system, say, Equation 1 and simplify.

$x + 14 = 26$

Subtract 14 from both the sides.

$$x + 14 - 14 = 26 - 14$$

$$x = 12$$

Therefore, 12 double games and 14 singles games were in progress.

Answer 61e.

STEP 1 Write verbal models for the situation. Then, translate them into equations.

Let x be the weight of the peanuts and y be the weight of the cashews.

$$\begin{array}{ccccccccccc} \text{Cost of} & & \text{weight of} & & \text{Cost of} & & \text{weight of} & & \text{Cost of} & & \text{Total} \\ \text{peanuts} & \cdot & \text{peanuts} & + & \text{cashews} & \cdot & \text{cashews} & = & \text{the mix} & \cdot & \text{weight} \\ \left(\begin{matrix}\text{dollars/} \\ \text{pound}\end{matrix}\right) & & (\text{pounds}) & & \left(\begin{matrix}\text{dollars/} \\ \text{pound}\end{matrix}\right) & & (\text{pounds}) & & \left(\begin{matrix}\text{dollars/} \\ \text{pound}\end{matrix}\right) & & (\text{pounds}) \\ \Downarrow & & \Downarrow & & \Downarrow & & \Downarrow & & \Downarrow & & \Downarrow \\ 2.80 & \cdot & x & + & 5.30 & \cdot & y & = & 3.30 & \cdot & (x+y) \end{array}$$

Similarly, model the second equation.

$$\begin{array}{ccccc} \text{Weight} & & \text{Weight} & & \text{Total} \\ \text{of peanuts} & + & \text{of cashews} & = & \text{weight} \\ (\text{pounds}) & & (\text{pounds}) & & (\text{pounds}) \\ \Downarrow & & \Downarrow & & \Downarrow \\ x & + & y & = & 100 \end{array}$$

STEP 2 Write a system of equations.

Equation 1 $2.80x + 5.30y = 3.30(x+y)$ Total Cost

Equation 2 $x + y = 100$ Total Weight

STEP 3 Solve the system using the substitution method since the coefficient of x in the second equation is 1.

Solve Equation 2 for x.
Subtract y from both the sides.

$$x + y - y = 100 - y$$

$$x = 100 - y \quad \text{Revised Equation 2}$$

Substitute $100-y$ for x in Equation 1.
$$2.80(100-y)+5.30y=3.30(100-y+y)$$

Clear the parentheses using the distributive property.
$$\begin{aligned} 2.80(100)+2.80(-y)+5.30y &= 3.30(100) \\ 280-2.80y+5.30y &= 330 \\ 280+2.5y &= 330 \end{aligned}$$

Solve for y. For this, subtract 280 from both the sides.
$$\begin{aligned} 280+2.5y-28 &= 330-280 \\ 2.5y &= 50 \end{aligned}$$

Divide both the sides by 2.5.
$$\begin{aligned} y &= \frac{50}{2.5} \\ &= 20 \end{aligned}$$

Substitute 20 for y in Revised Equation 2.
$$\begin{aligned} x &= 100-20 \\ &= 80 \end{aligned}$$

Therefore, 80 pounds of peanuts and 20 pounds of cashews must be used to make 100 pound of the mix.

Answer 63e.

Step 1 Write verbal models for the situation. Then, translate them into equations.

Let x be the number of hours worked by the electrician and y be the number of hours worked by the apprentice. The total earnings of both the electrician and the apprentice is given as \$550.

Earnings of the electrician (dollars/hour)	·	Hours worked by the electrician (hours)	+	Earnings of the apprentice (dollars/hour)	·	Hours worked by the apprentice (hours)	=	Total earnings (dollars)
⇓		⇓		⇓		⇓		⇓
50	·	x	+	20	·	y	=	550

Similarly, model the second equation.

$$\underset{\text{(hours)}}{\text{Hours worked by the electrician}} = \underset{\text{(hours)}}{\text{Hours worked by the apprentice}} + \underset{\text{(hours)}}{\text{Additional Hours worked by the electrician}}$$

$$\Downarrow \qquad\qquad \Downarrow \qquad\qquad \Downarrow$$

$$x = y + 4$$

Step 2 Write a system of equations.

Equation 1	$50x + 20y = 550$	Total Earnings
Equation 2	$x = y + 4$	Total hours worked by the electrician

STEP 3 Solve the system using the substitution method. Substitute $y + 4$ for x in Equation 1.

$$50(y+4) + 20y = 550$$

Clear the parentheses using the distributive property.

$$\begin{aligned} 50(y) + 50(4) + 20y &= 550 \\ 50y + 200 + 20y &= 550 \\ 70y + 200 &= 550 \end{aligned}$$

Solve for y. For this, subtract 200 from both the sides.

$$\begin{aligned} 70y + 200 - 200 &= 550 - 200 \\ 70y &= 350 \end{aligned}$$

Divide both the sides by 70.

$$\frac{70y}{70} = \frac{350}{70}$$

$$y = 5$$

Substitute 5 for y in Equation 2.

$$\begin{aligned} x &= 5 + 4 \\ &= 9 \end{aligned}$$

Thus, the electrician works for 9 hours and the apprentice works for 5 hours.

It is given that the electrician earns an amount of \$50 per hour and the apprentice earns an amount of \$20 per hour. This means that the electrician will earn an amount of \$(50)(9) or \$450 for 9 hours, and the apprentice will earn \$(20)(5) or \$100 for 5 hours.

Therefore, the electrician earned \$450 and the apprentice earned \$100.

Answer 64e.

Consider the equation

$$-5x+4=29$$

$$-5x+4-4=29-4 \quad \text{Subtract 4 from both sides.}$$

$$-5x=25 \quad \text{Simplify.}$$

$$\frac{-5x}{-5}=\frac{25}{-5} \quad \text{Divide both sides by } -5.$$

Therefore $\boxed{x=-5}$

Answer 65e.

Open the parentheses using the distributive property.

$$6(2a)-3(6) = -30$$

$$12a-18 = -30$$

Add 18 to both sides of the equation.

$$12a-18+18 = -30+18$$

$$12a = -12$$

Divide both the sides by 12.

$$\frac{12a}{12} = \frac{-12}{12}$$

$$a = -1$$

The solution is -1.

CHECK

Substitute -1 for a in the original equation.

$$6(2a-3) = -30$$

$$6[2(-1)-3] \stackrel{?}{=} -30$$

$$6[-2-3] \stackrel{?}{=} -30$$

$$6(-5) \stackrel{?}{=} -30$$

$$-30 = -30 \quad \checkmark$$

Thus, the solution checks.

Answer 66e.

Consider the equation

$1.2m = 2.3m - 2.2$

$12m = 23m - 22$ Multiply both sides by 10

$12m - 23m = -22$ Subtract $23m$ on both sides

$-11m = -22$

$m = 2$ Divide by -11

Therefore $\boxed{m = 2}$

Answer 67e.

In order to solve an absolute value equation $|ax+b| = c$ where $c > 0$, re write as two equations: $ax + b = c$ or $ax + b = -c$.

$x + 3 = 4$ or $x + 3 = -4$

Solve each equation.

Subtract 4 from both sides of the first and the second equations.

$x + 3 - 3 = 4 - 3$ or $x + 3 - 3 = -4 - 3$

$x = 1$ $\quad$ $x = -7$

CHECK

Substitute 1 and -7 for x in the original equation.

For $x = 1$	For $x = -7$
$\|x+3\| = 4$	$\|x+3\| = 4$
$\|1+3\| \stackrel{?}{=} 4$	$\|-7+3\| \stackrel{?}{=} 4$
$\|4\| \stackrel{?}{=} 4$	$\|-4\| \stackrel{?}{=} 4$
$4 = 4$ ✓	$4 = 4$ ✓

The solutions are 1 and -7.

Answer 68e.

Consider equation is

$|2x+11| = 3$

If $|x| = a$ then $x = a$ or $x = -a$

Therefore

$2x + 11 = 3$ Or $2x + 11 = -3$

$2x = -8$ Or $-2x = -14$

$x = -4$ Or $x = -7$

Therefore $x = \{-4, -7\}$

Answer 69e.

In order to solve an absolute value equation $|ax+b| = c$ where $c > 0$, re write as two equations: $ax + b = c$ or $ax + b = -c$. Thus,

$-x + 7 = 13$ or $-x + 7 = -13$.

Solve each equation.

Subtract 7 from both sides of the first equation and the second equation.

$2x + 5 - 5 = 12 - 5$ or $2x + 5 - 5 = -12 - 5$

$2x = 7$ $\quad$ $2x = -17$

Divide each side of the first and the second equation by 2.

$$\frac{2x}{2} = \frac{7}{2} \quad \text{or} \quad \frac{2x}{2} = \frac{-17}{2}$$

$$x = \frac{7}{2} \qquad\qquad x = \frac{-17}{2}$$

Thus, the solutions are $\frac{7}{2}$ and $-\frac{17}{2}$.

CHECK

Substitute $\frac{7}{2}$ and $-\frac{17}{2}$ for x in the original equation.

$x = \frac{7}{2}$	$x = -\frac{17}{2}$
$\lvert 2x+5 \rvert = 12$	$\lvert 2x+5 \rvert = 12$
$\left\lvert 2\left(\frac{7}{2}\right)+5 \right\rvert \stackrel{?}{=} 12$	$\left\lvert 2\left(-\frac{17}{2}\right)+5 \right\rvert \stackrel{?}{=} 12$
$\lvert 7+5 \rvert \stackrel{?}{=} 12$	$\lvert -17+5 \rvert \stackrel{?}{=} 12$
$\lvert 12 \rvert \stackrel{?}{=} 12$	$\lvert -12 \rvert \stackrel{?}{=} 12$
$12 = 12$ ✓	$12 = 12$ ✓

The solution checks.

Answer 70e.

Let the line l_1 is $(2,10)$ and $(1,5)$

Slope of line l_1 is

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{5-10}{1-2} \\ &= \frac{-5}{-1} \\ &= 5 \end{aligned}$$

And the points on line l_2 is $(3,-7)$ and $(8,-8)$

Slope of line l_2 is

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-8-(-7)}{8-3} \\ &= \frac{-8+7}{5} \\ &= \frac{-1}{5} \end{aligned}$$

Now slope of l_1 slope of l_2

$$= 5 \times \frac{-1}{5}$$

$$= -1$$

Since product of slopes is -1

Then the two lines are perpendicular.

Answer 71e.

Find the slope of line 1.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-2 - 5}{9 - 4}$$

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

Similarly, find the slope of line 2.

$$m = \frac{-1 - (-6)}{-2 - 6}$$

$$= \frac{-1 + 6}{-2 - 6}$$

$$= -\frac{5}{8}$$

The lines will be perpendicular only if their slopes are negative reciprocals of each other.

$$-\frac{7}{5}\left(-\frac{5}{8}\right) = \frac{7}{8}$$

Since the product of the slopes is not -1, the lines are not perpendicular.

The lines will be parallel only if they have the same slope. Since the given lines have different slopes, they are not parallel.

Therefore, the lines are neither perpendicular nor parallel.

Answer 72e.

From the given graph, the points on the required line is $(2,4)$ and $(5,1)$

Let $(x_1, y_1) = (2,4)$ and $(x_2, y_2) = (5,1)$

Slope of line is

$$\frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{1-4}{5-2}$$
$$= \frac{-3}{3}$$
$$= -1$$

Therefore the equation of the line is

$y - y_1 = m(x - x_1)$	Point –slope form
$y - 4 = -1(x-2)$	Put $m = -1$, $(x_1, y_2) = (2,4)$
$y - 4 = -x + 2$	
$x + y = 6$	Simplify

Therefore

Equation of line passing through $(2,4)$ and $(5,1)$ is $\boxed{x + y = 6}$

Answer 73e.

The slope m of a line is the ratio of vertical change to horizontal change.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

We note that the line passes through the points (3, 1) and (–1, –7). In order to find the slope of the given line, substitute –7 for y_2, 1 for y_1, –1 for x_2, and 3 for x_1.

$$m = \frac{-7-1}{-1-3}$$

Evaluate.

$$m = \frac{-8}{-4}$$
$$= 2$$

The slope of the line is 2.

The equation $y - y_1 = m(x - x_1)$ is the point-slope form of the line with slope m that contains the point (x_1, y_1).

Substitute 2 for m, 3 for x_1, and 1 for y_1.
$y - 1 = 2(x - 3)$

Use the distributive property to open the parentheses.

$$\begin{aligned} y - 1 &= 2x - 6 \\ y &= 2x - 6 + 1 \\ &= 2x - 5 \end{aligned}$$

The equation of the line is $y = 2x - 5$.

Answer 74e.

From the given graph, the points on the required line is $(-2,-2)$ and $(2,4)$

Let $(x_1,y_1)=(-2,-2)(x_2,y_2)=(2,4)$

$$\text{Slope of line is } \frac{y_2-y_1}{x_2-x_1} = \frac{4-(-2)}{2-(-2)} = \frac{4+2}{2+2} = \frac{6}{4} = \frac{3}{2}$$

Therefore the equation of the line is

$y-y_1=m(x-x_1)$	Point –slope form
$y-(-2)=\frac{3}{2}(x-(-2))$	Put $m=\frac{3}{2}$, $(x_1,y_1)=(-2,-2)$
$y+2=\frac{3}{2}(x+2)$	
$2(y+2)=3(x+2)$	Simplify
$2y+4=3x+6$	Multiply
$3x-2y=-2$	

Therefore

Equation of line passing through $(-2,-2)$ and $(2,4)$ is $\boxed{3x-2y=-2}$

Answer 75e.

STEP 1 **Graph the boundary line of the inequality.**

In order to obtain the boundary line, replace the inequality sign with "=" sign. We get an equation of the form $x = c$, which is the equation of a vertical line passing through $(c, 0)$.

In this case, the value of c is -3. This means that the line $x = -3$ passes through $(-3, 0)$.