Chapter 7. Solving Systems of Linear Equations and Inequalities

Ex. 7.4

Answer 1CU.

If none of the coefficients are 1 or -1 and neither of the variables can be eliminated by simply adding or subtraction the equations, in such cases we solve the equations by multiplying the equations with numbers and eliminate one variable.

Consider the equations,

$4x - 7y = 10$ ...... (1)

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

Eliminate *x*

$$4x - 7y = 10 \quad \text{Multiply by 3} \quad 12x - 21y = 30$$
$$3x + 2y = -7 \quad \text{Multiply by 4} \quad 12x + 8y = -28$$
$$-29y = 58 \quad \text{Subtract the equations}$$
$$\frac{-29y}{-29} = \frac{58}{-29} \quad \text{Divide each side with -29}$$
$$y = -2 \quad \text{Simplify}$$

Now substitute -2 for *y* in either equation to find the value of x

$$4x - 7y = 10 \quad \text{First Equation}$$
$$4x - 7(-2) = 10 \quad \text{Substitue } -2 \text{ for } y$$
$$4x + 14 = 10 \quad \text{Simplify}$$
$$4x + 14 - 14 = 10 - 14 \quad \text{Subtract 14 from each side}$$
$$4x = -4 \quad \text{Simplify}$$
$$\frac{4x}{4} = \frac{-4}{4} \quad \text{Divide each side with 4}$$
$$x = -1 \quad \text{Simplify}$$

The solution is $\boxed{(-1, -2)}$

Answer 1PQ.

Consider the equations,

$5x+4y=2$ ...... (1)

$3x-4y=14$ ...... (2)

Since the coefficients of the *y* terms, -4 and 4, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rrcrcr} & 5x & + & 4y & = & 2 \\ (+) & 3x & - & 4y & = & 14 \\ \hline & 8x & & & = & 16 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{8x}{8}=\frac{16}{8}$ Divide each side with 8

$x=2$ Simplify

Now substitute 2 for *x* in either equation to find the value of y

$5x+4y=2$	First Equation
$5(2)+4y=2$	Substitue 2 for x
$10+4y=2$	Simplify
$10+4y-10=2-10$	Subtract 10 from each side
$4y=-8$	Simplify
$\frac{4y}{4}=\frac{-8}{4}$	Divide each side with 4
$y=-2$	Simplify

The solution is $\boxed{(2,-2)}$

Answer 1RM.

1. If the graphs intersect or coincide, the system of equations is said to be Consistent. That is, it has at least one ordered pair that satisfies both equations.

2. If the graphs are parallel, the system of equations is said to be inconsistent. There are no ordered pairs that satisfy both equations.

3. Consistent equations can be independent or dependent. If a system has exactly one solution, it is independent. If the system has an infinite number of solutions, it is dependent.

Answer 2CU.

Consider the equations,

$-5x+3y=6$ ...... (1)

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

Eliminate *x*

$$\begin{array}{rlrl} -5x+3y=6 & & -5x+3y=6 & \\ x-y=4 & \text{Multiply by 5} & (+)5x-5y=20 & \\ & & -2y=26 & \text{Add the equations} \\ & & \frac{-2y}{-2}=\frac{26}{-2} & \text{Divide each side with } -2 \\ & & y=-13 & \text{Simplify} \end{array}$$

Answer 2PQ.

Consider the equations,

$2x-3y=13$ ...... (1)

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

Since the coefficients of the *y* terms, 2 and 2, are the same, we can eliminate the *x* terms by adding the equations.

$$\begin{array}{rcrcrcrl} & 2x & - & 3y & = & 13 & & \text{Write the equations in column form and subtract} \\ (-) & 2x & + & 2y & = & -2 & & \\ \hline & & & -5y & = & 15 & & \text{Notice that the } x \text{ variable eliminated} \end{array}$$

$\frac{-5y}{-5}=\frac{15}{-5}$ Divide each side with -5

$y=-3$ Simplify

Now substitute -3 for *y* in either equation to find the value of x

$$\begin{array}{rl} 2x-3y=13 & \text{First Equation} \\ 2x-3(-3)=13 & \text{Substitue } -3 \text{ for } y \\ 2x+9=13 & \text{Simplify} \\ 2x+9-9=13-9 & \text{Subtract 9 from each side} \\ 2x=4 & \text{Simplify} \end{array}$$

$\frac{2x}{2}=\frac{4}{2}$ Divide each side with 2

$x=2$ Simplify

The solution is $\boxed{(2,-3)}$

Answer 2RM.

If one of the variables in either equation has a coefficient of 1 or -1, then substitution method is the best method.

Example:

Consider the equations,

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

$2x + 3y = 34$ ...... (2)

Since $y = 5x$, substitute $5x$ for y in the second equation

$2x + 3(5x) = 34$

$2x + 15x = 34$ Simplify

$17x = 34$ Combine like terms

$x = \frac{34}{17}$ Divide each side with 17

$x = 2$ Simplify

Use $y = 5x$ to find the value of y

$y = 5x$

$y = 5(2)$ $x = 2$

$y = 10$ Simplify

The solution is $\boxed{(2,10)}$

If one of the variable has opposite coefficients in the two equations, then elimination using Addition

Example:

Consider the equations,

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

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

Since the coefficients of the *y* terms, -1 and 1, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rrcrcr} & x & + & y & = & 8 \\ (+) & x & - & y & = & 4 \\ \hline & 2x & & & = & 12 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{2x}{2} = \frac{12}{2}$ Divide each side with 2

$x = 6$ Simplify

Now substitute 6 for *x* in either equation to find the value of y

$x+y=8$	First Equation
$6+y=8$	Substitue 6 for x
$6+y-6=8-6$	Subtract 6 from each side
$y=2$	Simplify

The solution is $\boxed{(6,2)}$

If one of the variable has the same coefficient in the two equations, then elimination using Subtraction

Example:

Consider the equations,

$x+y=18$ …… (1)

$x+2y=25$ …… (2)

Since the coefficients of the *x* terms, 1 and 1, are the same, we can eliminate the *x* terms by subtracting the equations.

$$\begin{array}{rrcrcr} & x & + & y & = & 18 \\ (-) & x & + & 2y & = & 25 \\ \hline & & & -y & = & -7 \end{array}$$

Write the equations in column form and add

Notice that the x variable eliminated

$\frac{-y}{-1}=\frac{-7}{-1}$ Divide each side with -1

$y=7$ Simplify

Now substitute 7 for *y* in either equation to find the value of x

$x+y=18$	First Equation
$x+7=18$	Substitue 7 for x
$x+7-7=18-7$	Subtract 7 from each side
$x=11$	Simplify

The solution is $\boxed{(11,7)}$

Answer 3CU.

Elimination method to solve the system of equation:

Consider the equations,

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

$2a+3b=15$ ...... (2)

Eliminate *b*

$$\begin{array}{rlrl} a-b=5 & \text{Multiply by 3} & 3a-3b=15 & \\ 2a+3b=15 & & (+)\,2a+3b=15 & \\ & & 5a=30 & \text{Add the equations} \\ & & \frac{5a}{5}=\frac{30}{5} & \text{Divide each side with 5} \\ & & a=6 & \text{Simplify} \end{array}$$

Now substitute 6 for *a* in either equation to find the value of b

$$\begin{array}{rl} a-b=5 & \text{First Equation} \\ 6-b=5 & \text{Substitue 2 for } x \\ 6-b-6=5-6 & \text{Subtract 6 from each side} \\ -b=-1 & \text{Simplify} \\ b=1 & \text{Multiply each side with } -1 \end{array}$$

The solution is $\boxed{(6,1)}$

Solving the system of equation by using Substitution:

Consider the equations,

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

$2a+3b=15$ ...... (2)

From the equation (1)

$a-b=5$ First equation

$a=5+b$ Add b to each side

Since $a=5+b$, substitute $5+b$ for a in the first equation

$2a+3b=15$ Second equation

$2(5+b)+3b=15$

$10+2b+3b=15$ Use Distributive property

$10+5b=15$ Combine like terms

$10+5b-10=15-10$ Subtract 10 from each side

$5b=5$ Simplify

$\frac{5b}{5}=\frac{5}{5}$ Divide each side with 5

$b=1$ Simplify

Now substitute 1 for b in the equation $a=5+b$ to find the value of a

$a=5+b$

$a=5+1$ Substitue 5 for a

$a=6$ Simplify

The solution is $\boxed{(6,1)}$

The elimination method is the best method to solve the above problem. Since one of the variable has opposite coefficients in the two equations.

Answer 3PQ.

Consider the equations,

$6x-2y=24$ ...... (1)

$3x+4y=27$ ...... (2)

Eliminate *y*

$$\begin{array}{lll} 6x-2y=24 & \text{Multiply by 2} & 12x-4y=48 \\ 3x+4y=27 & & (+)3x+4y=27 \\ & & 15x=75 \quad \text{Add the equations} \\ & & \frac{15x}{15}=\frac{75}{15} \quad \text{Divide each side with 15} \\ & & x=5 \quad \text{Simplify} \end{array}$$

Now substitute 5 for *x* in either equation to find the value of y

$$\begin{array}{rl} 6x-2y=24 & \text{First Equation} \\ 6(5)-2y=24 & \text{Substitue 5 for } x \\ 30-2y=24 & \text{Simplify} \\ 30-2y-30=24-30 & \text{Subtract 30 from each side} \\ -2y=-6 & \text{Simplify} \end{array}$$

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

$$y=3$$

The solution is $\boxed{(5,3)}$

Answer 3RM.

If neither of the variable in the system can be eliminated by simply adding or subtracting the equations, in such cases use the Multiplication Property of Equality so that adding or subtracting eliminates one of the variable.

Consider the following example:

Consider the equations,

$3x-4y=-10$ ...... (1)

$5x+8y=-2$ ...... (2)

In the above system of equations, neither of the variables can be eliminated by adding or subtraction of the equations.

Eliminate *y* by multiplying the equation (1) with 2

$$\begin{array}{llll} 3x-4y=-10 & \text{Multiply by 2} & 6x-8y=-20 & \\ 5x+8y=-2 & & 5x+8y=-2 & \\ & & 11x=-22 & \text{Subtract the equations} \\ & & \frac{11x}{11}=\frac{-22}{11} & \text{Divide each side with 11} \\ & & x=-2 & \text{Simplify} \end{array}$$

Now substitute -2 for *x* in either equation to find the value of y

$$\begin{array}{rl} 3x-4y=-10 & \text{First Equation} \\ 3(-2)-4y=-10 & \text{Substitue } -2 \text{ for } x \\ -6-4y=-10 & \text{Simplify} \\ -6-4y+6=-10+6 & \text{Add 6 to each side} \\ -4y=-4 & \text{Simplify} \\ \frac{-4y}{-4}=\frac{-4}{-4} & \text{Divide each side with } -4 \\ y=1 & \text{Simplify} \end{array}$$

The solution is $\boxed{(-2,1)}$

Answer 4CU.

Consider the equations,

$2x - y = 6$ ...... (1)

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

Eliminate *x*

$$\begin{array}{llrl} 2x - y = 6 & \text{Multiply by 4} & 8x - 4y = 24 & \\ 3x + 4y = -2 & & (+)3x + 4y = -2 & \\ & & 11x = 22 & \text{Add the equations} \\ & & \frac{11x}{11} = \frac{22}{11} & \text{Divide each side with 11} \\ & & x = 2 & \text{Simplify} \end{array}$$

Now substitute 2 for *x* in either equation to find the value of y

$$\begin{array}{rl} 2x - y = 6 & \text{First Equation} \\ 2(2) - y = 6 & \text{Substitue 2 for } x \\ 4 - y = 6 & \text{Simplify} \\ 4 - y - 4 = 6 - 4 & \text{Subtract 6 from each side} \\ -y = 2 & \text{Simplify} \end{array}$$

$y = -2$

The solution is $\boxed{(2, -2)}$

Answer 4PQ.

Consider the equations,

$5x + 2y = 4$ ...... (1)

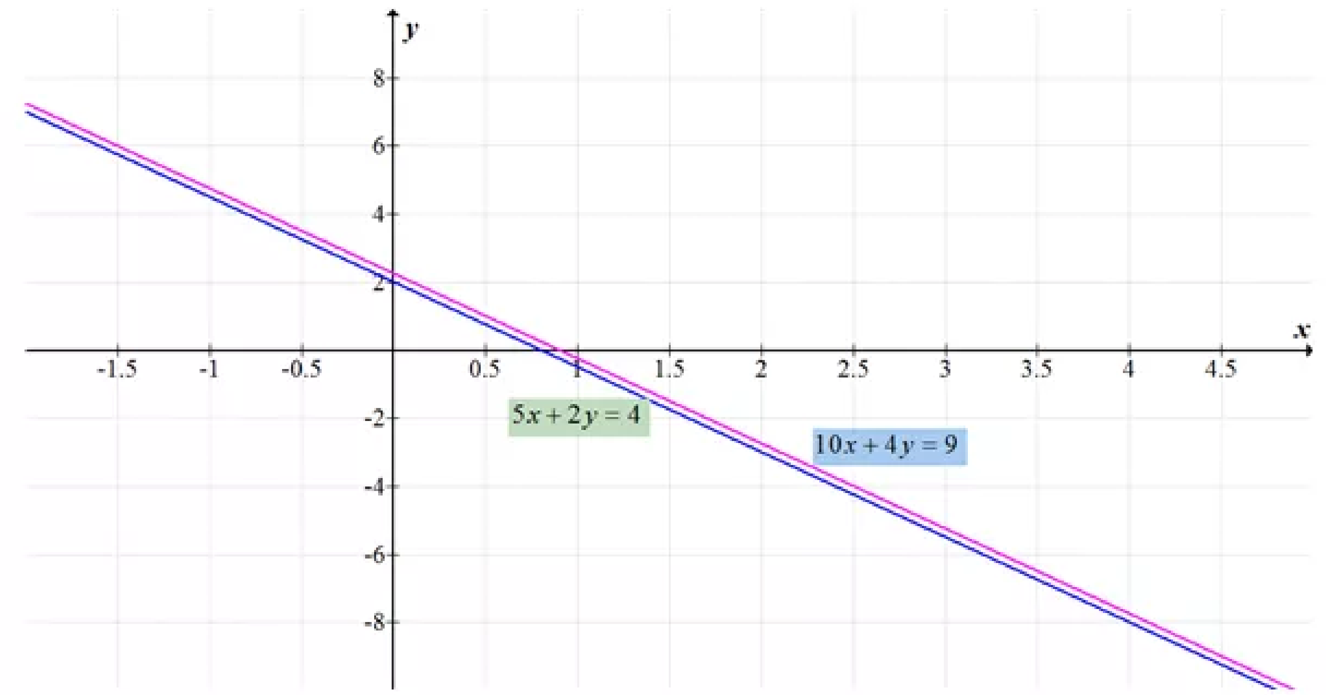
$10x + 4y = 9$ ...... (2)

Eliminate *y*

$$\begin{array}{llrl} 5x + 2y = 4 & \text{Multiply by 2} & 10x + 4y = 8 & \\ 10x + 4y = 9 & & (-)10x + 4y = 9 & \\ & & 0x + 0y = 17 & \text{Subtract the equations} \\ & & 0 = 17 & \text{False Statement} \end{array}$$

The result is false statement, the system has **no solution**

Consider the following graphs of the system of equations:



The equations are parallel lines. Hence there is no solution to the system of equations

Answer 4RM.

If one of the variable has opposite coefficients in the two equations, then elimination using Addition

Example:

Consider the equations,

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

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

Since the coefficients of the *y* terms, -1 and 1, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rcccl} & x & + & y & = & 8 \\ (+) & x & - & y & = & 4 \\ \hline & 2x & & & = & 12 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{2x}{2} = \frac{12}{2}$ Divide each side with 2

$x = 6$ Simplify

Now substitute 6 for *x* in either equation to find the value of y

$$\begin{aligned} x+y&=8 && \text{First Equation} \\ 6+y&=8 && \text{Substitue 6 for } x \\ 6+y-6&=8-6 && \text{Subtract 6 from each side} \\ y&=2 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(6,2)}$

If one of the variable has the same coefficient in the two equations, then elimination using Subtraction

Example:

Consider the equations,

$x+y=18$ ...... (1)

$x+2y=25$ ...... (2)

Since the coefficients of the *x* terms, 1 and 1, are the same, we can eliminate the *x* terms by subtracting the equations.

$$\begin{array}{rrcrcr} & x & + & y & = & 18 \\ (-) & x & + & 2y & = & 25 \\ \hline & & & -y & = & -7 \end{array}$$

Write the equations in column form and add

Notice that the x variable eliminated

$\frac{-y}{-1}=\frac{-7}{-1}$ Divide each side with -1

$y=7$ Simplify

Now substitute 7 for *y* in either equation to find the value of x

$$\begin{aligned} x+y&=18 && \text{First Equation} \\ x+7&=18 && \text{Substitue 7 for } x \\ x+7-7&=18-7 && \text{Subtract 7 from each side} \\ x&=11 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(11,7)}$

Answer 5CU.

Consider the equations,

$x+5y=4$ ...... (1)

$3x-7y=-10$ ...... (2)

Eliminate *x*

$$\begin{array}{llr} x+5y=4 & \text{Multiply by 3} & 3x+15y=12 \\ 3x-7y=-10 & & (-)3x-7y=-10 \end{array}$$

$$\begin{array}{rl} 22y=22 & \text{Subtract the equations} \\ \frac{22y}{22}=\frac{22}{22} & \text{Divide each side with 22} \\ y=1 & \text{Simplify} \end{array}$$

Now substitute 1 for *y* in either equation to find the value of x

$$\begin{array}{rl} x+5y=4 & \text{First Equation} \\ x+5(1)=4 & \text{Substitue 1 for } y \\ x+5=4 & \text{Simplify} \\ x+5-5=4-5 & \text{Subtract 5 from each side} \\ x=-1 & \text{Simplify} \end{array}$$

The solution is $\boxed{(-1,1)}$

Answer 5PQ.

Let the number of minutes used in peak time be *x* and the number of minutes used in peak time be *y*

Kelsey used 45 peak minutes and 50 nonpeak minutes and was charged $27.75

That is $45x+50y=27.75$ ...... (1)

Mitch used 70 peak minutes and 30 nonpeak minutes and was charged $36

That is $70x+30y=36$ ...... (2)

Eliminate *y*

$$\begin{array}{llr} 45x+50y=27.75 & \text{Multiply by 3} & 135x+150y=83.25 \\ 70x+30y=36 & \text{Multiply by 5} & (-)350x+150y=180 \end{array}$$

$$\begin{array}{rl} -215x=-96.75 & \text{Subtract the equations} \\ \frac{-215x}{-215}=\frac{-96.75}{-215} & \text{Divide each side with } -215 \\ x=0.45 & \text{Simplify} \end{array}$$

Now substitute 0.45 for *x* in either equation to find the value of y

$45x+50y=27.75$	First Equation
$45(0.45)+50y=27.75$	Substitue 1.29 for x
$20.25+50y=27.75$	Simplify
$20.25+50y-20.25=27.75-20.25$	Subtract 20.25 from each side
$50y=7.50$	Simplify

$\frac{50y}{50}=\frac{7.50}{50}$ Divide each side with 50

$y=0.15$ Simplify

Hence, the rate for the peak time is $\boxed{\$0.45 \text{ per min}}$ and the rate for the nonpeak time is $\boxed{\$0.15 \text{ per min}}$

Answer 6CU.

Consider the equations,

$4x+7y=6$ ...... (1)

$6x+5y=20$ ...... (2)

Eliminate *x*

$4x+7y=6$	Multiply by 3	$12x+21y=18$	
$6x+5y=20$	Multiply by 2	$12x+10y=40$	
		$11y=-22$	Subtract the equations
		$\frac{11y}{11}=\frac{-22}{11}$	Divide each side with 11
		$y=-2$	Simplify

Now substitute -2 for *y* in either equation to find the value of x

$4x+7y=6$	First Equation
$4x+7(-2)=6$	Substitue -2 for y
$4x-14=6$	Simplify
$4x-14+14=6+14$	Add 14 from each side
$4x=20$	Simplify
$\frac{4x}{4}=\frac{20}{4}$	Divide each side with 4
$x=5$	Simplify

The solution is $\boxed{(5,-2)}$

Answer 7CU.

$4x+2y=10.5$ ...... (1)

$2x+3y=10.75$ ...... (2)

Eliminate *x*

$$\begin{array}{lll} 4x+2y=10.5 & & 4x+2y=10.5 \\ 2x+3y=10.75 & \text{Multiply by 2} & 4x+6y=21.5 \end{array}$$

$$\begin{array}{rl} -4y=-11 & \text{Subtract the equations} \\ \frac{-4y}{-4}=\frac{-11}{-4} & \text{Divide each side with } -4 \\ y=2.75 & \text{Simplify} \end{array}$$

Now substitute -2.75 for *y* in either equation to find the value of x

$$\begin{array}{rl} 4x+2y=10.5 & \text{First Equation} \\ 4x+2(2.75)=10.5 & \text{Substitue 2.75 for } y \\ 4x+5.5=10.5 & \text{Simplify} \\ 4x+5.5-5.5=10.5-5.5 & \text{Subtract 5.5 to each side} \\ 4x=5 & \text{Simplify} \end{array}$$

$$\begin{array}{ll} \frac{4x}{4}=\frac{5}{4} & \text{Divide each side with 4} \\ x=1.25 & \text{Simplify} \end{array}$$

The solution is $\boxed{(1.25,2.75)}$

Answer 8CU.

Consider the equations,

$4x+3y=19$ ...... (1)

$3x-4y=8$ ...... (2)

Eliminate *y*

$$\begin{array}{lll} 4x+3y=19 & \text{Multiply by 4} & 16x+12y=76 \\ 3x-4y=8 & \text{Multiply by 3} & (+)9x-12y=24 \end{array}$$

$$\begin{array}{rl} 25x=100 & \text{Add the equations} \\ \frac{25x}{25}=\frac{100}{25} & \text{Divide each side with 25} \\ x=4 & \text{Simplify} \end{array}$$

Now substitute 4 for x in either equation to find the value of y

$4x+3y=19$	First Equation
$4(4)+3y=19$	Substitue 4 for x
$16+3y=19$	Simplify
$16+3y-16=19-16$	Subtract 16 from each side
$3y=3$	Simplify
$\frac{3y}{3}=\frac{3}{3}$	Divide each side with 3
$y=1$	Simplify

The solution is $\boxed{(4,1)}$

Answer 9CU.

Consider the equations,

$3x-7y=6$ ...... (1)

$2x+7y=4$ ...... (2)

Since the coefficients of the y terms, -7 and 7, are additive inverses, we can eliminate the y terms by adding the equations.

$$\begin{array}{rrcrcr} & 3x & - & 7y & = & 6 \\ (+) & 2x & + & 7y & = & 4 \\ \hline & 5x & & & = & 10 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{5x}{5}=\frac{10}{5}$ Divide each side with 5

$x=2$ Simplify

Now substitute 2 for x in either equation to find the value of y

$3x-7y=6$	First Equation
$3(2)-7y=6$	Substitue 2 for x
$6-7y=6$	Simplify
$6-7y-6=6-6$	Subtract 6 from each side
$-7y=0$	Simplify
$\frac{-7y}{-7}=\frac{0}{-7}$	Divide each side with -7
$y=0$	Simplify

The solution is $\boxed{(2,0)}$

Answer 10CU.

Consider the equations,

$y = 4x + 11$ ...... (1)

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

Since $y = 4x + 11$, substitute $4x + 11$ for y in the first equation

$3x - 2y = -7$ Second equation

$3x - 2(4x + 11) = -7$

$3x - 8x - 22 = -7$ Use Distributive property

$-5x - 22 = -7$ Combine like terms

$-5x - 22 + 22 = -7 + 22$ Add 22 to each side

$-5x = 15$ Simplify

$\frac{-5x}{-5} = \frac{15}{-5}$ Divide each side with -5

$x = -3$ Simplify

Now substitute -3 for x in the equation (1) to find the value of y

$y = 4x + 11$ First Equation

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

$y = -12 + 11$ Simplify

$y = -1$ Simplify

The solution is $\boxed{(-3, -1)}$

Answer 11CU.

Consider the equations,

$5x-2y=12$ ...... (1)

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

Since the coefficients of the y terms, -2 and 2, are the same, we can eliminate the y terms by subtracting the equations.

$$\begin{array}{rrcrcr} & 5x & - & 2y & = & 12 \\ (-) & 3x & - & 2y & = & -2 \\ \hline & 2x & & & = & 14 \end{array}$$

Write the equations in column form and subtract

Notice that the y variable eliminated

$\frac{2x}{2}=\frac{14}{2}$ Divide each side with 2

$x=7$ Simplify

Now substitute 7 for x in either equation to find the value of y

$5x-2y=12$	First Equation
$5(7)-2y=12$	Substitue 7 for x
$35-2y=12$	Simplify
$35-2y-35=12-35$	Subtract 35 from each side
$-2y=-23$	Simplify
$\frac{-2y}{-2}=\frac{-23}{-2}$	Divide each side with -2
$y=11.5$	Simplify

The solution is $\boxed{(7,11.5)}$

Answer 12CU.

Let the two number of two-seat tables be x and the number of four-seat tables be y

Since, the maximum number of customers is 56, so the equation is

$2x+4y=56$ ...... (1)

The total number of tables is 17

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

Eliminate y

$2x+4y=56$

$x+y=17$ Multiply by 4

$$\begin{array}{rr} & 2x+4y=56 \\ (-) & 4x+4y=68 \end{array}$$

$-2x=-12$ Subtract the equations

$\frac{-2x}{-2}=\frac{-12}{-2}$ Divide each side with -2

$x=6$ Simplify

Now substitute 6 for *x* in either equation to find the value of y

$x+y=17$	Second Equation
$6+y=17$	Substitue 6 for x
$6+y-6=17-6$	Subtract 6 from each side
$y=11$	Simplify

The solution is $\boxed{(6,11)}$

Hence, the number of two-seat tables is **6** and the number of four-seat tables is **11**

Answer 13PA.

Consider the equations,

$-5x+3y=6$ ...... (1)

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

Eliminate *x*

$$\begin{aligned} -5x+3y&=6 & & & -5x+3y&=6 \\ x-y&=4 & &\text{Multiply by 5} & (+)5x-5y&=20 \\ & & & & -2y&=26 & &\text{Add the equations} \\ & & & & \frac{-2y}{-2}&=\frac{26}{-2} & &\text{Divide each side with } -2 \\ & & & & y&=-13 & &\text{Simplify} \end{aligned}$$

Now substitute -13 for *y* in either equation to find the value of x

$x-y=4$	Second Equation
$x-(-13)=4$	Substitue -13 for y
$x+13=4$	Simplify
$x+13-13=4-13$	Subtract 13 from each side
$x=-9$	Simplify

The solution is $\boxed{(-9,-13)}$

Answer 14PA.

Consider the equations,

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

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

Eliminate y

$$\begin{array}{lll} x+y=3 & \text{Multiply by 3} & 3x+3y=9 \\ 2x-3y=16 & & (+)2x-3y=16 \\ & & 5x=25 \quad \text{Add the equations} \\ & & \frac{5x}{5}=\frac{25}{5} \quad \text{Divide each side with 5} \\ & & x=5 \quad \text{Simplify} \end{array}$$

Now substitute 5 for x in either equation to find the value of y

$$\begin{array}{rl} x+y=3 & \text{First Equation} \\ 5+y=3 & \text{Substitue 5 for } x \\ 5+y-5=3-5 & \text{Subtract 5 from each side} \\ y=-2 & \text{Simplify} \end{array}$$

The solution is $\boxed{(5,-2)}$

Answer 15PA.

Consider the equations,

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

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

Eliminate y

$$\begin{array}{lll} 2x+y=5 & \text{Multiply by 2} & 4x+2y=10 \\ 3x-2y=4 & & (+)3x-2y=4 \\ & & 7x=14 \quad \text{Add the equations} \\ & & \frac{7x}{7}=\frac{14}{7} \quad \text{Divide each side with 7} \\ & & x=2 \quad \text{Simplify} \end{array}$$

Now substitute 2 for *x* in either equation to find the value of y

$$\begin{aligned} 2x+y&=5 && \text{First Equation} \\ 2(2)+y&=5 && \text{Substitue 2 for } x \\ 4+y&=5 && \text{Simplify} \\ 4+y-4&=5-4 && \text{Subtract 4 from each side} \\ y&=1 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(2,1)}$

Answer 16PA.

Consider the equations,

$4x-3y=12$ ...... (1)

$x+2y=14$ ...... (2)

Eliminate *x*

$$\begin{aligned} 4x-3y&=12 && && 4x-3y&=12 \\ x+2y&=14 && \text{Multiply by 4} && (-)4x+8y&=56 \\ & && && -11y&=-44 && \text{Subtract the equations} \\ & && && \frac{-11y}{-11}&=\frac{-44}{-11} && \text{Divide each side with } -11 \\ & && && y&=4 && \text{Simplify} \end{aligned}$$

Now substitute 4 for *y* in either equation to find the value of x

$$\begin{aligned} x+2y&=14 && \text{Second Equation} \\ x+2(4)&=14 && \text{Substitue 4 for } y \\ x+8&=14 && \text{Simplify} \\ x+8-8&=14-8 && \text{Subtract 8 from each side} \\ x&=6 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(6,4)}$

Answer 17PA.

Consider the equations,

$5x-2y=-15$ ...... (1)

$3x+8y=37$ ...... (2)

Eliminate *y*

$$\begin{array}{llll} 5x-2y=-15 & \text{Multiply by 4} & 20x-8y=-60 & \\ 3x+8y=37 & & 3x+8y=37 & \\ & & 23x=-23 & \text{Add the equations} \\ & & \dfrac{23x}{23}=-\dfrac{23}{23} & \text{Divide each side with 23} \\ & & x=-1 & \text{Simplify} \end{array}$$

Now substitute -1 for *x* in either equation to find the value of y

$$\begin{array}{rl} 5x-2y=-15 & \text{First Equation} \\ 5(-1)-2y=-15 & \text{Substitue } -1 \text{ for } x \\ -5-2y=-15 & \text{Simplify} \\ -5-2y+5=-15+5 & \text{Add 5 to each side} \\ -2y=-10 & \text{Simplify} \\ \dfrac{-2y}{-2}=\dfrac{-10}{-2} & \text{Divide each side with -2} \\ y=5 & \text{Simplify} \end{array}$$

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

Answer 18PA.

Consider the equations,

$8x-3y=-11$ ...... (1)

$2x-5y=27$ ...... (2)

Eliminate *x*

$$\begin{array}{llll} 8x-3y=-11 & & 8x-3y=-11 & \\ 2x-5y=27 & \text{Multiply by 4} & 8x-20y=108 & \\ & & 17y=-119 & \text{Subtract the equations} \\ & & \dfrac{17y}{17}=-\dfrac{119}{17} & \text{Divide each side with 17} \\ & & y=-7 & \text{Simplify} \end{array}$$

Now substitute -7 for y in either equation to find the value of x

$$
\begin{aligned}
8x-3y&=-11 && \text{First Equation}\\
8x-3(-7)&=-11 && \text{Substitue } -7 \text{ for } y\\
8x+21&=-11 && \text{Simplify}\\
8x+21-21&=-11-21 && \text{Subtract 21 from each side}\\
8x&=-32 && \text{Simplify}
\end{aligned}
$$

$$
\begin{aligned}
\frac{8x}{8}&=-\frac{32}{8} && \text{Divide each side with 8}\\
x&=-4 && \text{Simplify}
\end{aligned}
$$

The solution is $\boxed{(-4,-7)}$

Answer 19PA.

Consider the equations,

$4x-7y=10$ ...... (1)

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

Eliminate x

$$
\begin{aligned}
4x-7y&=10 \quad \text{Multiply by 3} && 12x-21y=30\\
3x+2y&=-7 \quad \text{Multiply by 4} && 12x+8y=-28\\
& && -29y=58 \quad \text{Subtract the equations}\\
& && \frac{-29y}{-29}=\frac{58}{-29} \quad \text{Divide each side with -29}\\
& && y=-2 \quad \text{Simplify}
\end{aligned}
$$

Now substitute -2 for y in either equation to find the value of x

$$
\begin{aligned}
4x-7y&=10 && \text{First Equation}\\
4x-7(-2)&=10 && \text{Substitue } -2 \text{ for } y\\
4x+14&=10 && \text{Simplify}\\
4x+14-14&=10-14 && \text{Subtract 14 from each side}\\
4x&=-4 && \text{Simplify}
\end{aligned}
$$

$$
\begin{aligned}
\frac{4x}{4}&=\frac{-4}{4} && \text{Divide each side with 4}\\
x&=-1 && \text{Simplify}
\end{aligned}
$$

The solution is $\boxed{(-1,-2)}$

Answer 20PA.

Consider the equations,

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

$5x+4y=28$ ...... (2)

Eliminate *x*

$$\begin{array}{llr} 2x-3y=2 & \text{Multiply by 5} & 10x-15y=10 \\ 5x+4y=28 & \text{Multiply by 2} & 10x+8y=56 \end{array}$$

$$\begin{array}{rl} -23y=-46 & \text{Subtract the equations} \\ \frac{-23y}{-23}=\frac{-46}{-23} & \text{Divide each side with -23} \\ y=2 & \text{Simplify} \end{array}$$

Now substitute 2 for *y* in either equation to find the value of x

$$\begin{array}{rl} 2x-3y=2 & \text{First Equation} \\ 2x-3(2)=2 & \text{Substitue 2 for } y \\ 2x-6=2 & \text{Simplify} \\ 2x-6+6=2+6 & \text{Add 6 from each side} \\ 2x=8 & \text{Simplify} \end{array}$$

$$\begin{array}{rl} \frac{2x}{2}=\frac{8}{2} & \text{Divide each side with 2} \\ x=4 & \text{Simplify} \end{array}$$

The solution is $\boxed{(4,2)}$

Answer 21PA.

Consider the equations,

$1.8x-0.3y=14.4$ ...... (1)

$x-0.6y=2.8$ ...... (2)

Eliminate *y*

$$\begin{array}{llr} 1.8x-0.3y=14.4 & \text{Multiply by 2} & 3.6x-0.6y=28.8 \\ x-0.6y=2.8 & & x-0.6y=2.8 \end{array}$$

$$\begin{array}{rl} 2.6x=26 & \text{Subtract the equations} \\ \frac{2.6x}{2.6}=\frac{26}{2.6} & \text{Divide each side with 2.6} \\ x=10 & \text{Simplify} \end{array}$$

Now substitute 10 for x in either equation to find the value of y

$$\begin{aligned} x-0.6y &= 2.8 && \text{Second Equation} \\ 10-0.6y &= 2.8 && \text{Substitue 10 for } x \\ 10-0.6y-10 &= 2.8-10 && \text{Simplify} \\ -0.6y &= -7.2 && \text{Subtract 10 from each side} \\ \frac{-0.6y}{-0.6} &= \frac{-7.2}{-0.6} && \text{Divide each side with -0.6} \end{aligned}$$

$y=12$ Simplify

The solution is $\boxed{(10,12)}$

Answer 22PA.

Consider the equations,

$0.4x+0.5y=2.5$ ...... (1)

$1.2x-3.5y=2.5$ ...... (2)

Eliminate x

$$\begin{aligned} 0.4x+0.5y &= 2.5 \quad \text{Multiply by 7} \quad & 2.8x+3.5y &= 17.5 \\ 1.2x-3.5y &= 2.5 & 1.2x-3.5y &= 2.5 \\ & & 4x &= 20 \quad \text{Add the equations} \\ & & \frac{4x}{4} &= \frac{20}{4} \quad \text{Divide each side with 4} \\ & & x &= 5 \quad \text{Simplify} \end{aligned}$$

Now substitute 5 for x in either equation to find the value of y

$$\begin{aligned} 0.4x+0.5y &= 2.5 && \text{First Equation} \\ 0.4(5)+0.5y &= 2.5 && \text{Substitue 5 for } x \\ 2+0.5y &= 2.5 && \text{Simplify} \\ 2+0.5y-2 &= 2.5-2 && \text{Subtract 2 from each side} \\ 0.5y &= 0.5 && \text{Simplify} \end{aligned}$$

$$\frac{0.5y}{0.5} = \frac{0.5}{0.5} \quad \text{Divide each side with 0.5}$$

$y=1$ Simplify

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

Answer 23PA.

Consider the equations,

$$3x-\frac{1}{2}y=10 \quad \ldots\ldots (1)$$

$$5x+\frac{1}{4}y=8 \quad \ldots\ldots (2)$$

Eliminate y

$$3x-\frac{1}{2}y=10 \qquad\qquad 3x-\frac{1}{2}y=10$$

$$5x+\frac{1}{4}y=8 \quad \text{Multiply by 2} \quad 10x+\frac{1}{2}y=16$$

$$13x=26 \quad \text{Add the equations}$$

$$\frac{13x}{13}=\frac{26}{13} \quad \text{Divide each side with 13}$$

$$x=2 \quad \text{Simplify}$$

Now substitute 2 for x in either equation to find the value of y

$$3x-\frac{1}{2}y=10 \quad \text{First Equation}$$

$$3(2)-\frac{1}{2}y=10 \quad \text{Substitue 5 for } x$$

$$6-\frac{1}{2}y=10 \quad \text{Simplify}$$

$$6-\frac{1}{2}y-6=10-6 \quad \text{Subtract 6 from each side}$$

$$-\frac{1}{2}y=4 \quad \text{Simplify}$$

$$-\frac{1}{2}y\times -2=4\times -2 \quad \text{Multiply each side with } -2$$

$$y=-8 \quad \text{Simplify}$$

The solution is $\boxed{(2,-8)}$

Answer 24PA.

Consider the equations,

$$2x+\frac{2}{3}y=4 \;\ldots\ldots\; (1)$$

$$x-\frac{1}{2}y=7 \;\ldots\ldots\; (2)$$

Eliminate y

$$2x+\frac{2}{3}y=4 \qquad\qquad 2x+\frac{2}{3}y=4$$

$$x-\frac{1}{2}y=7 \quad \text{Multiply by 2} \qquad 2x-y=14$$

$$\left(\frac{2}{3}+1\right)y=-10 \quad \text{Subtract the equations}$$

$$\frac{5y}{3}=-10 \quad \text{Multiply each side with } \frac{3}{5}$$

$$y=-6 \quad \text{Simplify}$$

Now substitute -6 for y in either equation to find the value of x

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

$$2x+\frac{2}{3}(-6)=4 \qquad \text{Substitue } -6 \text{ for } y$$

$$2x-4=4 \qquad \text{Simplify}$$

$$2x-4+4=4+4 \qquad \text{Add 4 to each side}$$

$$2x=8 \qquad \text{Simplify}$$

$$\frac{2x}{2}=\frac{8}{2} \qquad \text{Multiply each side with 2}$$

$$x=4 \qquad \text{Simplify}$$

The solution is $\boxed{(4,-6)}$

Answer 25PA.

Let the first number be x and the second number be y,

Seven times a number plus three times another number equals negative one

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

The sum of the numbers is negative three

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

Eliminate x

$$\begin{array}{rlrl} 7x+3y=-1 & & 7x+3y=-1 & \\ x+y=-3 & \text{Multiply by 3} & (-)3x+3y=-9 & \\ & & 4x=8 & \text{Subtract the equations} \\ & & \dfrac{4x}{4}=\dfrac{8}{4} & \text{Divide each side with 4} \\ & & x=2 & \text{Simplify} \end{array}$$

Now substitute 2 for x in either equation to find the value of y

$$\begin{array}{rl} x+y=-3 & \text{Second Equation} \\ 2+y=-3 & \text{Substitue 2 for } x \\ 2+y-2=-3-2 & \text{Subtract 2 from each side} \\ y=-5 & \text{Simplify} \end{array}$$

The solution is $\boxed{(2,-5)}$

Answer 26PA.

Let the first number be x and the second number be y,

Five times a number minus twice another number equals twenty-two

$5x-2y=22$ ...... (1)

The sum of the numbers is three

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

Eliminate y

$$\begin{array}{rlrl} 5x-2y=22 & & 5x-2y=22 & \\ x+y=3 & \text{Multiply by 2} & (+)2x+2y=6 & \\ & & 7x=28 & \text{Add the equations} \\ & & \dfrac{7x}{7}=\dfrac{28}{7} & \text{Divide each side with 7} \\ & & x=4 & \text{Simplify} \end{array}$$

Now substitute 4 for *x* in either equation to find the value of y

$$\begin{aligned} x+y&=3 && \text{Second Equation} \\ 4+y&=3 && \text{Substitue 4 for } x \\ 4+y-4&=3-4 && \text{Subtract 4 from each side} \\ y&=-1 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(4,-1)}$

Answer 27PA.

Consider the equations,

$3x-4y=-10$ …… (1)

$5x+8y=-2$ …… (2)

Eliminate *y*

$$\begin{aligned} 3x-4y&=-10 \quad \text{Multiply by 2} \qquad & 6x-8y&=-20 \\ 5x+8y&=-2 & 5x+8y&=-2 \\ & & 11x&=-22 && \text{Subtract the equations} \\ & & \frac{11x}{11}&=\frac{-22}{11} && \text{Divide each side with 11} \\ & & x&=-2 && \text{Simplify} \end{aligned}$$

Now substitute -2 for *x* in either equation to find the value of y

$$\begin{aligned} 3x-4y&=-10 && \text{First Equation} \\ 3(-2)-4y&=-10 && \text{Substitue } -2 \text{ for } x \\ -6-4y&=-10 && \text{Simplify} \\ -6-4y+6&=-10+6 && \text{Add 6 to each side} \\ -4y&=-4 && \text{Simplify} \\ \frac{-4y}{-4}&=\frac{-4}{-4} && \text{Divide each side with } -4 \\ y&=1 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(-2,1)}$

Answer 28PA.

Consider the equations,

$9x-8y=42$ ...... (1)

$4x+8y=-16$ ...... (2)

Since the coefficients of the *y* terms, -8 and 8, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rrrrrr} & 9x & - & 8y & = & 42 \\ (+) & 4x & + & 8y & = & -16 \\ \hline & 13x & & & = & 26 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{13x}{13}=\frac{26}{13}$ Divide each side with 13

$x=2$ Simplify

Answer 29PA.

Consider the equations,

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

$3x+4y=30$ ...... (2)

Since $y=3x$, substitute $3x$ for y in the second equation

$3x+4y=30$ Second equation

$3x+4(3x)=30$ Substitute $y=3x$

$3x+12x=30$ Simplify

$15x=30$ Combine like terms

$\frac{15x}{15}=\frac{30}{15}$ Divide each side with 15

$x=2$ Simplify

Now substitute 2 for *x* in the equation (1) to find the value of y

$y=3x$ First equation

$y=3(2)$ Substitute $x=2$

$y=6$ Simplify

The solution is $\boxed{(2,6)}$

Answer 30PA.

Consider the equations,

$x = 4y + 8$ ...... (1)

$2x - 8y = -3$ ...... (2)

Since $x = 4y + 8$, substitute $4y + 8$ for x in the first equation

$2x - 8y = -3$ Second equation

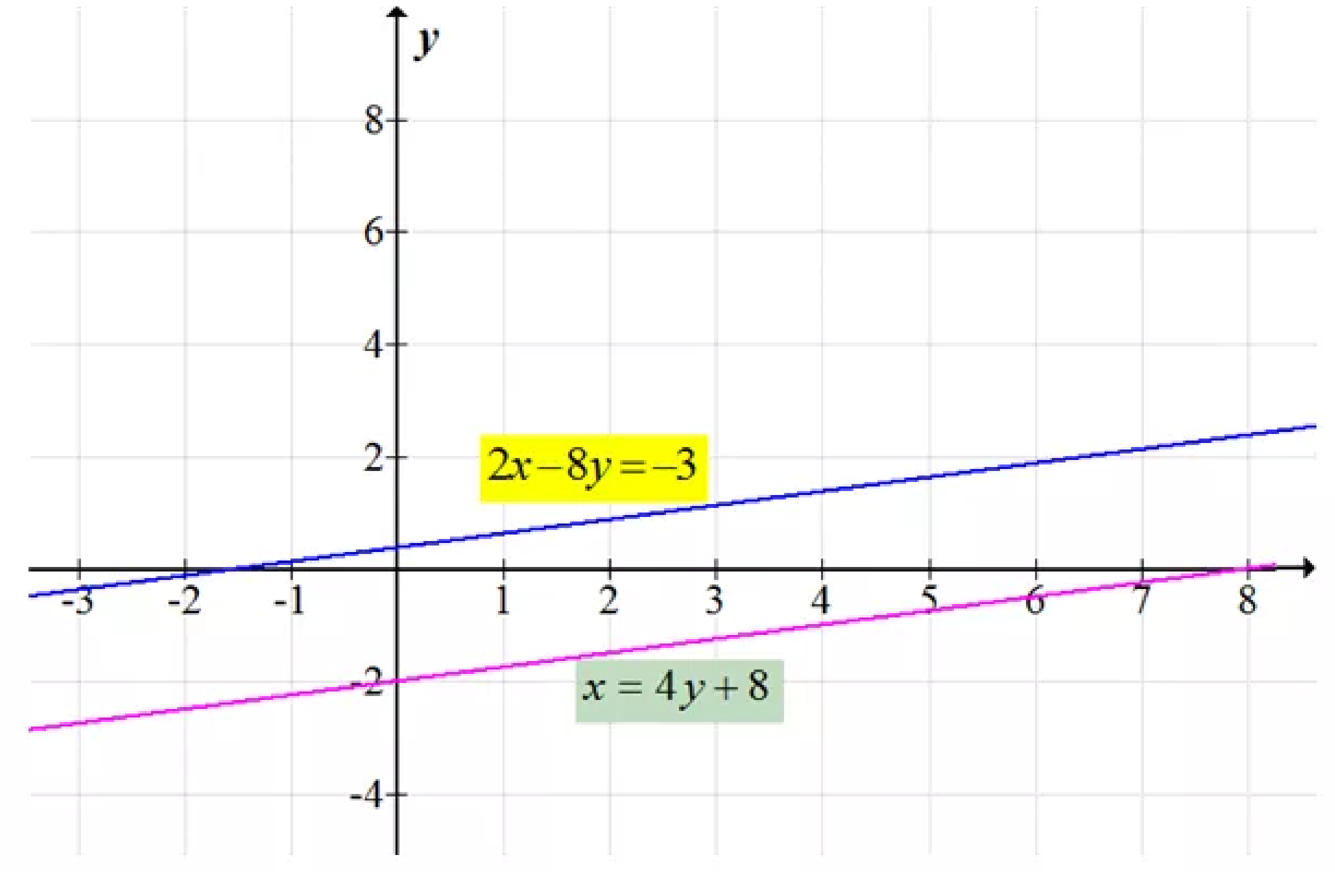
$2(4y + 8) - 8y = -3$ Substitute $x = 4y + 8$

$8y + 16 - 8y = -3$ Use Distributive property

$16 = -3$ Combine like terms

The result $16 = -3$ is a **false** statement; the system of equations has **no solution**

The graphs of the equations $x = 4y + 8$ and $2x - 8y = -3$ is shown below:



Answer 31PA.

Consider the equations,

$2x-3y=12$ ...... (1)

$x+3y=12$ ...... (2)

Since the coefficients of the *y* terms, -3 and 3, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rrrrrl} & 2x & - & 3y & = & 12 \\ (+) & x & + & 3y & = & 12 \\ \hline & 3x & & & = & 24 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{3x}{3}=\frac{24}{3}$ Divide each side with 3

$x=8$ Simplify

Now substitute 12 for *x* in either equation to find the value of y

$2x-3y=12$ First Equation

$2(8)-3y=12$ Substitue 8 for x

$16-3y=12$ Simplify

$16-3y-16=12-16$ Subtract 16 from each side

$-3y=-4$ Simplify

$\frac{-3y}{-3}=\frac{-4}{-3}$ Divide each side with -3

$y=\frac{4}{3}$ Simplify

The solution is $\boxed{\left(8,\frac{4}{3}\right)}$

Answer 32PA.

Consider the equations,

$4x-2y=14$ ...... (1)

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

Since $y=x$, substitute x for y in the second equation

$4x-2y=14$ Second equation

$4x-2x=14$ Substitute $y=x$

$2x=14$ Combine like terms

$\frac{2x}{2}=\frac{14}{2}$ Divide each side with 2

$x=7$ Simplify

Now substitute 7 for *x* in the equation (1) to find the value of y

$y = x$ First equation

$y = 7$ Substitute $x = 7$

The solution is $\boxed{(7,7)}$

Answer 33PA.

Consider the equations,

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

$5x + 3y = 18$ ...... (2)

Eliminate *y*

$$\begin{aligned} x - y &= 2 \quad \text{Multiply by 3} & 3x - 3y &= 6 \\ 5x + 3y &= 18 & 5x + 3y &= 18 \\ & & 8x &= 24 \quad \text{Subtract the equations} \\ & & \frac{8x}{8} &= \frac{24}{8} \quad \text{Divide each side with 8} \\ & & x &= 3 \quad \text{Simplify} \end{aligned}$$

Now substitute 3 for *x* in either equation to find the value of y

$$\begin{aligned} x - y &= 2 && \text{First Equation} \\ 3 - y &= 2 && \text{Substitue 3 for } x \\ 3 - y - 3 &= 2 - 3 && \text{Subtract 3 from each side} \\ -y &= -1 && \text{Simplify} \\ y &= 1 && \text{Multiply each side with } -1 \end{aligned}$$

The solution is $\boxed{(3,1)}$

Answer 34PA.

Consider the equations,

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

$2x - y = -9$ ...... (2)

Since $y = 2x + 9$, substitute $2x + 9$ for y in the Second equation

$2x - y = -9$ Second equation

$2x - (2x + 9) = -9$

$2x - 2x - 9 = -9$ Use Distributive property

$-9 = -9$ Combine like terms

The statement is true. This means that there are infinitely many solutions of the system of equations. This is true because the slope-intercept form of both equations $y = 2x + 9$

Consider the equation (2)

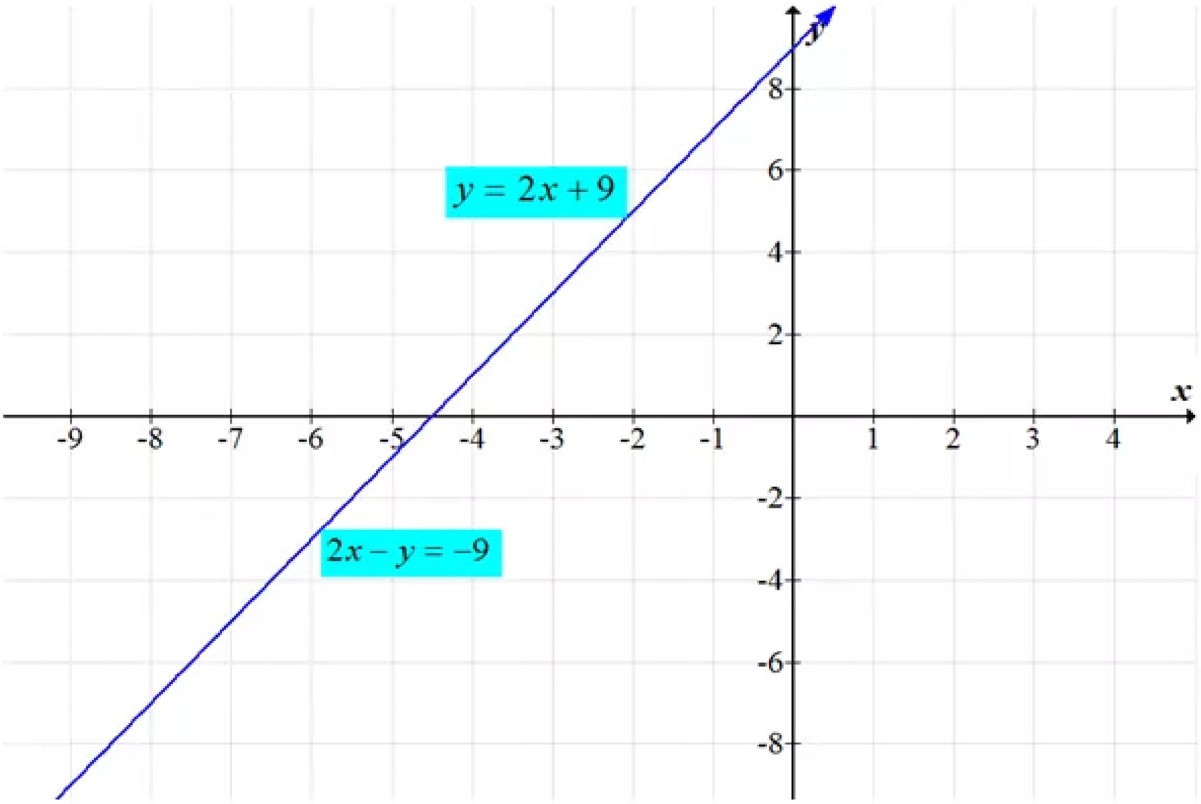
$2x - y = -9$

$2x - y + 9 = -9 + 9$ Add 9 to both sides

$2x - y + 9 = 0$ Add *y* to each side of the equation

$2x + 9 = y$ First equation

That is, the equations are equivalent, and they have the same graph.



Answer 35PA.

Consider the equations,

$6x - y = 9$ ...... (1)

$6x - y = 11$ ...... (2)

Since the coefficients of the *y* terms, 6 and 6 and the coefficients of *x*, are the same, we can eliminate the *x* and *y* terms by subtracting the equations.

$$\begin{array}{rrcrcr} & 6x & - & y & = & 9 \\ (-) & 6x & - & y & = & 11 \\ \hline & 0 & - & 0 & = & -2 \end{array}$$

Write the equations in column form and subtract

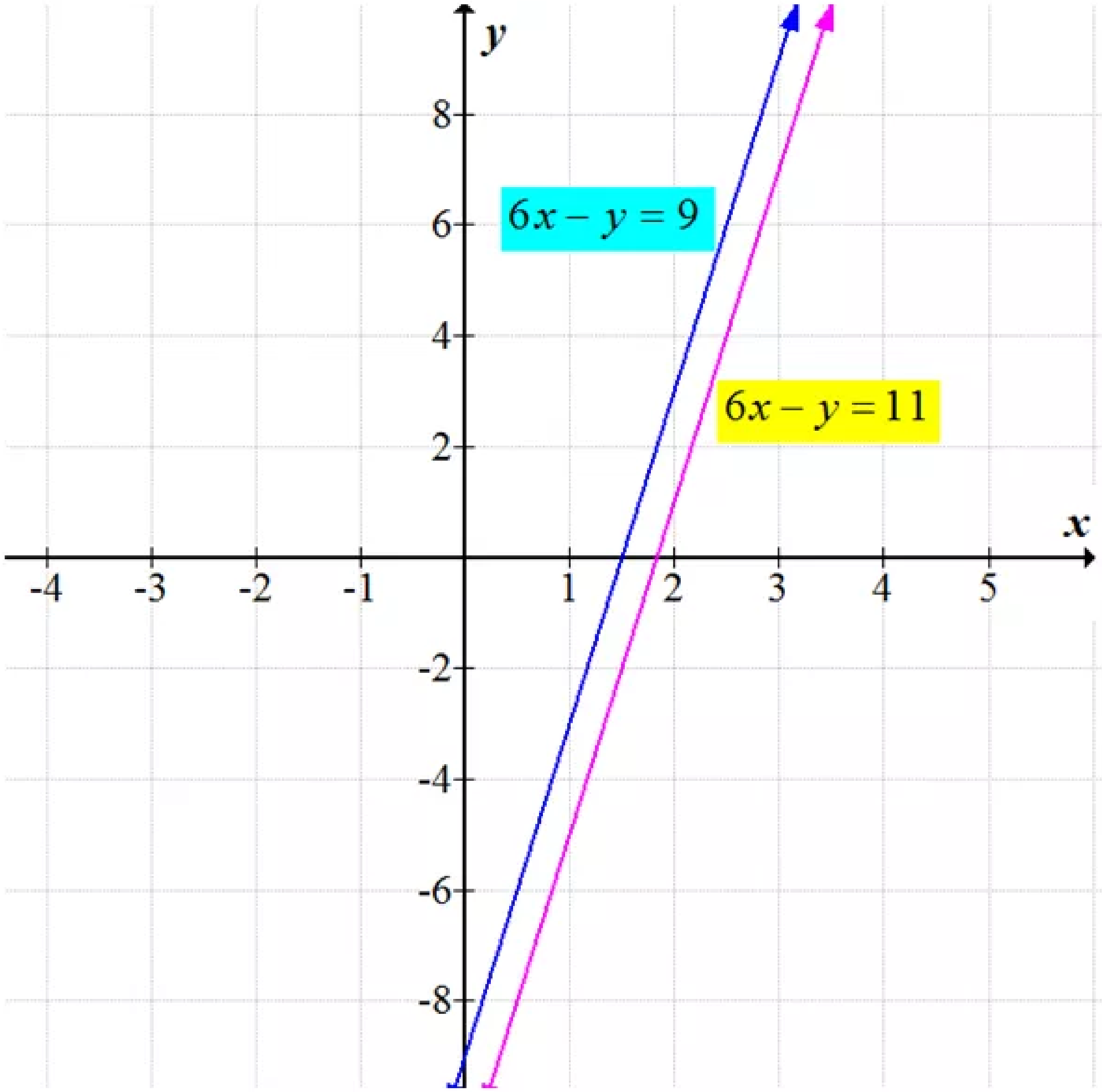
Notice that the *x* and *y* variable eliminated

$0 = -2$ Simplify

The result is a false statement. Hence the system has **no solution**.

The following graph supports our conclusion

The graph of the equations $6x-y=9$ and $6x-y=11$ is shown below:



From the graph, observe that the lines are non-intersecting, so the equation has **no** solution

Answer 36PA.

Consider the equations,

$x = 8y$ ...... (1)

$2x + 3y = 38$ ...... (2)

Since $x = 8y$, substitute $8y$ for x in the second equation

$2x + 3y = 38$ Second equation

$2(8y) + 3y = 38$ Substitute $x = 8y$

$16y + 3y = 38$ Simplify

$19y = 38$ Combine like terms

$\frac{19y}{19} = \frac{38}{19}$ Divide each side with 19

$y = 2$ Simplify

Now substitute 2 for *y* in the equation (1) to find the value of y

$x = 8y$ First equation

$x = 8(2)$ Substitute $y = 2$

$x = 16$ Simplify

The solution is $\boxed{(16,2)}$

Answer 37PA.

Consider the equations,

$\frac{2}{3}x - \frac{1}{2}y = 14$ ...... (1)

$\frac{5}{6}x - \frac{1}{2}y = 18$ ...... (2)

Since the coefficients of the *y* terms, $\frac{1}{2}$ and $\frac{1}{2}$, are the same, we can eliminate the *y* terms by subtracting the equations.

$$\begin{array}{rrrcl} & \frac{2}{3}x & - \frac{1}{2}y & = & 14 \\ (-) & \frac{5}{6}x & - \frac{1}{2}y & = & 18 \\ \hline & \left(\frac{2}{3} - \frac{5}{6}\right)x & & = & -4 \end{array}$$

Write the equations in column form and subtract

Notice that the y variable eliminated

$\frac{(4-5)}{6}x = -4$ Divide each side with 3

$\frac{-1}{6}x = -4$ Simplify

$x = 24$ Multiply each side with -6

Now substitute 24 for x in either equation to find the value of y

$\frac{2}{3}x-\frac{1}{2}y=14$	First Equation
$\frac{2}{3}(24)-\frac{1}{2}y=14$	Substitue 24 for x
$16-\frac{1}{2}y=14$	Simplify
$16-\frac{1}{2}y-16=14-16$	Subtract 16 from each side
$-\frac{1}{2}y=-2$	Simplify
$-\frac{1}{2}y\times-2=-2\times-2$	Multiply each side with -2
$y=4$	Simplify

The solution is $\boxed{(24,4)}$

Answer 38PA.

Consider the equations,

$$\frac{1}{2}x-\frac{2}{3}y=\frac{7}{3} \quad \ldots\ldots (1)$$

$$\frac{3}{2}x+2y=-25 \quad \ldots\ldots (2)$$

Eliminate y

$\frac{1}{2}x-\frac{2}{3}y=\frac{7}{3}$ Multiply by 3 $\frac{3}{2}x-2y=7$

$\frac{3}{2}x+2y=-25$ $\qquad\qquad\qquad$ $\frac{3}{2}x+2y=-25$

$3x=-18$	Subtract the equations
$\frac{3x}{3}=\frac{-18}{3}$	Divide each side with 3
$x=-6$	Simplify

Now substitute -6 for x in either equation to find the value of y

$\frac{3}{2}x+2y=-25$	Second Equation
$\frac{3}{2}(-6)+2y=-25$	Substitue -6 for x
$-9+2y+9=-25+9$	Add 9 to each side
$2y=-16$	Simplify
$y=-8$	Divide each side with 2

The solution is $\boxed{(-6,-8)}$

Answer 39PA.

Let *z* represents the 1-point field goal, *x* represents the 2-point field goal and *y* represent 3-point field goal.

Given that a player scored 475, 1-point field goals out of 557 free throws.

That is $z = 475$

Basketball player scored a total of 1938 points in one season

$z + 2x + 3y = 1938$

$475 + 2x + 3y = 1938$ Substitute $z = 475$

$475 + 2x + 3y - 475 = 1938 - 475$ Subtract 475 from each side

$2x + 3y = 1463$ …… (1)

The total number of 2-point and 3-point goals is 701

$x + y = 701$ …… (2)

Eliminate *x*

$2x + 3y = 1463$		$2x + 3y = 1463$	
$x + y = 701$	Multiply by 2	$2x + 2y = 1402$	
		$y = 61$	Subtract the equations

Now substitute 61 for *y* in either equation to find the value of x

$x + y = 701$	Second Equation
$x + 61 = 701$	Substitue 61 for y
$x + 61 - 61 = 701 - 61$	Subtract 61 from each side
$x = 640$	Simplify

Hence the number of 2-point field goals is **640** and the number of 3-point field goals is **61**.

Answer 40PA.

Consider the equations,

$4x+5y=2$ ...... (1)

$6x-2y=b$ ...... (2)

Since $(3,a)$ is the solution to the system of equations, so the point $(3,a)$ passes through the two lines.

As the point passes through the equation (1), substitute $x=3$ and $y=a$ in (1)

$4x+5y=2$ First equation

$4(3)+5a=2$ Substitute $x=3$ and $y=a$

$12+5a=2$ Simplify

$12+5a-12=2-12$ Subtract 12 from each side

$5a=-2$ Simplify

$\frac{5a}{5}=\frac{-10}{5}$ Divide each side with 5

$a=-2$ Simplify

As the point passes through the equation (2), substitute $x=3$ and $y=a=-2$ in (2)

$6x-2y=b$ Second equation

$6(3)-2(-2)=b$ Substitute $x=3$ and $y=a$

$18+4=b$ Simplify

$22=b$ Add

Hence $\boxed{a=-2}$ and $\boxed{b=22}$

Answer 42PA.

Let the unit digit of a number be *y* and 10's place digit is *x*. So the number is xy

Given that sum of the digits are 14

That is $x+y=14$ ...... (1)

The original number can also be written as $xy=10x+y$

The reverse of the original number is $yx=10y+x$

The digits are reversed; the new number yx is 18 less than the original number xy

Then the equation is $yx+18=xy$

That is $10y+x+18=10x+y$

That is $9x-9y=18$ ...... (2)

Eliminate y

$$\begin{aligned} x+y&=14 & & x+y=14 \\ 9x-9y&=18 \quad \text{Divided by 9} & & x-y=2 \\ & & & 2x=16 \quad \text{Add the equations} \end{aligned}$$

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

$$x=8$$

Now substitute 8 for x in either equation to find the value of y

$$\begin{aligned} x+y&=14 && \text{First Equation} \\ 8+y&=14 && \text{Substitue 8 for } x \\ 8+y-8&=14-8 && \text{Subtract 8 from each side} \\ y&=6 && \text{Simplify} \end{aligned}$$

Hence the number is $xy=\boxed{86}$.

Answer 44PA.

Let c represents the number of batches of cookies and b represents the number of loaves of bread, the following system of equations is

$20c+10b=800$ ...... (1)

$10c+30b=900$ ...... (2)

Procedure to solve the system of equations:

- Since the none of the coefficient s are -1 or 1 and neither of the variables can be eliminated by subtracting the equations.
- Multiply the equation (1) with 3 and subtract the equations.
- Solve the equations for c
- Substitute the value of c, in either of the equation to get the value of b

Eliminate b

$$\begin{aligned} 20c+10b&=800 \quad \text{Multiply by 3} & & 60c+30b=2400 \\ 10c+30b&=900 & & 10c+30b=900 \\ & & & 50c=1500 \quad \text{Subtract the equations} \\ & & & \frac{50c}{50}=\frac{1500}{50} \quad \text{Divide each side with 50} \\ & & & c=30 \quad \text{Simplify} \end{aligned}$$

Now substitute 30 for *c* in either equation to find the value of b

$$\begin{aligned} 20c + 10b &= 800 && \text{First Equation} \\ 20(30) + 10b &= 800 && \text{Substitue 30 for } c \\ 600 + 10b &= 800 && \text{Simplify} \\ 600 + 10b - 600 &= 800 - 600 && \text{Subtract 600 from each side} \\ 10b &= 200 && \text{Simplify} \end{aligned}$$

$$\frac{10b}{10} = \frac{200}{10} \quad \text{Divide each side with 10}$$

$$b = 20 \quad \text{Simplify}$$

Hence a restaurant manager would schedule **20 loaves** of bread and **30 batches** cookies.

Answer 45PA.

Consider the equations,

$5x + 3y = 12$ …… (1)

$4x - 5y = 17$ …… (2)

Eliminate *x*

$$\begin{aligned} 5x + 3y = 12 \quad \text{Multiply by 4} \quad & 20x + 12y = 48 \\ 4x - 5y = 17 \quad \text{Multiply by 5} \quad & 20x - 25y = 85 \\ & 37y = -37 && \text{Subtract the equations} \\ & \frac{37y}{37} = \frac{-37}{37} && \text{Divide each side with 37} \\ & y = -1 && \text{Simplify} \end{aligned}$$

Notice that A is the value of *y*.

Hence the correct Option is **A**

Answer 46PA.

Consider the equations,

$x + 2y = -1$ …… (1)

$2x + 4y = -2$ …… (2)

Eliminate *x*

$$\begin{aligned} x + 2y = -1 \quad \text{Multiply by 2} \quad & 2x + 4y = -2 \\ 2x + 4y = -2 \quad & 2x + 4y = -2 \\ & 0 = 0 && \text{Subtract the equations} \end{aligned}$$

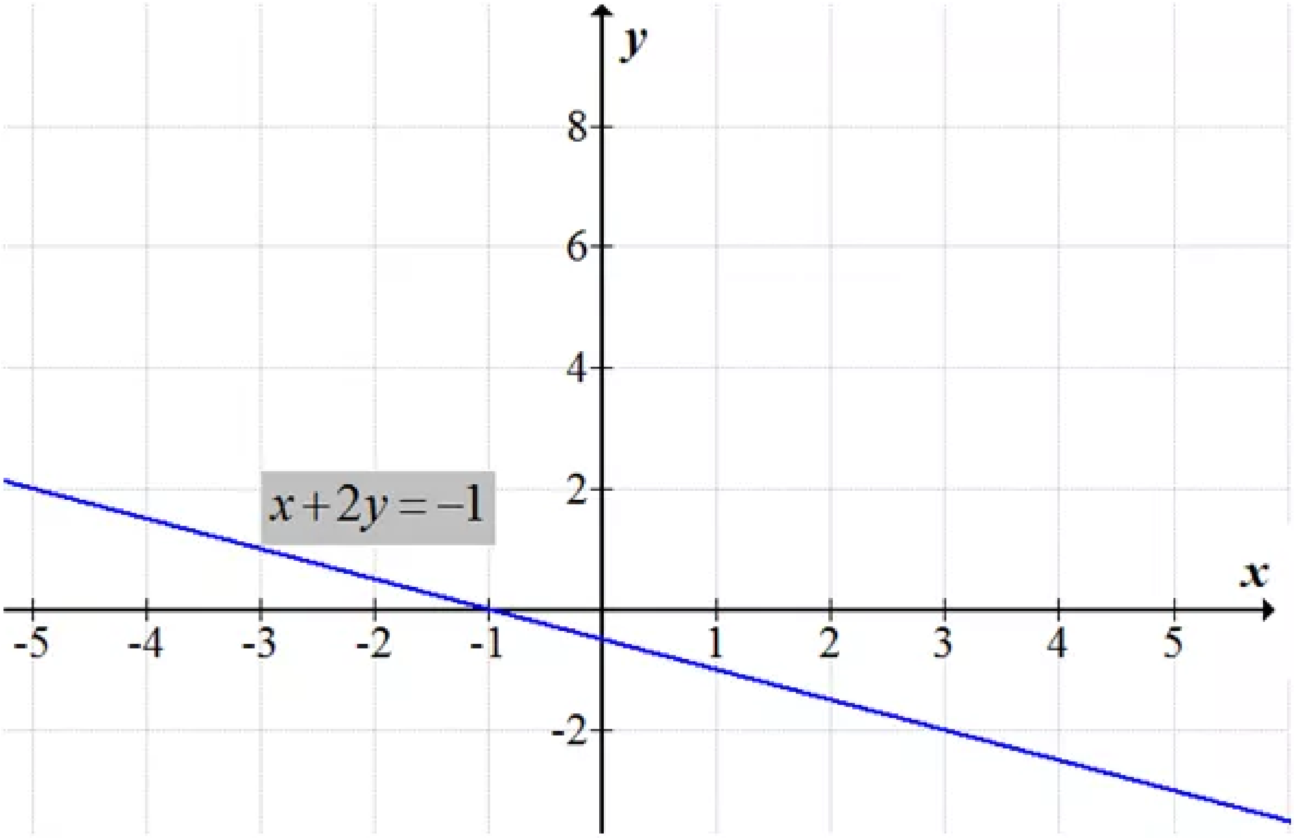
The statement 0=0 is true. This means that there are infinitely many solutions of the system of equations. This is true because the slope-intercept form of both equations is $x + 2y = -1$

Consider the second equation (2), $2x+4y=-2$

$$\frac{2x+4y}{2}=-\frac{2}{2}$$

$x+2y=-1$ First equation

That is, the equations are equivalent, and they have the same graph.



Hence the system has an infinite number of solutions.

Hence the correct Option is **D**

Answer 47MYS.

Consider the equations,

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

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

Since the coefficients of the *y* terms, -1 and 1, are additive inverses, we can eliminate the *y* terms by adding the equations.

$$\begin{array}{rcccl} & x & + & y & = & 8 \\ (+) & x & - & y & = & 4 \\ \hline & 2x & & & = & 12 \end{array}$$

Write the equations in column form and add

Notice that the y variable eliminated

$\frac{2x}{2}=\frac{12}{2}$ Divide each side with 2

$x=6$ Simplify

Now substitute 6 for *x* in either equation to find the value of y

$$\begin{aligned} x+y&=8 && \text{First Equation} \\ 6+y&=8 && \text{Substitue 6 for } x \\ 6+y-6&=8-6 && \text{Subtract 6 from each side} \\ y&=2 && \text{Simplify} \end{aligned}$$

The solution is $\boxed{(6,2)}$

Answer 48MYS.

Consider the equations,

$2r+s=5$ ...... (1)

$r-s=1$ ...... (2)

Since the coefficients of the *s* terms, -1 and 1, are additive inverses, we can eliminate the *s* terms by adding the equations.

$$\begin{array}{rrcrcr} & 2r & + & s & = & 5 \\ (+) & r & - & s & = & 1 \\ \hline & 3r & & & = & 6 \end{array}$$

Write the equations in column form and add

Notice that the s variable eliminated

$\frac{3r}{3}=\frac{6}{3}$ Divide each side with 3

$r=2$ Simplify

Now substitute 2 for *r* in either equation to find the value of r

$$\begin{aligned} r-s&=1 && \text{Second Equation} \\ 2-s&=1 && \text{Substitue 2 for } r \\ 2-s-2&=1-2 && \text{Subtract 2 from each side} \\ -s&=-1 && \text{Simplify} \\ s&=1 && \text{Multiply each side with } -1 \end{aligned}$$

The solution is $\boxed{(2,1)}$

Answer 49MYS.

Consider the equations,

$x+y=18$ ...... (1)

$x+2y=25$ ...... (2)

Since the coefficients of the *x* terms, 1 and 1, are the same, we can eliminate the *x* terms by subtracting the equations.

$$\begin{array}{rrcrcr} & x & + & y & = & 18 \\ (-) & x & + & 2y & = & 25 \\ \hline & & & -y & = & -7 \end{array}$$

Write the equations in column form and add

Notice that the x variable eliminated

$\frac{-y}{-1}=\frac{-7}{-1}$ Divide each side with -1

$y=7$ Simplify

Now substitute 7 for *y* in either equation to find the value of x

$x+y=18$	First Equation
$x+7=18$	Substitue 7 for x
$x+7-7=18-7$	Subtract 7 from each side
$x=11$	Simplify

The solution is $\boxed{(11,7)}$

Answer 50MYS.

Consider the equations,

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

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

Since $x=-3y$, substitute $-3y$ for x in the second equation

$2x+3y=3$ Second equation

$2(-3y)+3y=3$ Substitute $x=-3y$

$-6y+3y=3$ Simplify

$-3y=3$ Combine like terms

$\frac{-3y}{-3}=\frac{3}{-3}$ Divide each side with -3

$y=-1$ Simplify

Now substitute -1 for x in the equation (2) to find the value of x

$x = -3y$ First equation

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

$x = 3$ Simplify

The solution is $\boxed{(3,-1)}$

Answer 51MYS.

Consider the equations,

$x + y = 0$ ...... (1)

$3x + y = -8$ ...... (2)

From the equation (1)

$x + y = 0$

$x + y - y = 0 - y$ Subtract y from each side

$x = -y$ Simplify

Since $x = -y$, substitute $-y$ for x in the second equation

$3x + y = -8$ Second equation

$3(-y) + y = -8$ Substitute $x = -y$

$-3y + y = -8$ Simplify

$-2y = -8$ Combine like terms

$\frac{-2y}{-2} = \frac{-8}{-2}$ Divide each side with -2

$y = 4$ Simplify

Now substitute 4 for y in the equation (1) to find the value of x

$x + y = 0$ First equation

$x + 4 = 0$ Substitute $y = 4$

$x = -4$ Simplify

The solution is $\boxed{(-4,4)}$

Answer 52MYS.

Consider the equations,

$x-2y=7$ ...... (1)

$-3x+6y=-21$ ...... (2)

From the equation (1)

$x-2y=7$

$x-2y+2y=7+2y$ Subtract $2y$ from each side

$x=2y+7$ Simplify

Since $x=2y+7$, substitute $2y+7$ for x in the second equation

$-3x+6y=-21$ Second equation

$-3(2y+7)+6y=-21$ Substitute $x=2y+7$

$-6y-21+6y=-21$ Use the Distributive Property

$-21=-21$ Combine like terms

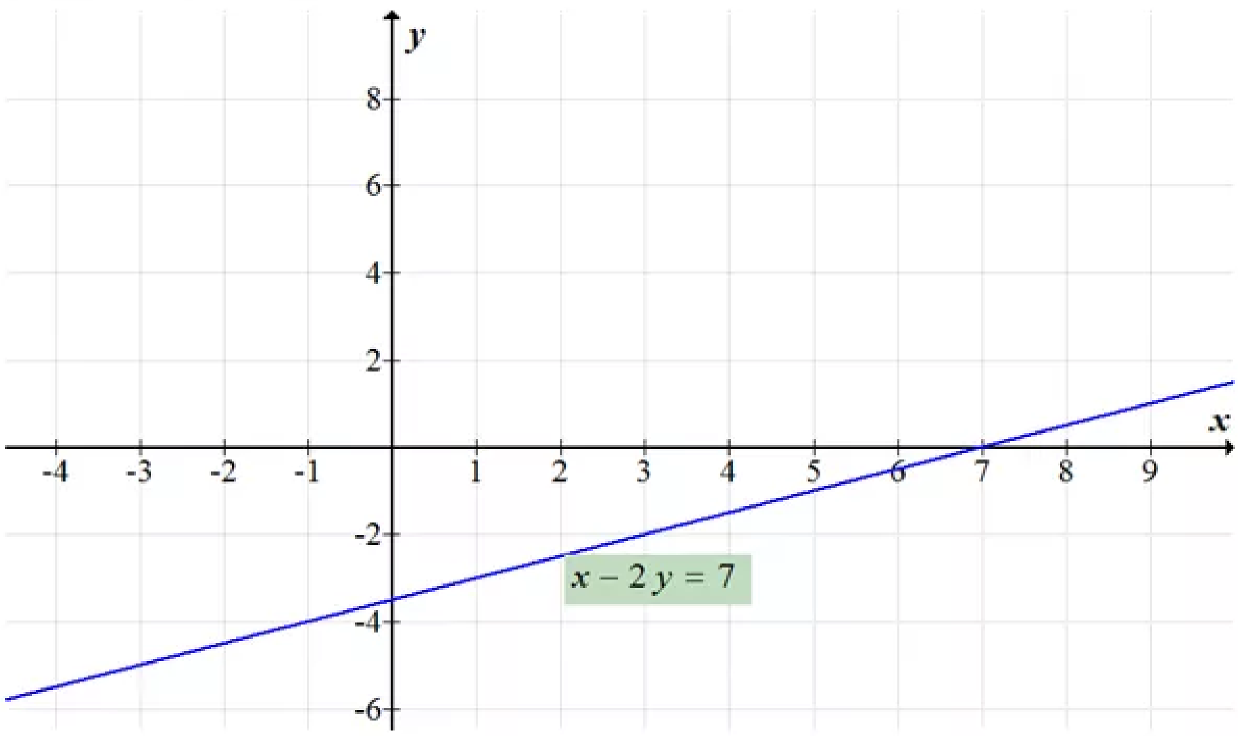
The statement $-21=-21$ is true. This means that there are infinitely many solutions of the system of equations. This is true because the slope-intercept form of both equations is $x-2y=7$ That is, the equations are equivalent, and they have the same graph.

Consider the equation (2)

$-3x+6y=-21$ Equation (2)

$\frac{-3x}{-3}+\frac{6y}{-3}=\frac{-21}{-3}$ Divide each side with -3

$x-2y=7$ Equation (1)

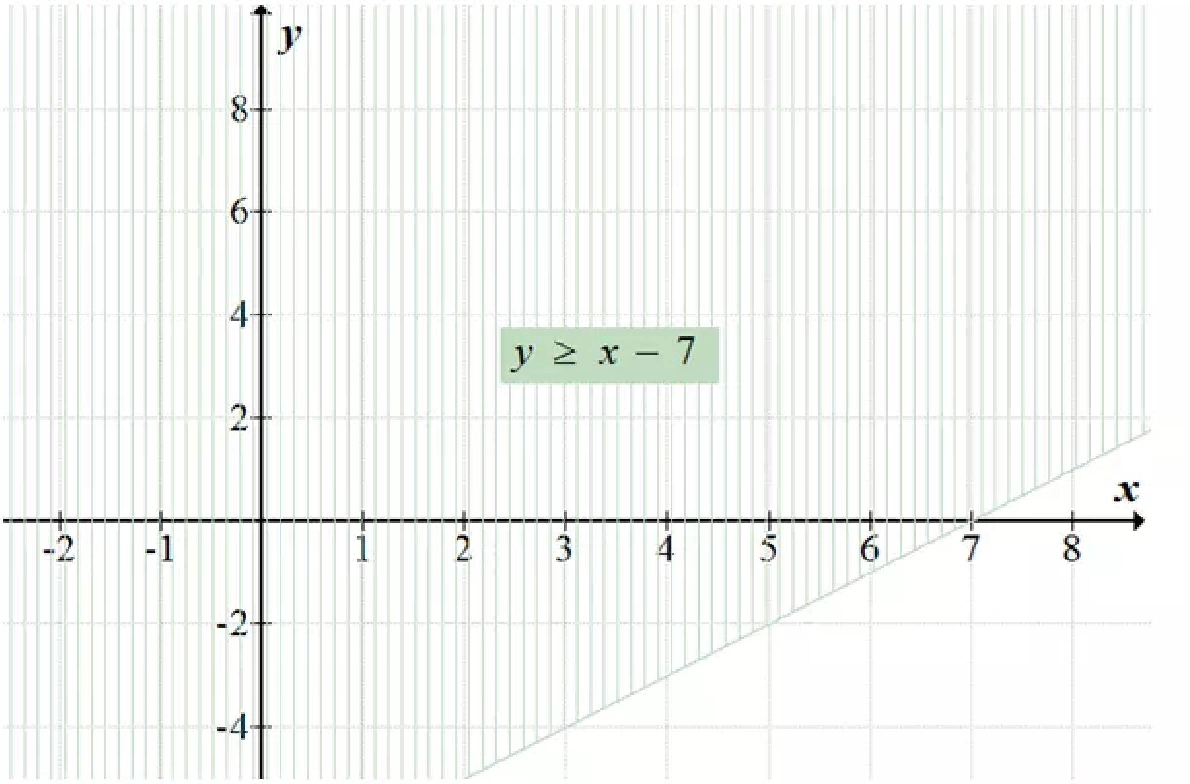


Answer 54MYS.

Consider the inequality,

$y \geq x - 7$ …… (1)

The graph of the inequality is shown below:

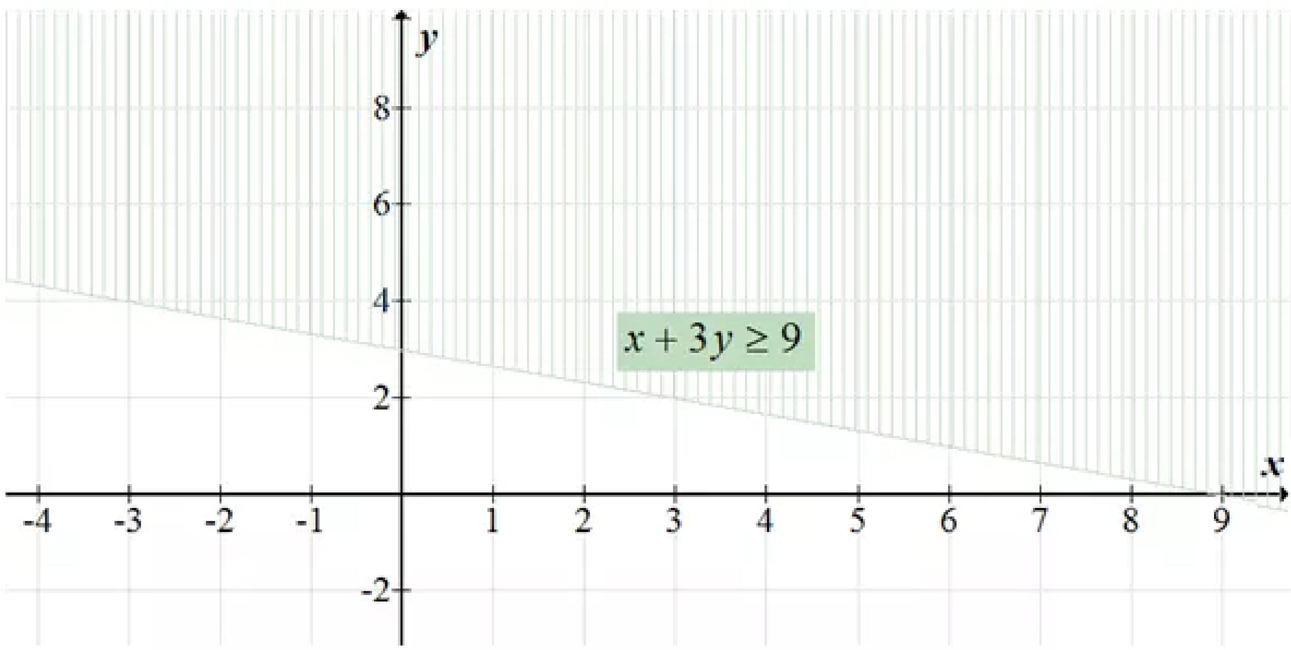


Answer 55MYS.

Consider the inequality,

$x + 3y \geq 9$ …… (1)

The graph of the inequality is shown below:

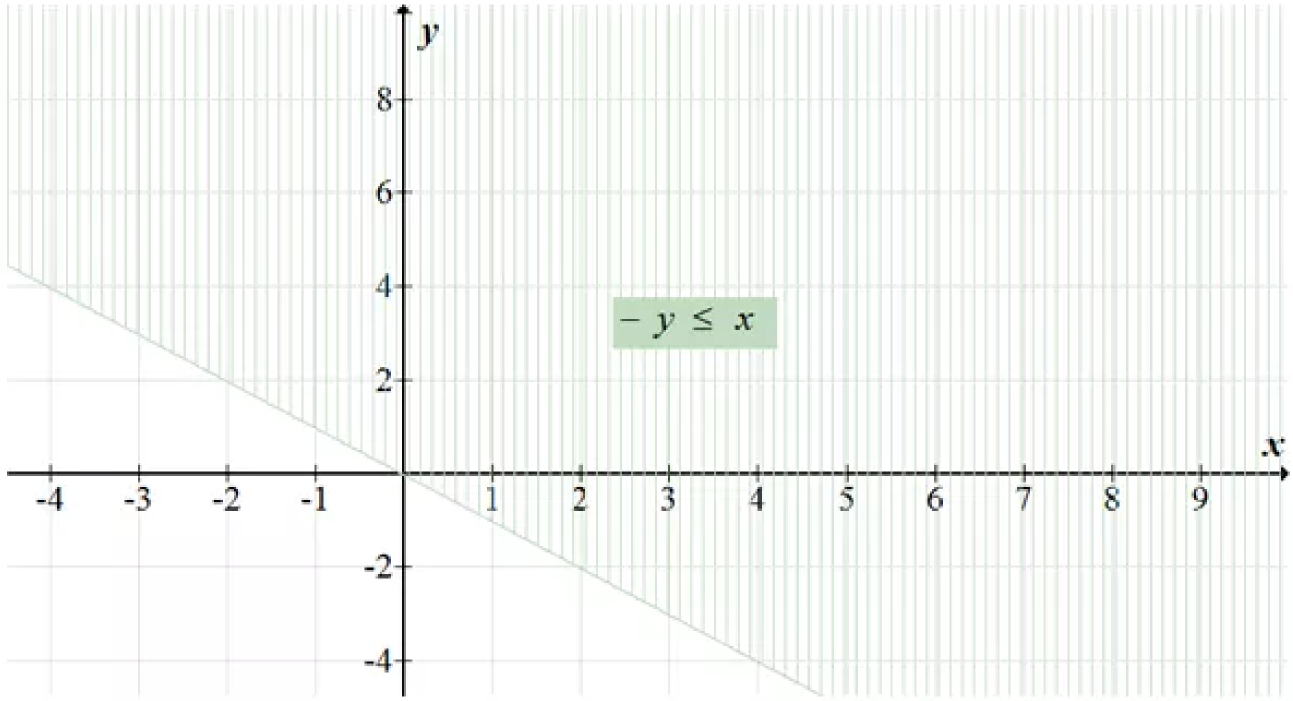


Answer 56MYS.

Consider the inequality,

$-y \le x$ ...... (1)

The graph of the inequality is shown below:



Answer 57MYS.

Consider the inequality,

$-3x + y \ge -1$ ...... (1)

The graph of the inequality is shown below: