Chapter 7. Solving Systems of Linear Equations and Inequalities

Ex. 7.1

Answer 1CU.

Given that system of equations has a solution $(-2,3)$

Now, identify the two linear equations that pass through the point $(-2,3)$

Suppose, $(-2)+(3)=1$ and $(-2)-(3)=-5$

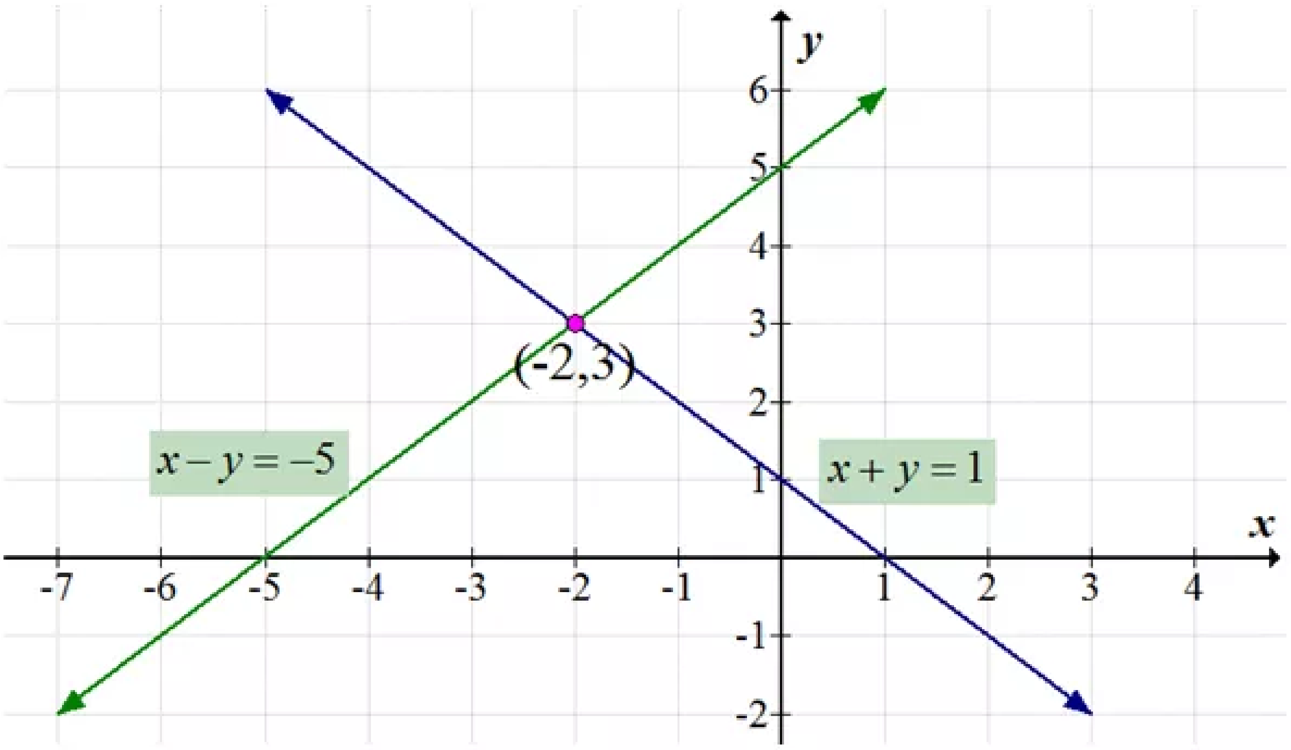
Let $(-2)=x$ and $(3)=y$

Now, write the linear equations,

$x+y=1$ …… (1)

$x-y=-5$ …… (2)

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

Hence, the solution is $(-2,3)$

Answer 1GCI.

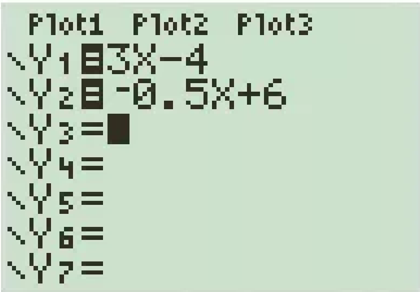
Consider the equations,

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

$y = -0.5x + 6$ ...... (2)

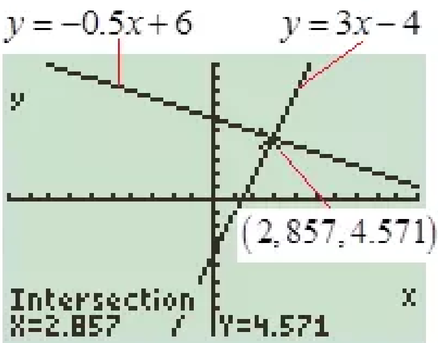
By using the Graphic calculator solve the system of linear equations

Enter the equations in the $\boxed{Y =}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(2,857,4.571)}$

Answer 1SI.

Let *x* is the amount of Mr. Winters' weekly sales, and *y* is his total weekly salary

The salary at the first job is $400 per week plus 10% commission on Mr. Winters' sales

Slope intercept of a line is $y = mx + c$

m is the slope of the line and *c* is the *y* intercept

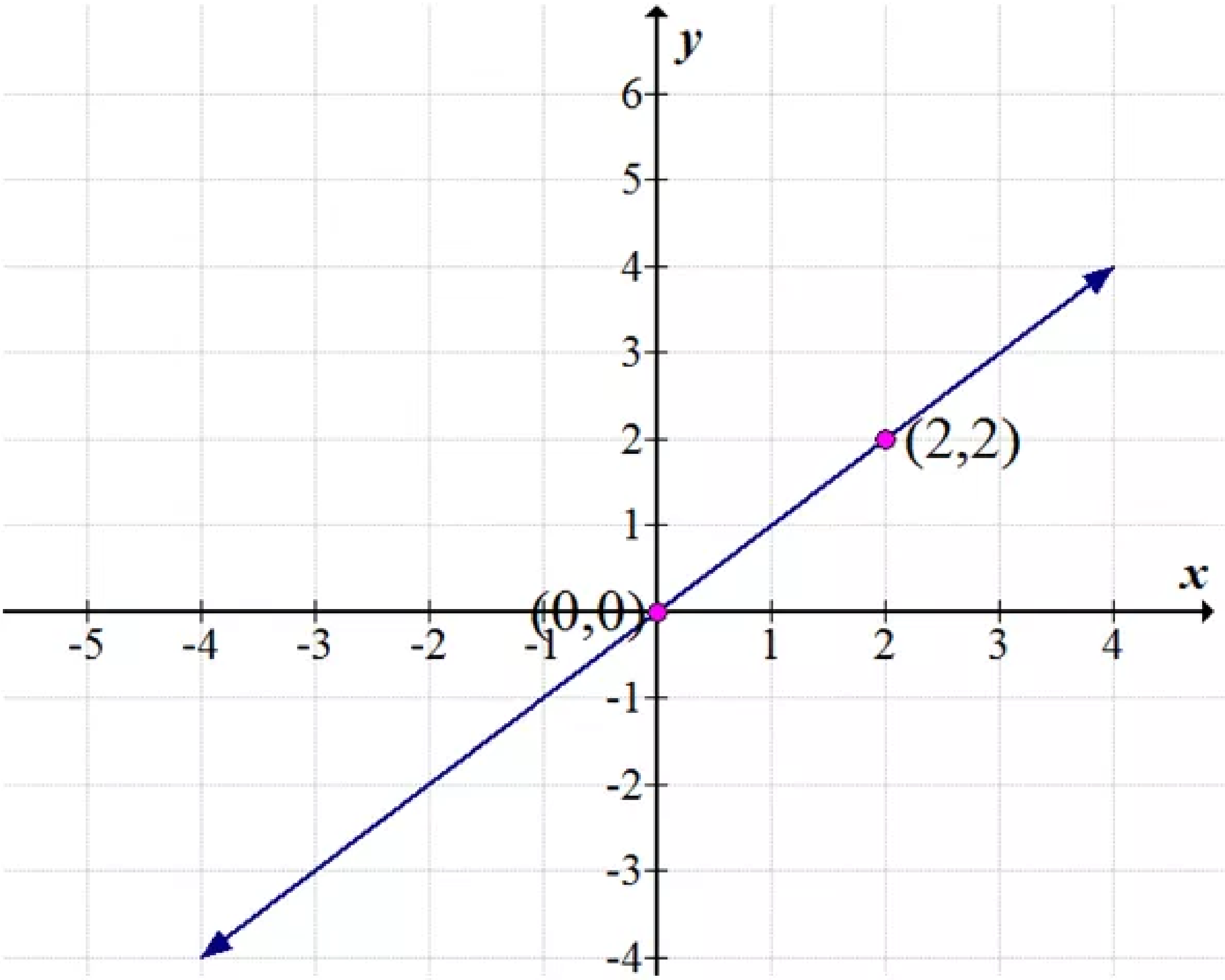
Slope $m = 10\% = 0.1$ and $c = 400$

Linear equation for the salary at the first job is

$y = 0.1x + 400$

Answer 2CU.

A system of equations with $(0,0)$ and $(2,2)$ as solutions, then the system has always solution.



If the system of equations having more than one solution, then two linear equations must be same. And that system of equations having infinitely many solutions.

Answer 2GCI.

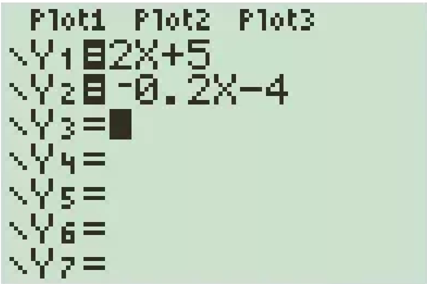
Consider the equations,

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

$y = -0.2x - 4$ ...... (2)

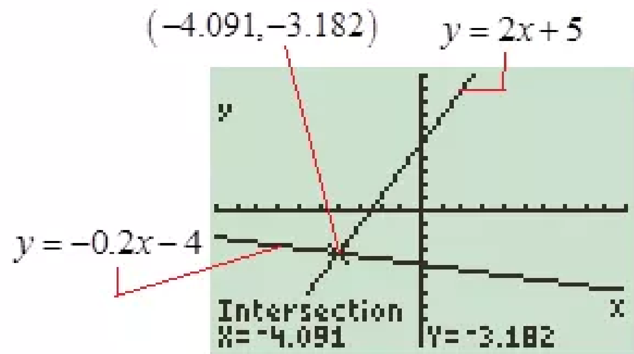
By using the Graphic calculator solve the system of linear equations

Enter the equations in the $\boxed{Y =}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(-4.091, -3.182)}$

Answer 2SI.

Let *x* is the amount of Mr. Winters' weekly sales, and *y* is his total weekly salary

The salary at the second job is $375 per week plus 15% commission on Mr. Winters' sales

Slope intercept of a line is $y = mx + c$

m is the slope of the line and *c* is the *y* intercept

Slope $m = 15\% = 0.15$ and $c = 400$

Linear equation for the salary at the second job is

$y = 0.15x + 375$

Answer 3CU.

If the graphs of two linear equations have the same slope, then the system of equations has no solution.

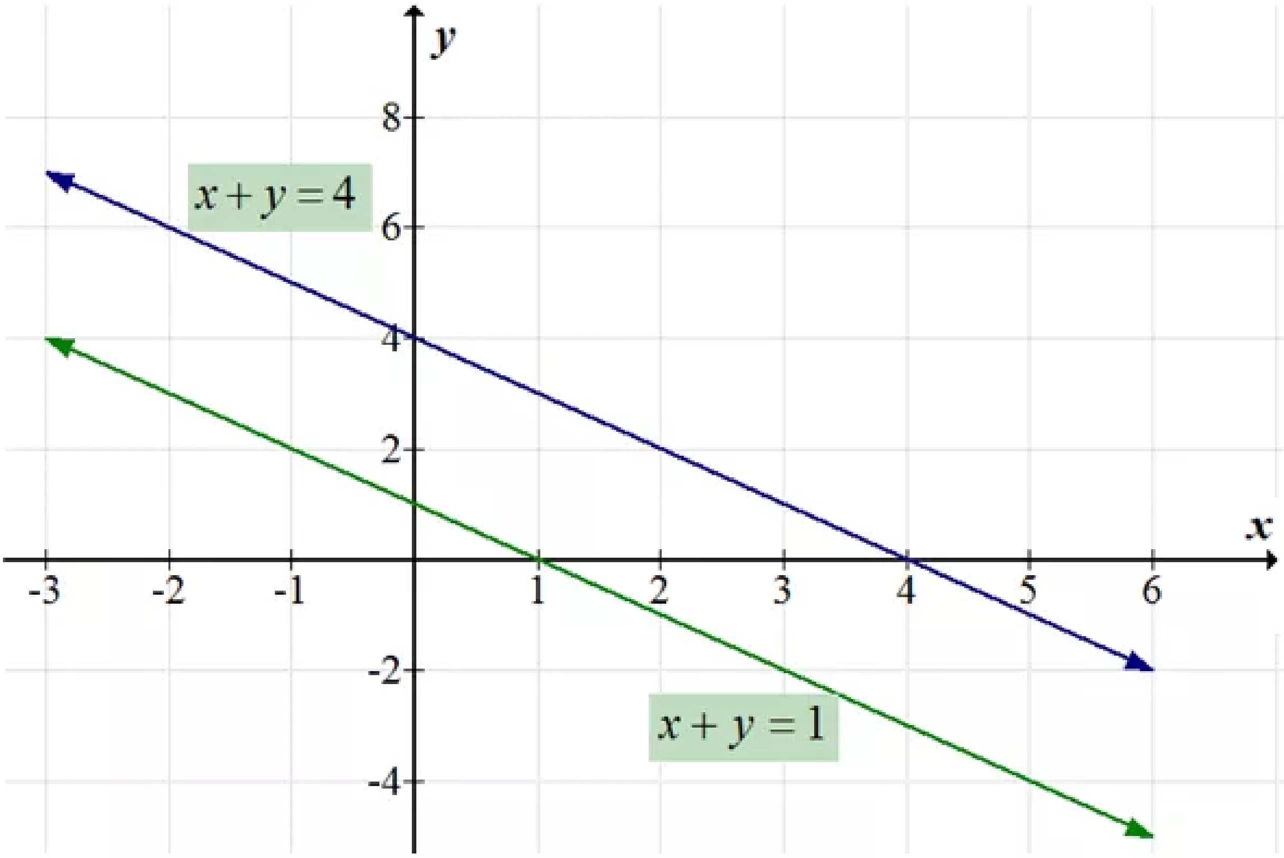
Example:

Consider the equations,

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

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

The graphs of $x+y=4$ and $x+y=1$ is shown below:



The lines $x+y=4$ and $x+y=1$ are parallel. So the system of equations has **no solution**.

Answer 3GCI.

Consider the equations,

$x+y=5.35$ ...... (1)

$3x-y=3.75$ ...... (2)

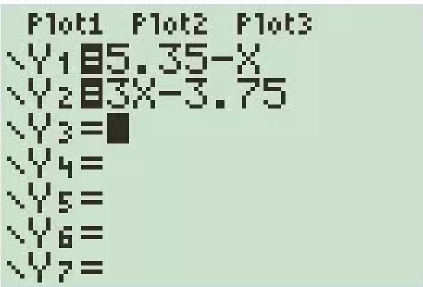
Solve each equation for *y* to enter them into the calculator

$$\begin{aligned} x+y&=5.35 && \text{First equation} \\ x+y-x&=5.35-x && \text{Subtract } x \text{ from each side} \\ y&=5.35-x && \text{Combine like terms} \end{aligned}$$

$$\begin{aligned} 3x-y&=3.75 && \text{Second equation} \\ 3x-y-3x&=3.75-3x && \text{Subtract } 3x \text{ from each side} \\ -y&=3.75-3x && \text{Combine like terms} \\ y&=3x-3.75 && \text{Divide each side with } -1 \end{aligned}$$

By using the Graphic calculator solve the system of linear equations

Enter the equations $y=5.35-x$ and $y=3x-3.75$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

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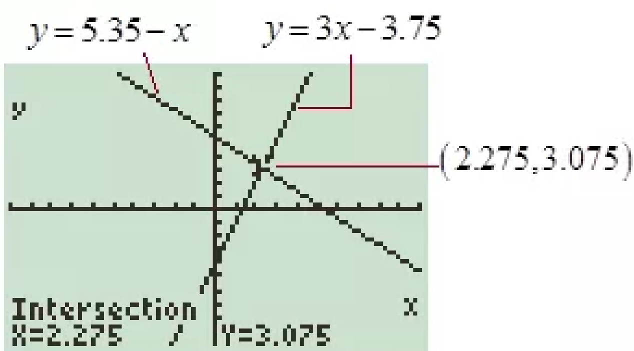


The solution is approximately $\boxed{(2.275,3.075)}$

Answer 3SI.

Let x is the amount of Mr. Winters' weekly sales, and y is his total weekly salary

The salary at the second job is $375 per week plus 15% commission on Mr. Winters' sales

Slope intercept of a line is $y = mx + c$

m is the slope of the line and c is the y intercept

Slope $m = 10\% = 0.1$ and $c = 400$

Linear equation for the salary at the first job is

$y = 0.1x + 400$ ...... (1)

Slope $m = 15\% = 0.15$ and $c = 375$

Linear equation for the salary at the second job is

$y = 0.15x + 375$ ...... (2)

Check option by option:

Substitute the order pair $(100, 410)$ in both the equation.

$y = 0.1x + 400$	First equation
$410 = 0.1(100) + 400$	Substitue x for 100 and 410 for y
$410 = 10 + 400$	Simplify
$410 = 410$	True

$y = 0.15x + 375$	Second equation
$410 = 0.15(100) + 375$	Substitue x for 100 and 410 for y
$410 = 15 + 375$	Simplify
$410 = 390$	False

The order pair $(100, 410)$ does not satisfy the equation (2). So option ***a*** is wrong

Substitute the order pair $(300, 420)$ in both the equation.

$y = 0.1x + 400$	First equation
$420 = 0.1(300) + 400$	Substitue x for 300 and 420 for y
$420 = 30 + 400$	Simplify
$420 = 430$	False

$y = 0.15x + 375$	Second equation
$420 = 0.15(300) + 375$	Substitue x for 300 and 420 for y
$420 = 45 + 375$	Simplify
$420 = 420$	True

The order pair $(300, 420)$ does not satisfy the equation (1). So option ***b*** is wrong

Substitute the order pair $(500, 450)$ in both the equation.

$y = 0.1x + 400$	First equation
$450 = 0.1(500) + 400$	Substitue x for 500 and 450 for y
$450 = 50 + 400$	Simplify
$450 = 450$	True

$y = 0.15x + 375$	Second equation
$450 = 0.15(500) + 375$	Substitue x for 500 and 450 for y
$450 = 75 + 375$	Simplify
$450 = 450$	True

The order pair $(500, 450)$ satisfies the equation (1) and (2). So option ***c*** is **correct**

Substitute the order pair $(900, 510)$ in both the equation.

$y = 0.1x + 400$	First equation
$510 = 0.1(900) + 400$	Substitue x for 900 and 510 for y
$510 = 90 + 400$	Simplify
$510 = 490$	False

$y = 0.15x + 375$	Second equation
$510 = 0.15(900) + 375$	Substitue x for 900 and 510 for y
$510 = 135 + 375$	Simplify
$510 = 510$	True

The order pair $(900, 510)$ does not satisfy the equation (1). So option ***d*** is wrong

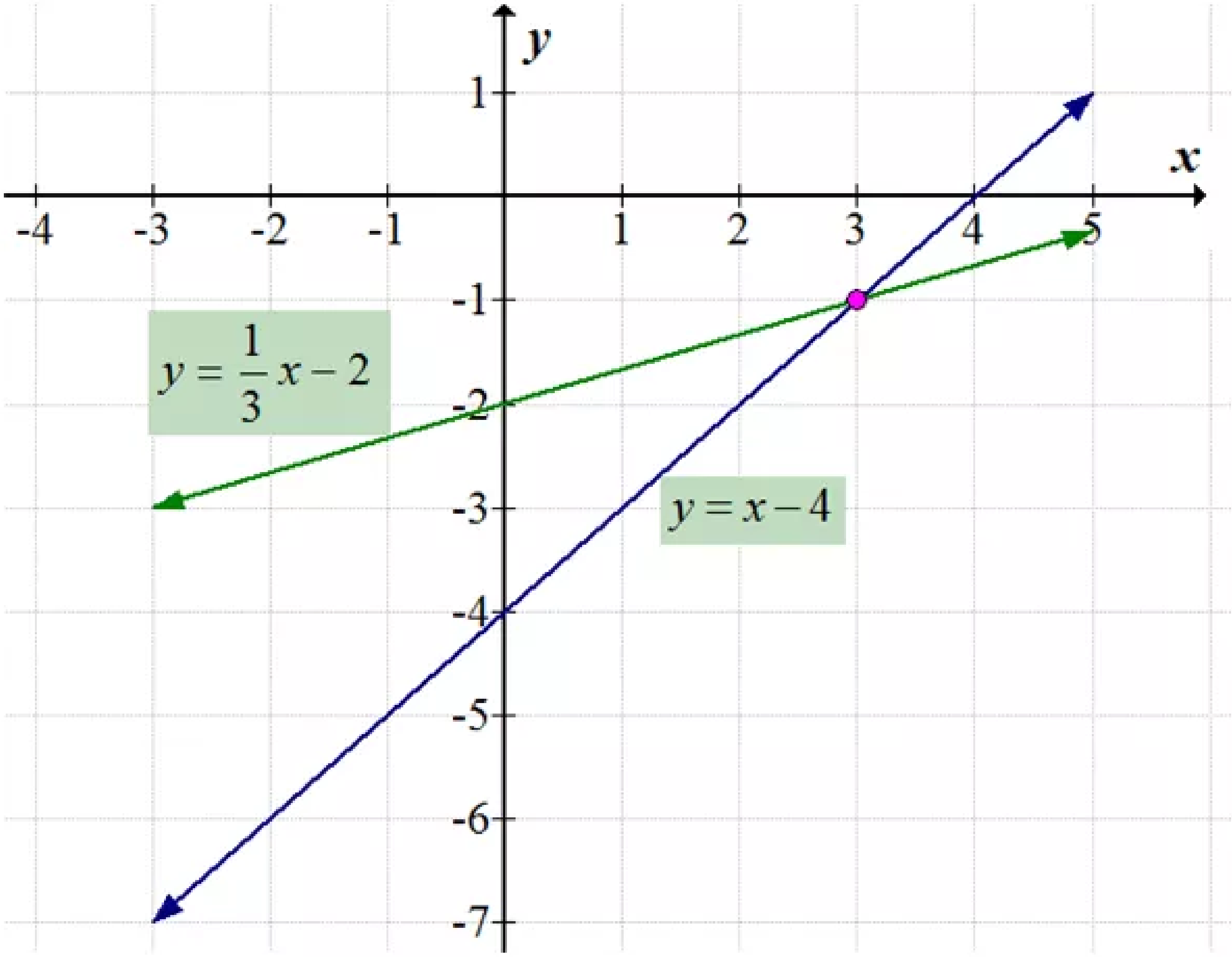
Answer 4CU.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

Answer 4GCI.

Consider the equations,

$0.35x - y = 1.12$ ...... (1)

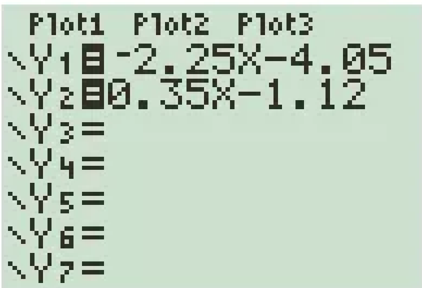
$2.25x + y = -4.05$ ...... (2)

Solve each equation for *y* to enter them into the calculator

$2.25x + y = -4.05$	Second equation
$2.25x + y - 2.25x = -4.05 - 2.25x$	Subtract $2.25x$ from each side
$y = -2.25x - 4.05$	Combine like terms
$0.35x - y = 1.12$	Second equation
$0.35x - y - 0.35x = 1.12 - 0.35x$	Subtract $0.35x$ from each side
$-y = 1.12 - 0.35x$	Combine like terms
$y = 0.35x - 1.12$	Divide each side with -1

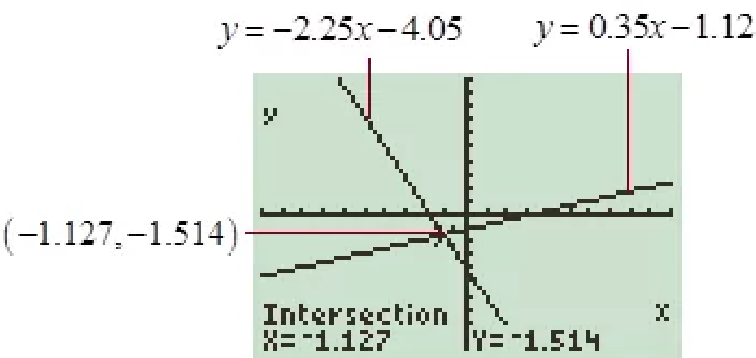
By using the Graphic calculator solve the system of linear equations

Enter the equations $y = -2.25x - 4.05$ and $y = 0.35x - 1.12$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(-1.127, -1.514)}$

Answer 4SI.

Linear equation for the salary at the first job is

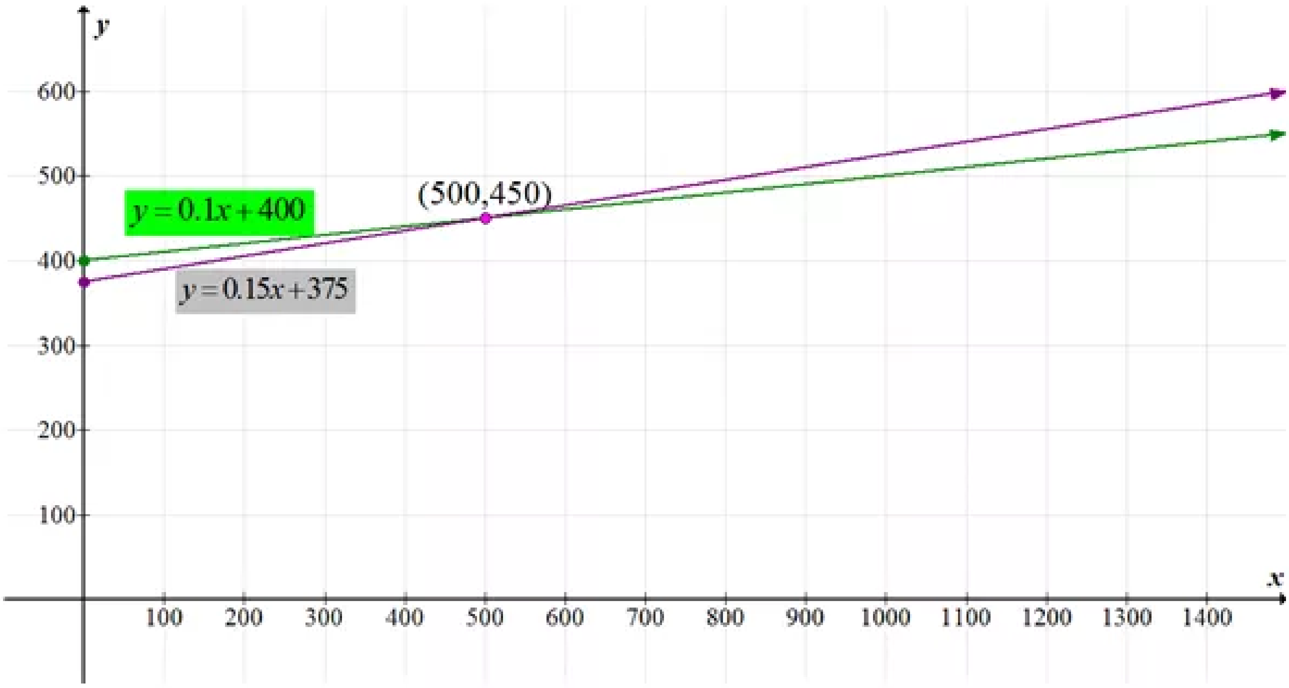
$y = 0.1x + 400$ ...... (1)

Linear equation for the salary at the second job is

$y = 0.15x + 375$ ...... (2)

The graph of the salary data is shown below:

Take sales on *x* axis and salary on *y* axis.



If the sales are more than 500, then the second job is the best job.

If the sales are less than 500, then the first job is the best job.

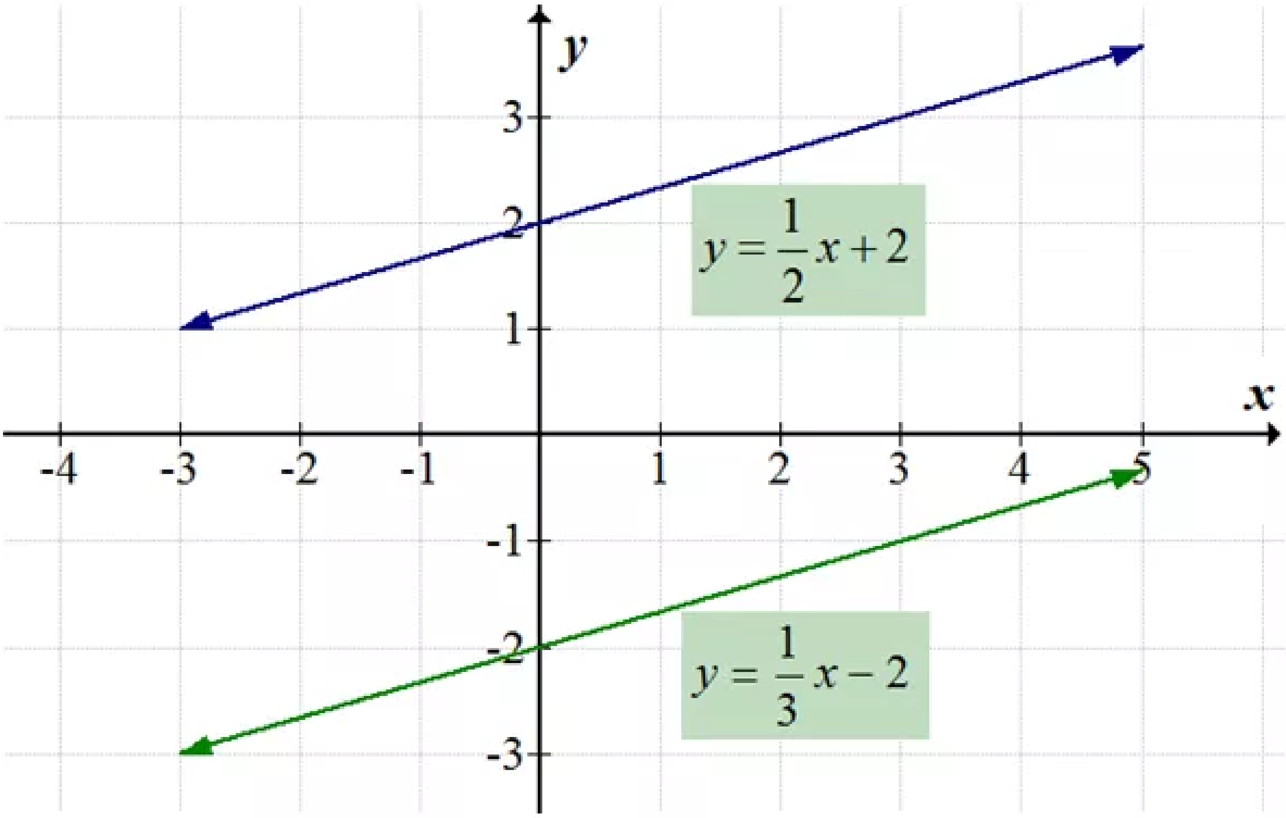
Answer 5CU.

Consider the equations,

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

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

The graph of the equations is shown below:



The lines $y = \frac{1}{3}x + 2$ and $y = \frac{1}{3}x - 2$ are parallel. So the system of equations has **no solution**

Answer 5GCI.

Consider the equations,

$1.5x + y = 6.7$ ...... (1)

$5.2x - y = 4.1$ ...... (2)

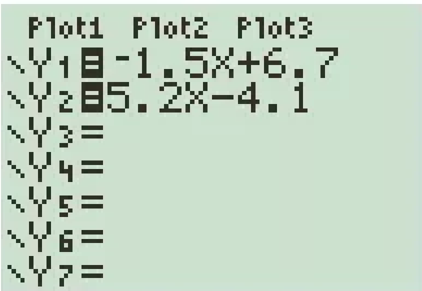
Solve each equation for *y* to enter them into the calculator

$$\begin{aligned} 1.5x + y &= 6.7 && \text{First equation} \\ 1.5x + y - 1.5x &= 6.7 - 1.5x && \text{Subtract } 1.5x \text{ from each side} \\ y &= -1.5x + 6.7 && \text{Combine like terms} \end{aligned}$$

$$\begin{aligned} 5.2x - y &= 4.1 && \text{Second equation} \\ 5.2x - y - 5.2x &= 4.1 - 5.2x && \text{Subtract } 5.2x \text{ from each side} \\ -y &= 4.1 - 5.2x && \text{Combine like terms} \\ y &= 5.2x - 4.1 && \text{Divide each side with } -1 \end{aligned}$$

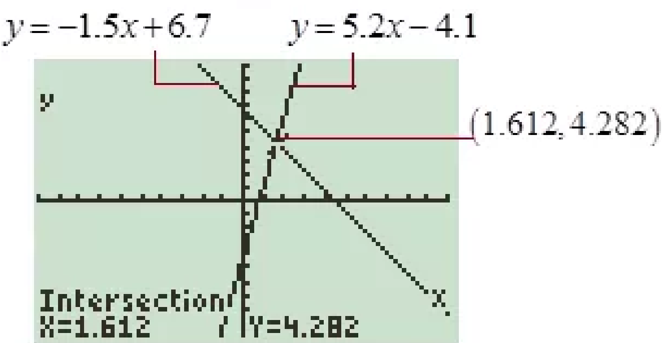
By using the Graphic calculator solve the system of linear equations

Enter the equations $y = -1.5x + 6.7$ and $y = 5.2x - 4.1$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 [ENTER] [ENTER] [ENTER]



The solution is approximately $\boxed{(1.612, 4.282)}$

Answer 5SI.

Linear equation for the salary at the first job is

$y = 0.1x + 400$ ...... (1)

Linear equation for the salary at the second job is

$y = 0.15x + 375$ ...... (2)

Suppose for x sales the salaries of the two jobs are equal

Substitute $y = 0.15x + 375$ in the equation (1)

$$0.15x + 375 = 0.1x + 400$$

$$0.15x + 375 - 0.1x = 0.1x + 400 - 0.1x \quad \text{Subtract } 0.1x \text{ from each side}$$

$$0.05x + 375 = 400 \quad \text{Combine like terms}$$

$$0.05x + 375 - 375 = 400 - 375 \quad \text{Subtract 375 from each side}$$

$$0.05x = 25 \quad \text{Simplify}$$

$$\frac{0.05x}{0.05} = \frac{25}{0.05} \quad \text{Divide each side with 0.05}$$

$$x = 500 \quad \text{Simplify}$$

Hence, for **500** sales both the salaries are equal.

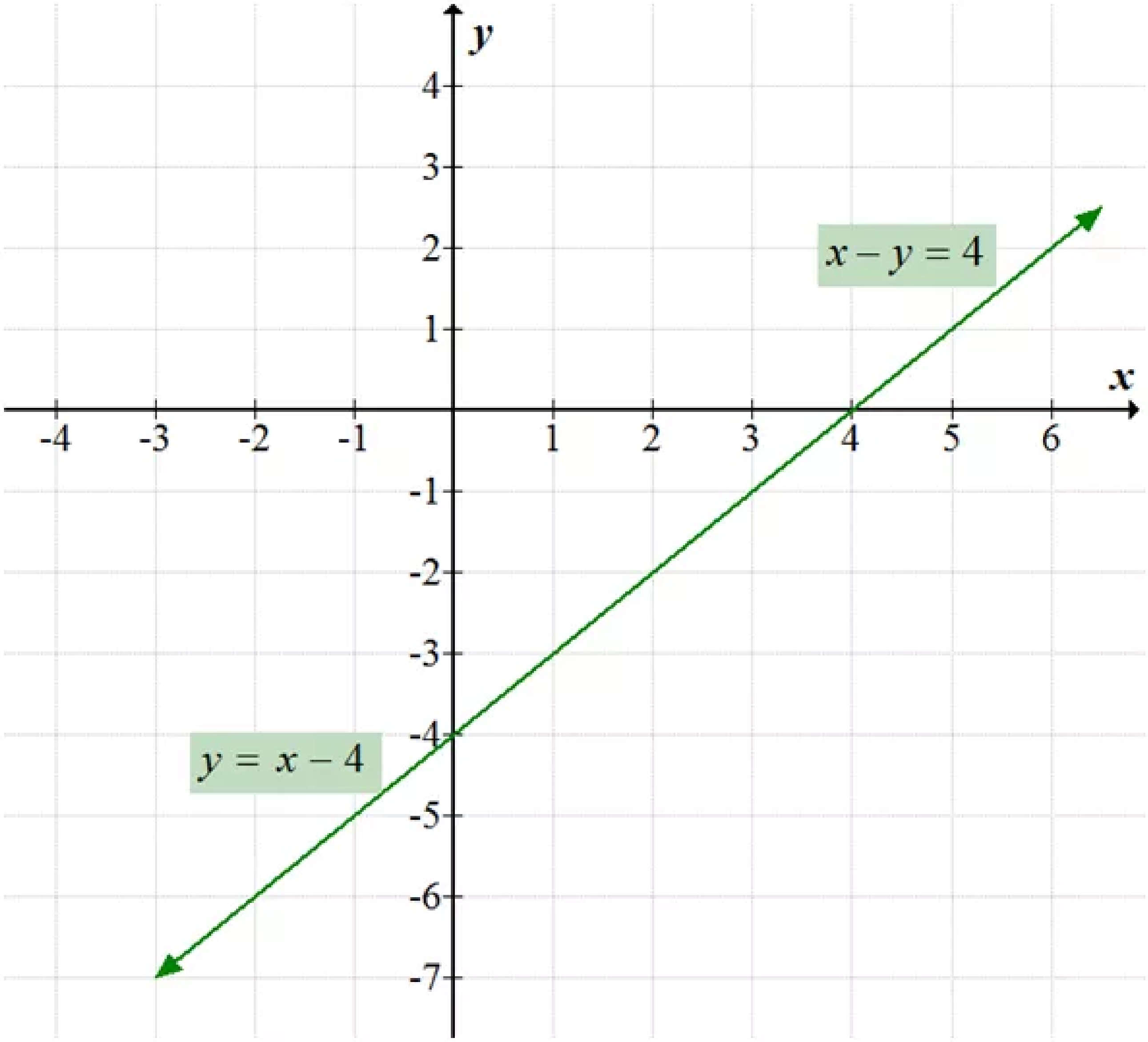
Answer 6CU.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs of the two equations are the same. So, the system of equations has **infinite many solutions**.

Answer 6GCI.

Consider the equations,

$5.4x - y = 1.8$ ...... (1)

$6.2x + y = -3.8$ ...... (2)

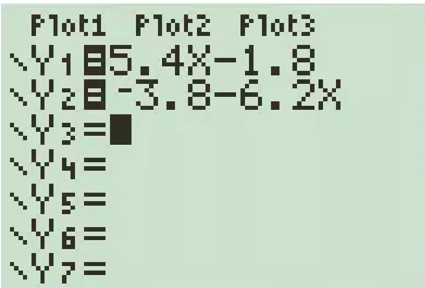
Solve each equation for *y* to enter them into the calculator

$5.4x - y = 1.8$	First equation
$5.4x - y - 5.4x = 1.8 - 5.4x$	Subtract $5.4x$ from each side
$-y = 1.8 - 5.4x$	Combine like terms
$y = 5.4x - 1.8$	Divide each side with -1

$6.2x + y = -3.8$	Second equation
$6.2x + y - 6.2x = -3.8 - 6.2x$	Subtract $6.2x$ from each side
$y = -6.2x - 3.8$	Combine like terms

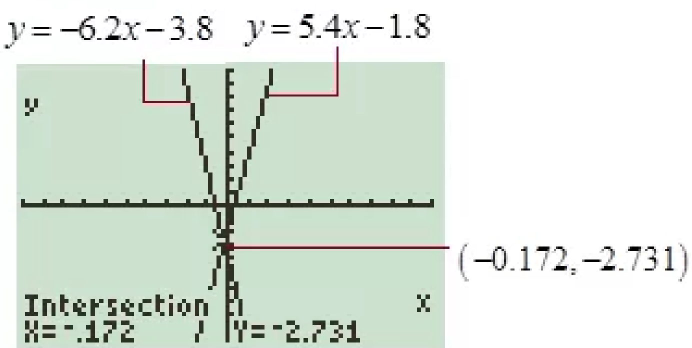
By using the Graphic calculator solve the system of linear equations

Enter the equations $y = 5.4x - 1.8$ and $y = -6.2x - 3.8$ in the [Y =] list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 [ENTER] [ENTER] [ENTER]



The solution is approximately $\boxed{(-0.172, -2.731)}$

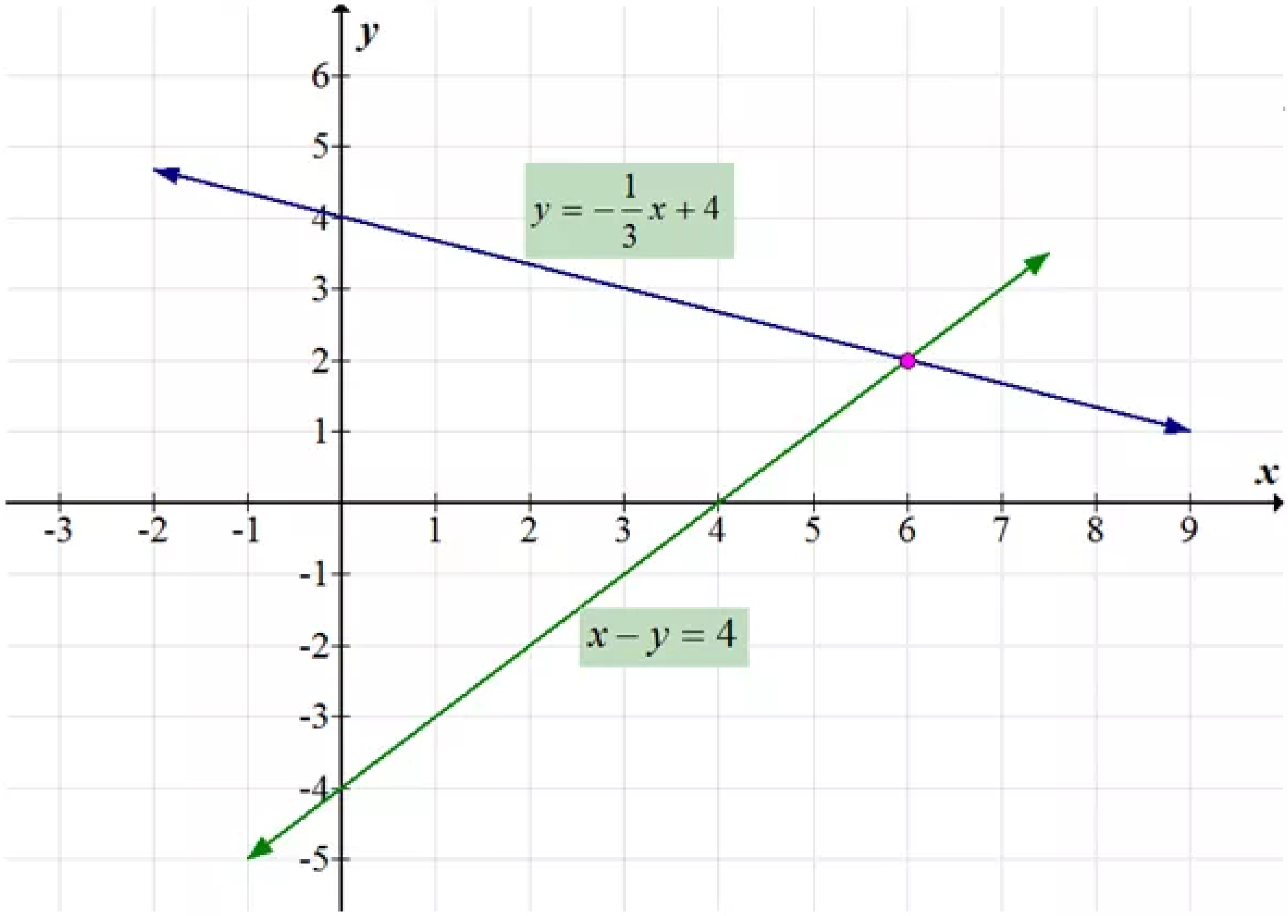
Answer 7CU.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

Answer 7GCI.

Consider the equations,

$5x-4y=26$ ...... (1)

$4x+2y=53.3$ ...... (2)

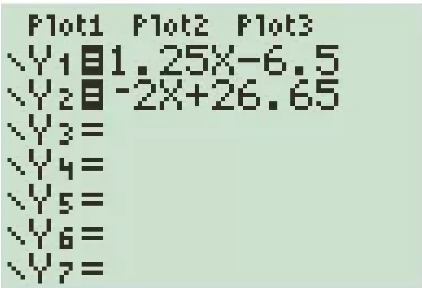
Solve each equation for *y* to enter them into the calculator

$$
\begin{aligned}
5x-4y&=26 && \text{First equation}\\
5x-4y-5x&=26-5x && \text{Subtract } 5x \text{ from each side}\\
-4y&=26-5x && \text{Combine like terms}\\
y&=1.25x-6.5 && \text{Divide each side with } -4
\end{aligned}
$$

$$
\begin{aligned}
4x+2y&=53.3 && \text{Second equation}\\
4x+2y-4x&=53.3-4x && \text{Subtract } 4x \text{ from each side}\\
2y&=53.3-4x && \text{Combine like terms}\\
y&=-2x+26.65 && \text{Divide each side with } 2
\end{aligned}
$$

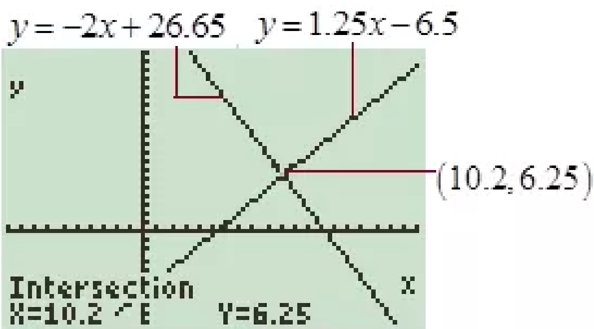
By using the Graphic calculator solve the system of linear equations

Enter the equations $y=1.25x-6.5$ and $y=-2x+26.65$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(10.2, 6.25)}$

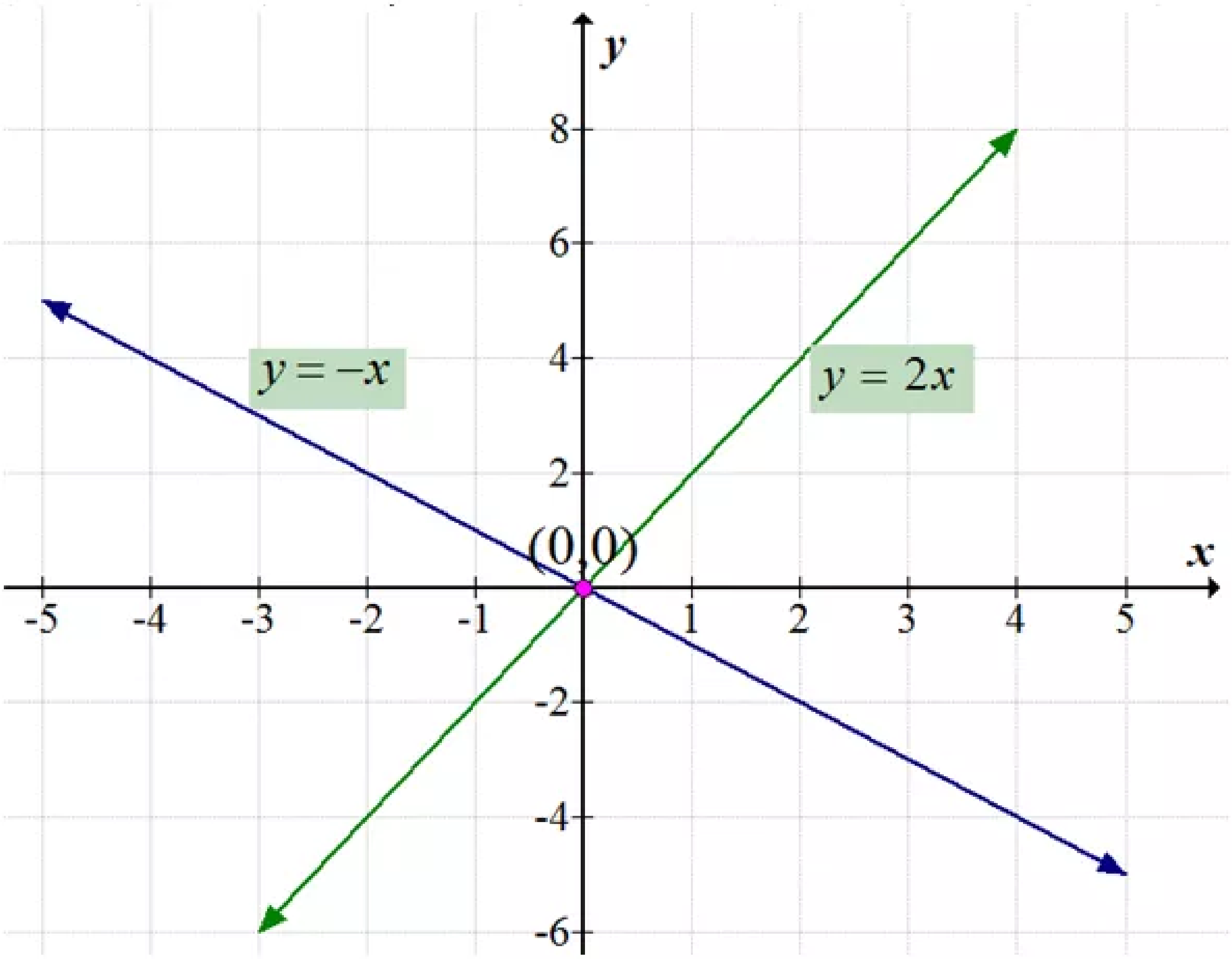
Answer 8CU.

Consider the equations,

$y=-x$ …… (1)

$y=2x$ …… (2)

The graphs of $y=-x$ and $y=2x$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(0,0)$

Check:

$y = -x$ First equation

$0 = -0$ Substitue 0 for x and 0 for y

$0 = 0$ Simplify

$y = 2x$ Second equation

$0 = 2(0)$ Substitue 0 for x and 0 for y

$0 = 0$ Simplify

Hence the solution to the system of equations is $\boxed{(0,0)}$

Answer 8GCI.

Consider the equations,

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

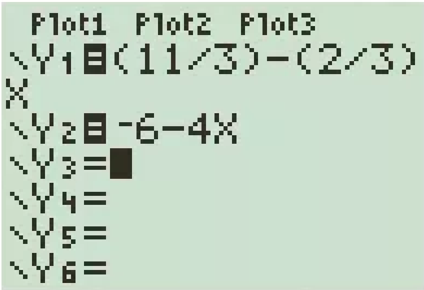
$4x + y = -6$ ...... (2)

Solve each equation for *y* to enter them into the calculator

$2x + 3y = 11$	First equation
$2x + 3y - 2x = 11 - 2x$	Subtract $2x$ from each side
$3y = 11 - 2x$	Combine like terms
$y = \frac{11}{3} - \frac{2}{3}x$	Divide each side with 3
$4x + y = -6$	Second equation
$4x + y - 4x = -6 - 4x$	Subtract $4x$ from each side
$y = -6 - 4x$	Combine like terms

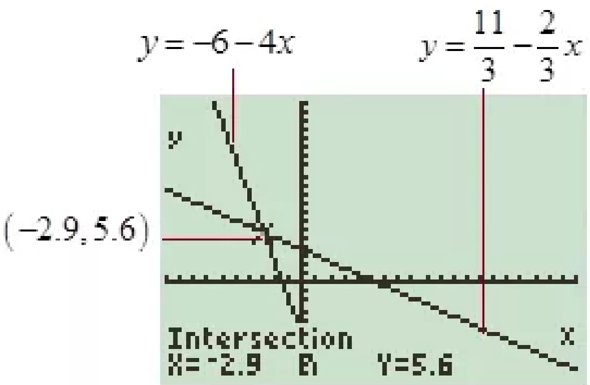
By using the Graphic calculator solve the system of linear equations

Enter the equations $y=\frac{11}{3}-\frac{2}{3}x$ and $y=-6-4x$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(-2.9,5.6)}$

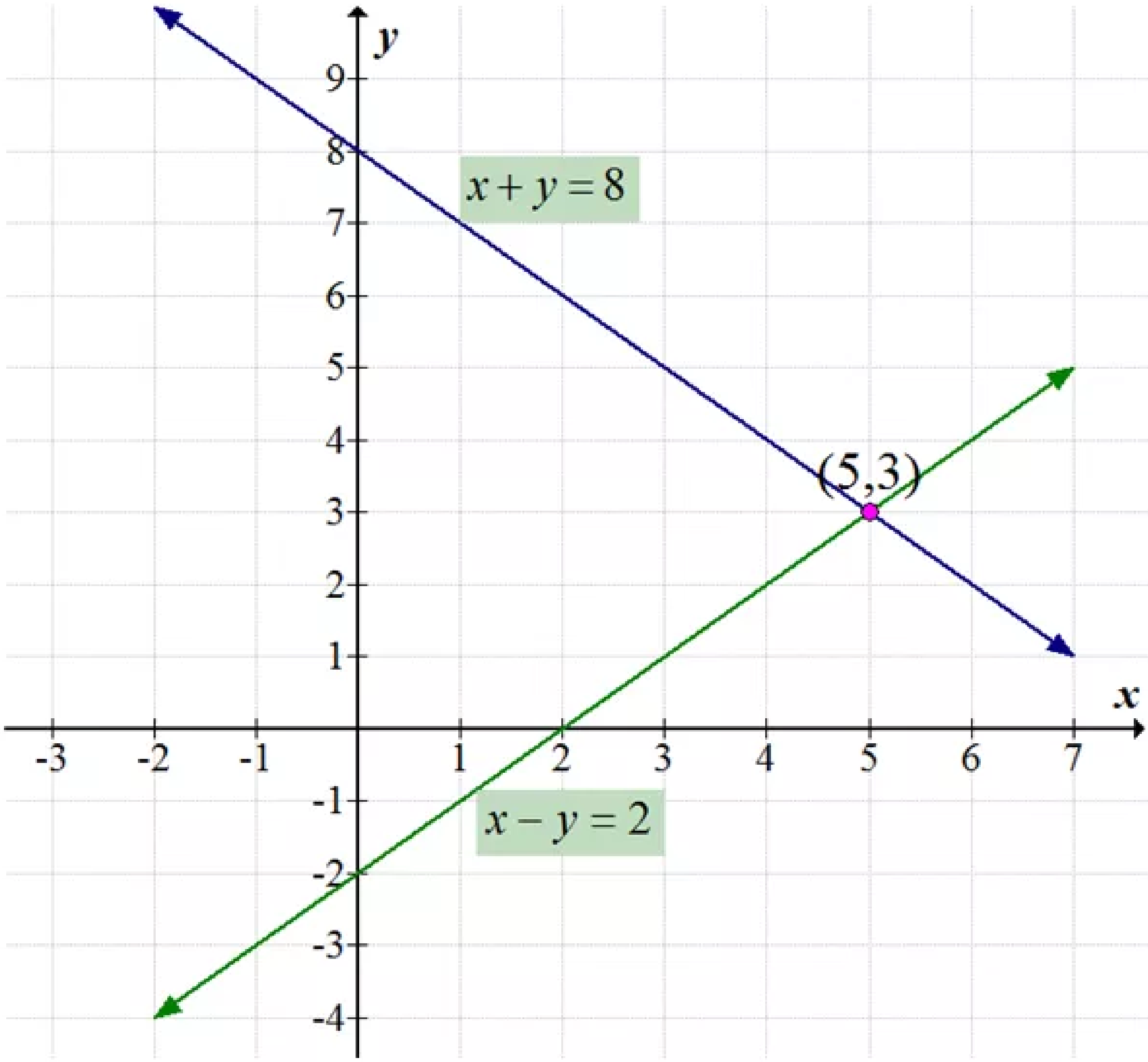
Answer 9CU.

Consider the equations,

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

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

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



The graphs appear to **intersect** at the point with coordinates $(5,3)$

Check:

$$\begin{aligned} x+y&=8 && \text{First equation} \\ 5+3&=8 && \text{Substitue 5 for } x \text{ and 3 for } y \\ 8&=8 && \text{Simplify} \end{aligned}$$

$$\begin{aligned} x-y&=2 && \text{Second equation} \\ 5-3&=2 && \text{Substitue 5 for } x \text{ and 3 for } y \\ 2&=2 && \text{Simplify} \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(5,3)}$

Answer 9GCI.

Consider the equations,

$0.22x+0.15y=0.30$ ...... (1)

$-0.33x+y=6.22$ ...... (2)

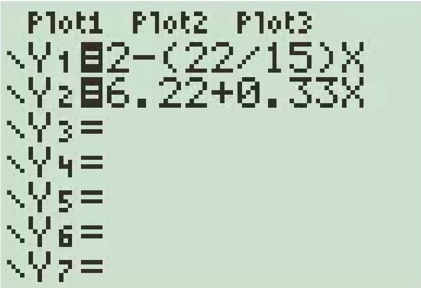
Solve each equation for *y* to enter them into the calculator

$$\begin{aligned} 0.22x+0.15y&=0.30 && \text{First equation} \\ 0.22x+0.15y-0.22x&=0.30-0.22x && \text{Subtract } 0.22x \text{ from each side} \\ 0.15y&=0.30-0.22x && \text{Combine like terms} \\ y&=2-\frac{22}{15}x && \text{Divide each side with 0.15} \end{aligned}$$

$$\begin{aligned} -0.33x+y&=6.22 && \text{Second equation} \\ -0.33x+y+0.33x&=6.22+0.33x && \text{Add } 0.33x \text{ to each side} \\ y&=6.22+0.33x && \text{Combine like terms} \end{aligned}$$

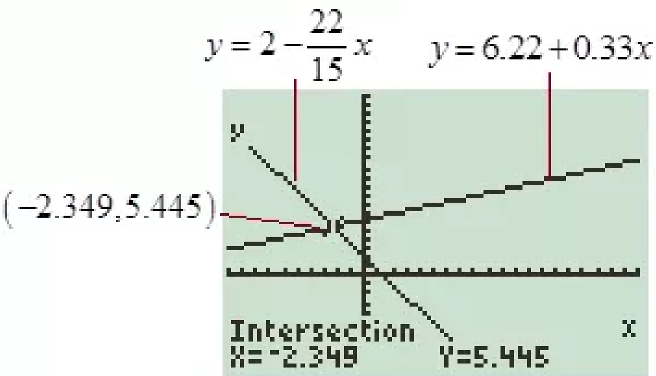
By using the Graphic calculator solve the system of linear equations

Enter the equations $y = 2 - \frac{22}{15}x$ and $y = 6.22 + 0.33x$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(-2.349, 5.445)}$

Answer 10CU.

Consider the equations,

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

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

Consider the equation (1)

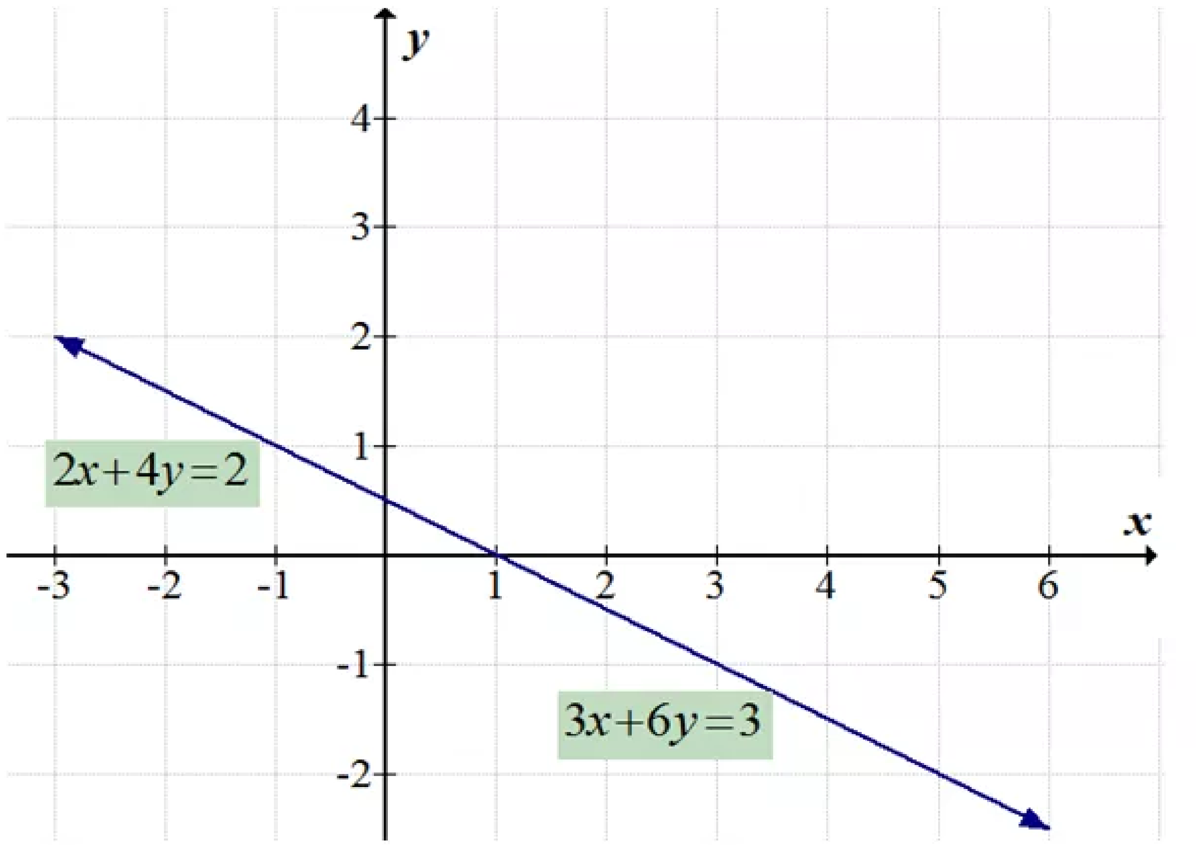
$2x + 4y = 2$	First equation
$\frac{2x + 4y}{2} = \frac{2}{2}$	Divide each side with 2
$x + 2y = 1$	Simplify

Consider the equation (2)

$3x + 6y = 3$	Second equation
$\frac{3x + 6y}{3} = \frac{3}{3}$	Divide each side with 3
$x + 2y = 1$	Simplify

Hence the equations (1) and (2) are same.

The graphs of $2x+4y=2$ and $3x+6y=3$ is shown below:



Since, the lines $2x+4y=2$ and $3x+6y=3$ are the same. So the system of equations has **infinitely many solutions**.

Answer 10GCI.

Consider the equations,

$125x-200y=800$ ...... (1)

$65x-20y=140$ ...... (2)

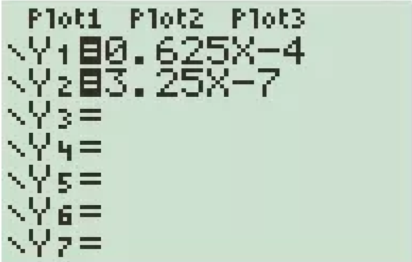
Solve each equation for *y* to enter them into the calculator

$$\begin{aligned} 125x-200y&=800 && \text{First equation} \\ 125x-200y-125x&=800-125x && \text{Subtract } 5x \text{ from each side} \\ -200y&=800-125x && \text{Combine like terms} \\ y&=0.625x-4 && \text{Divide each side with } -200 \end{aligned}$$

$$\begin{aligned} 65x-20y&=140 && \text{Second equation} \\ 65x-20y-65x&=140-65x && \text{Subtract } 65x \text{ from each side} \\ -20y&=140-65x && \text{Combine like terms} \\ y&=3.25x-7 && \text{Divide each side with } -20 \end{aligned}$$

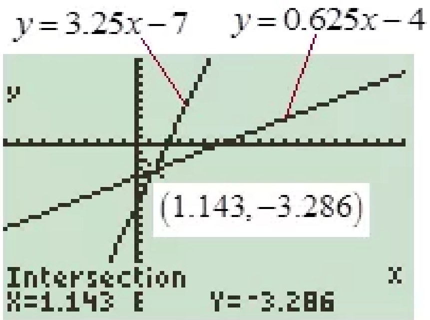
By using the Graphic calculator solve the system of linear equations

Enter the equations $y = 0.625x - 4$ and $y = 3.25x - 7$ in the $\boxed{Y=}$ list



Use the CALC to find the point of intersection.

Press 2nd [CALC] 5 ENTER ENTER ENTER



The solution is approximately $\boxed{(1.143, -3.286)}$

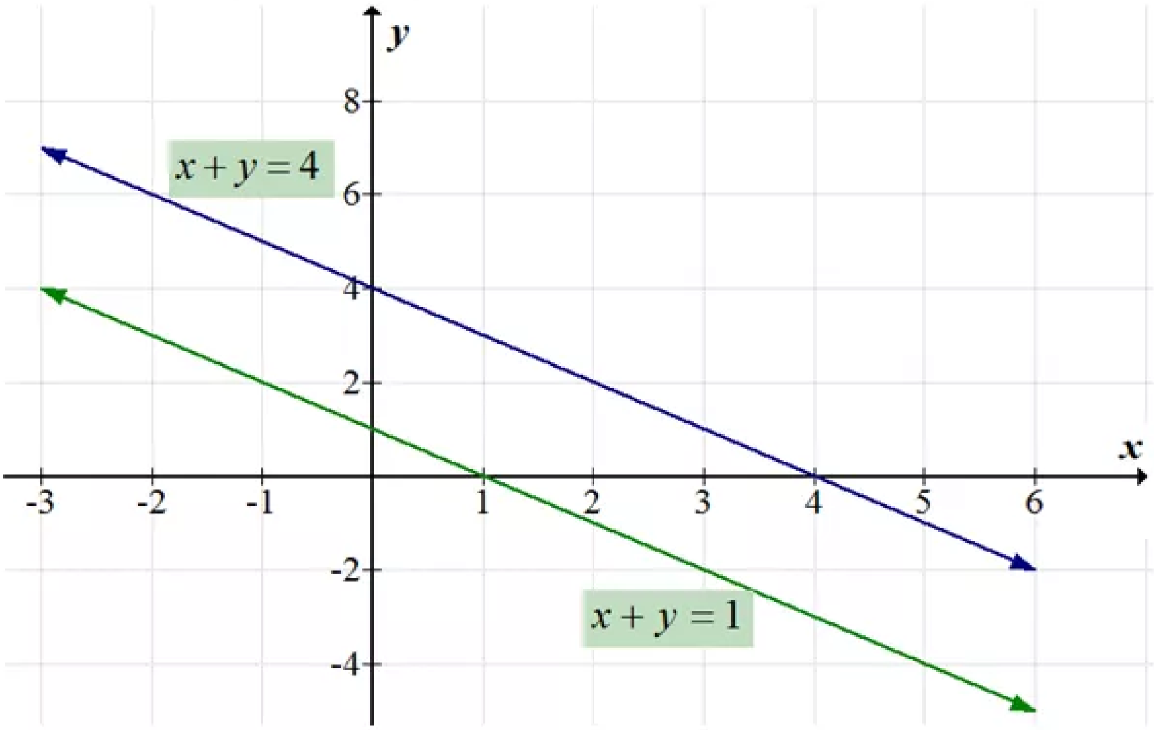
Answer 11CU.

Consider the equations,

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

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

The graphs of $x + y = 4$ and $x + y = 1$ is shown below:



The lines $x + y = 4$ and $x + y = 1$ are parallel. So the system of equations has **no solution**.

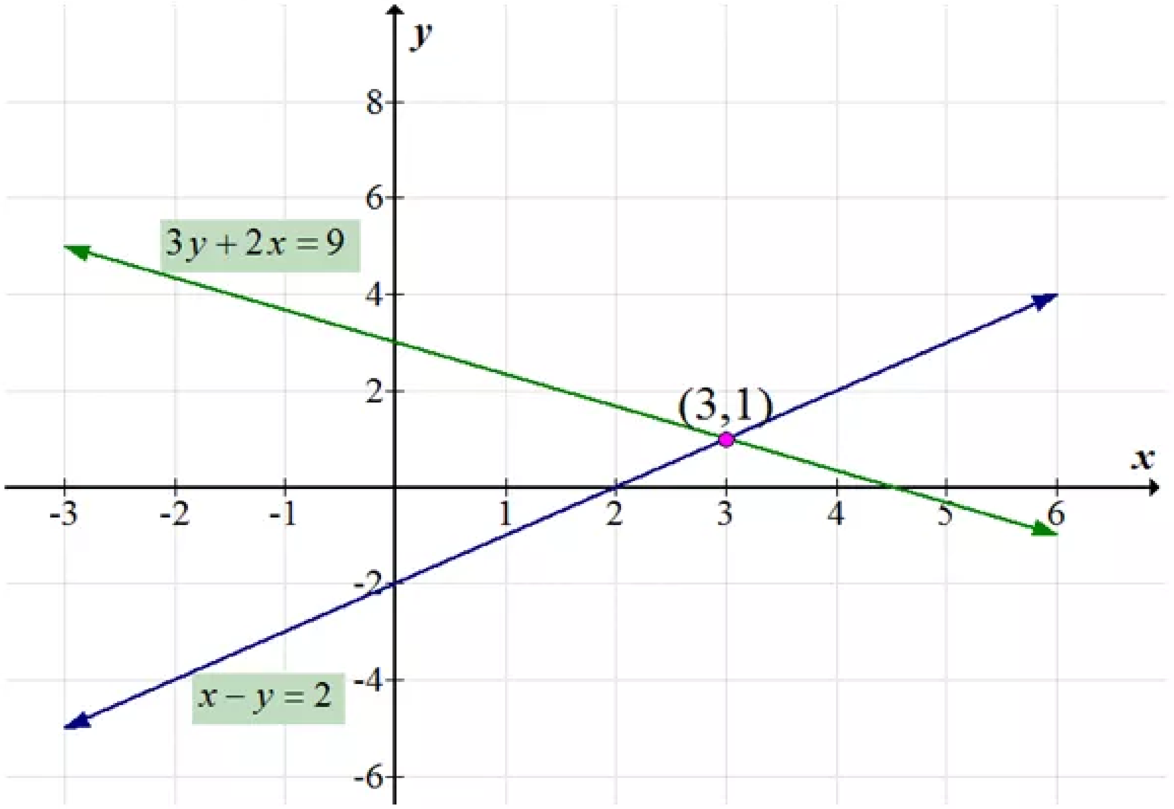
Answer 12CU.

Consider the equations,

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

$3y + 2x = 9$ ...... (2)

The graphs of $x - y = 2$ and $3y + 2x = 9$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(3,1)$

Check:

$$\begin{aligned} x - y &= 2 && \text{First equation} \\ 3 - 1 &= 2 && \text{Substitue 3 for } x \text{ and 1 for } y \\ 2 &= 2 && \text{Simplify} \end{aligned}$$

$$\begin{aligned} 3y + 2x &= 9 && \text{Second equation} \\ 3(1) + 2(3) &= 9 && \text{Substitue 3 for } x \text{ and 1 for } y \\ 3 + 6 &= 9 && \text{Simplify} \\ 9 &= 9 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(3,1)}$

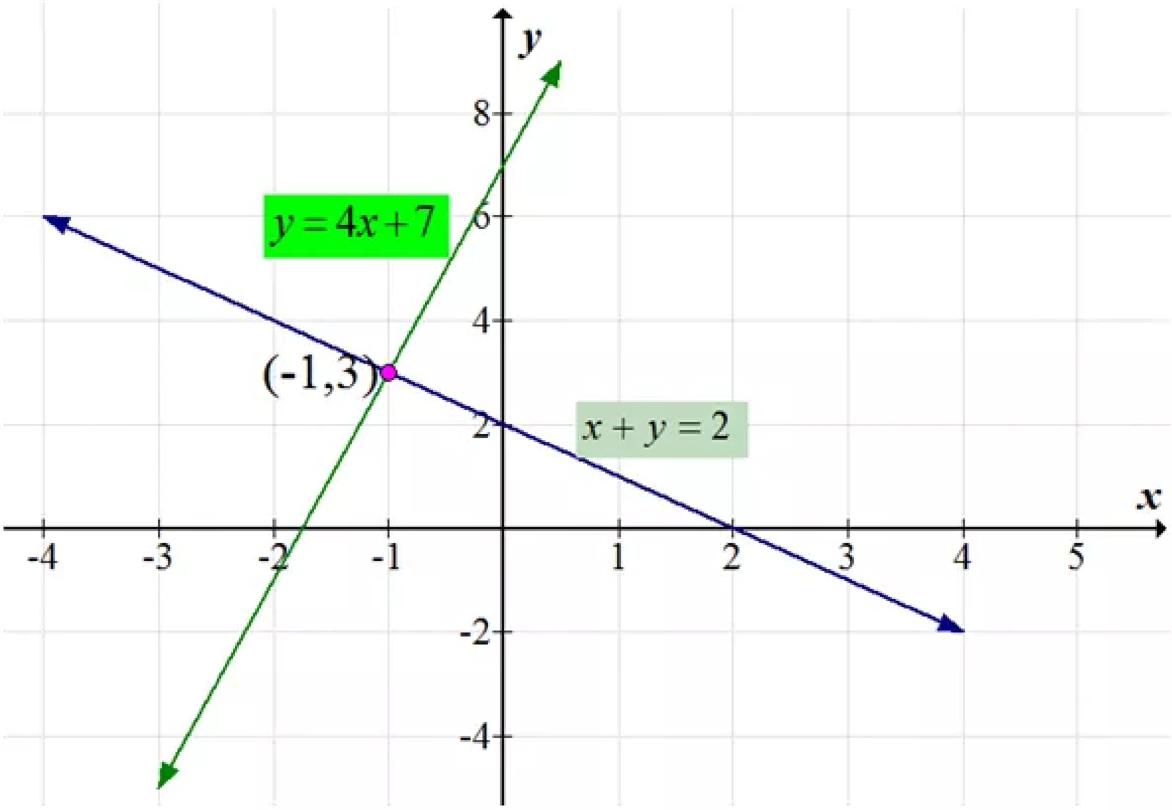
Answer 13CU.

Consider the equations,

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

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

The graphs of $x + y = 2$ and $y = 4x + 7$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-1, 3)$

Check:

$$\begin{aligned} x + y &= 2 && \text{First equation} \\ -1 + 3 &= 2 && \text{Substitue } -1 \text{ for } x \text{ and } 3 \text{ for } y \\ 2 &= 2 && \text{Simplify} \end{aligned}$$

$$\begin{aligned} y &= 4x + 7 && \text{Second equation} \\ 3 &= 4(-1) + 7 && \text{Substitue } -1 \text{ for } x \text{ and } 3 \text{ for } y \\ 3 &= -4 + 7 && \text{Simplify} \\ 3 &= 3 && \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(-1, 3)}$

Answer 14CU.

Let the price of the buffet for an adult is \$*x* and price for a child is \$*y*

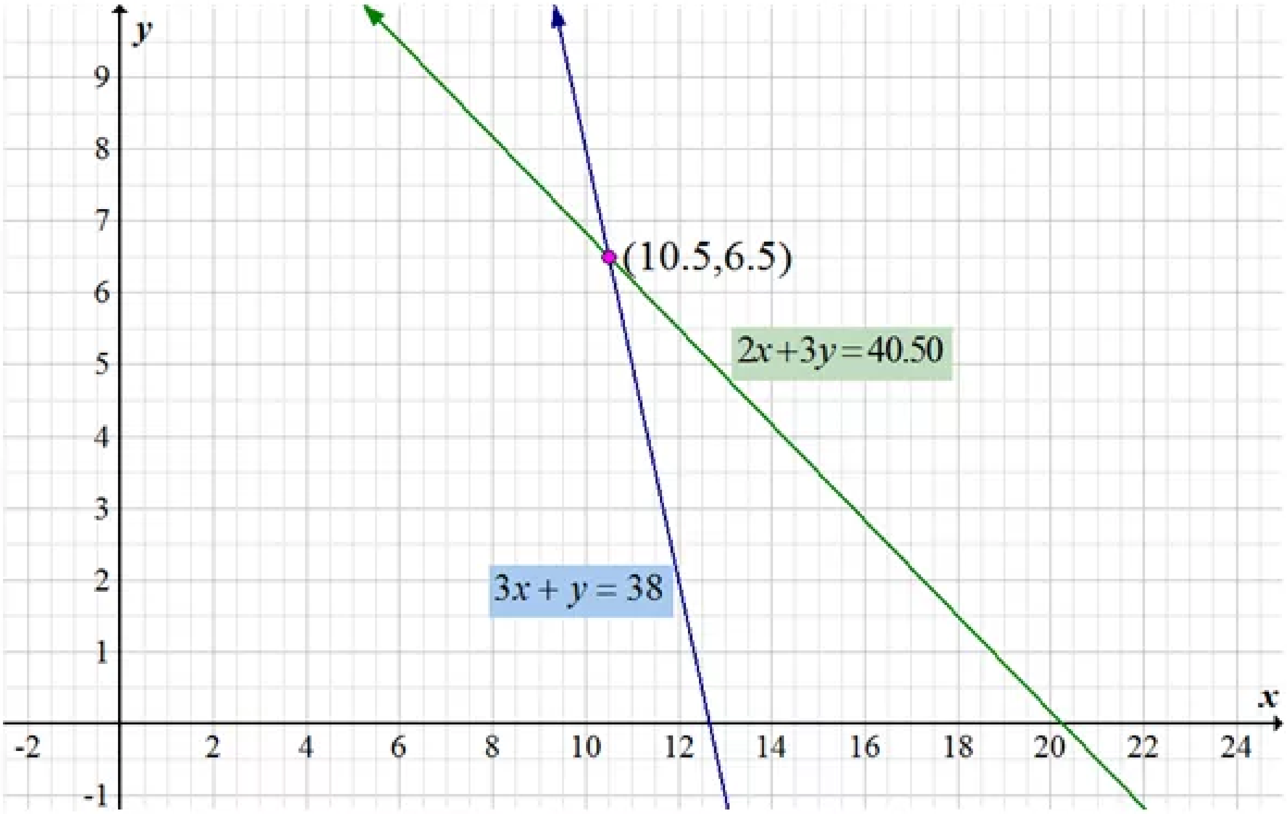
The Rodriguez's restaurant bill for two adults and three children is \$40.50

That is $2x+3y=40.50$ ...... (1)

The Rodriguez's restaurant bill for two adults and three children is \$40.50

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

The graphs of $2x+3y=40.50$ and $3x+y=38$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(10.5, 6.5)$

The price of the buffet for an adult is **\$10.5** and price for a child is **\$6.5**

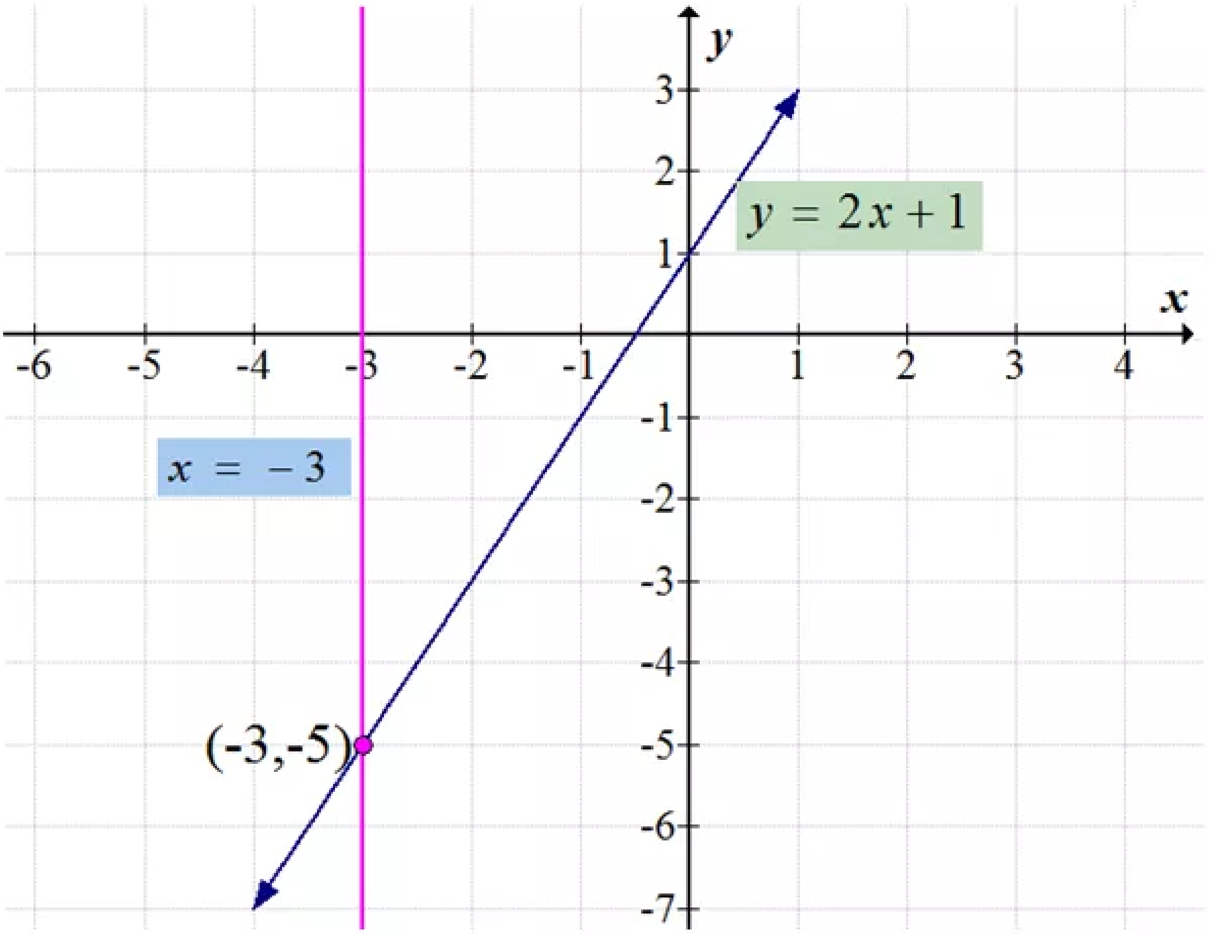
Answer 15PA.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs appear to **intersect** at the point with coordinates $(-3, -5)$

Check:

$$x = -3 \quad \text{First equation}$$
$$-3 = -3 \quad \text{Substitue } -3 \text{ for } x$$

$$y = 2x + 1 \quad \text{Second equation}$$
$$-5 = 2(-3) + 1 \quad \text{Substitue } -3 \text{ for } x \text{ and } -5 \text{ for } y$$
$$-5 = -5$$

Hence the solution to the system of equations is $\boxed{(-3, -5)}$

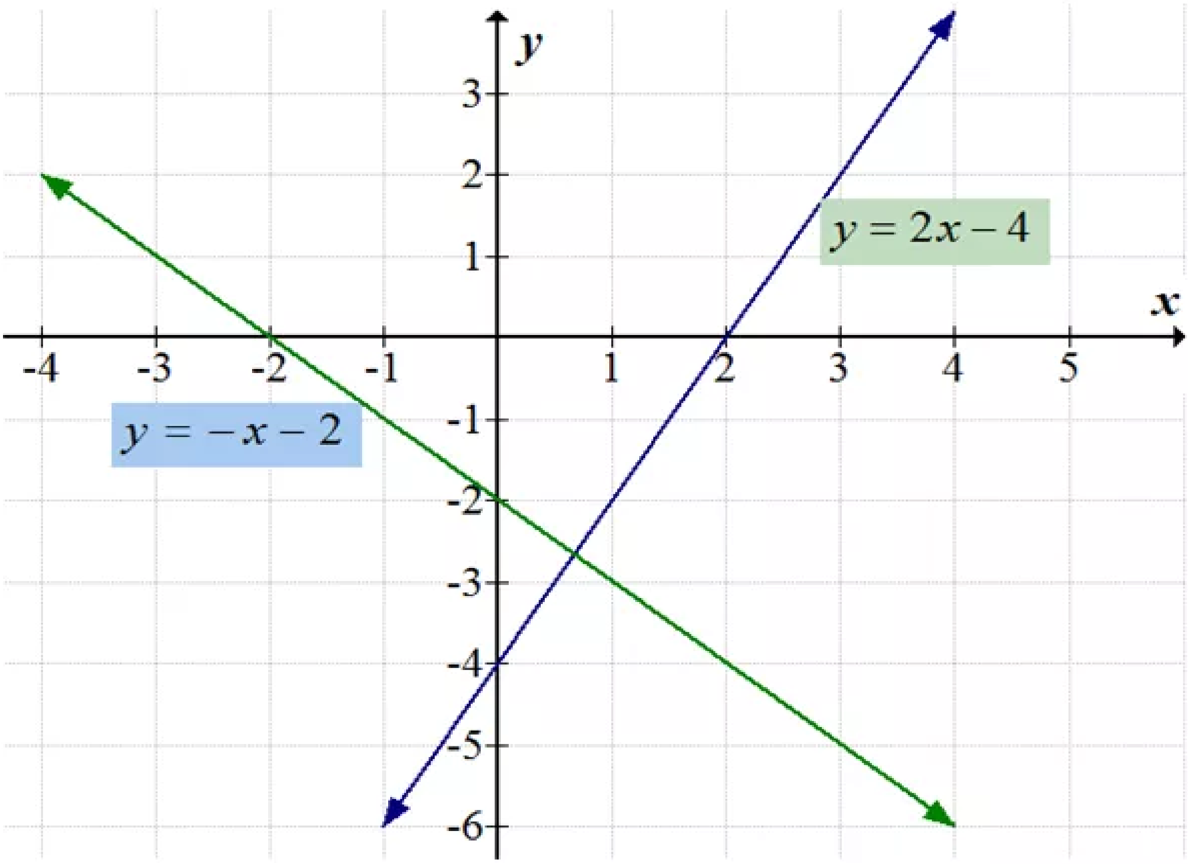
Answer 16PA.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

Answer 17PA.

Consider the equations,

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

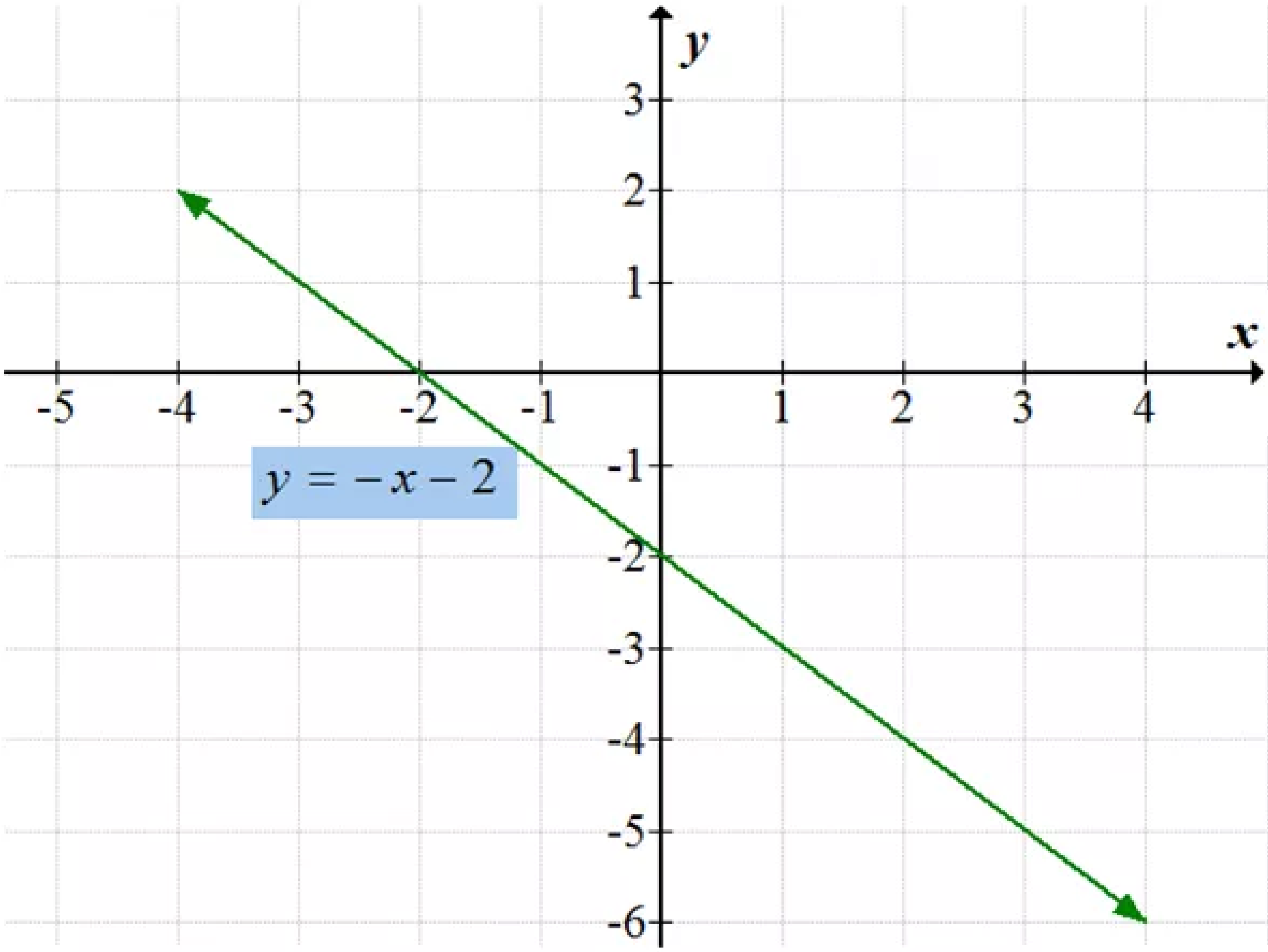
$y=-x-2$ ...... (2)

The slope intercept of the line equation (1)

$y+x=-2$	First equation
$y+x-x=-2-x$	Subtract x from each side
$y=-2-x$	Combine like terms
$y=-x-2$	Second equation

The equations (1) and (2) are the same

The graph of the equations is shown below:



The graphs of the two lines $y + x = -2$ and $y = -x - 2$ are appear to the same, so the equation has **infinitely many solutions**.

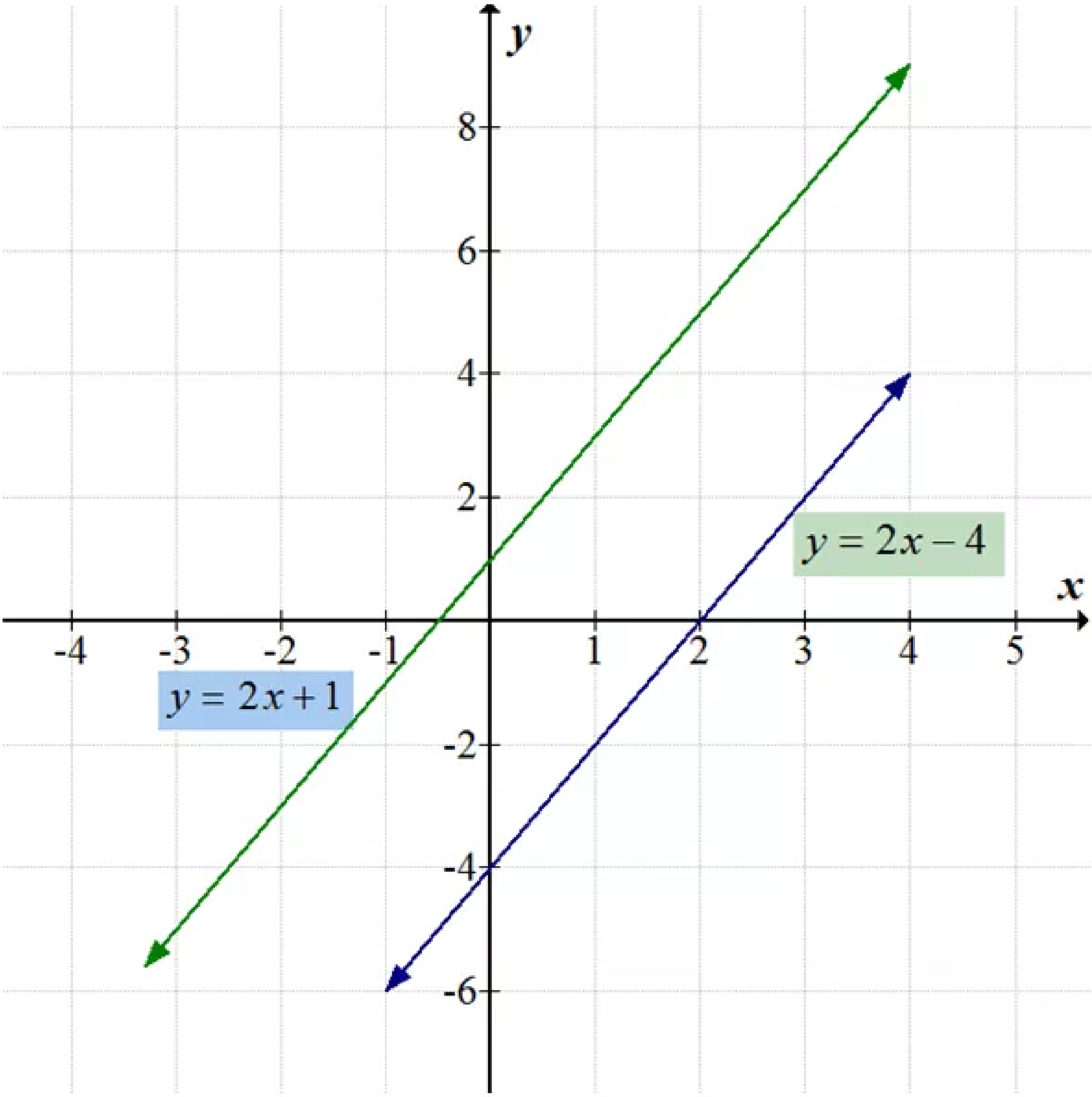
Answer 18PA.

Consider the equations,

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

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

The graph of the equations is shown below:



The lines $y = 2x + 1$ and $y = 2x - 4$ are parallel. So the there is **no solution**

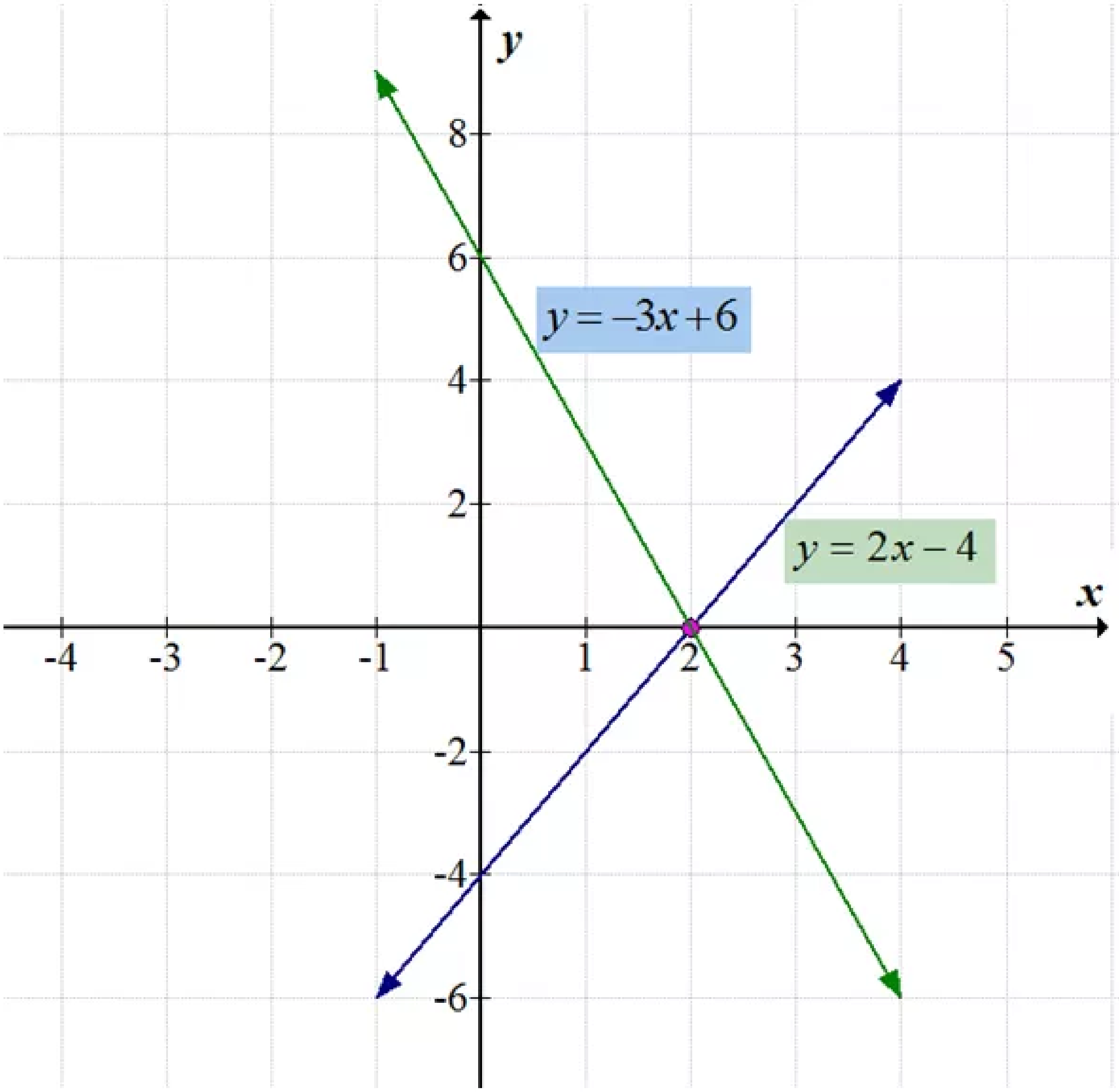
Answer 19PA.

Consider the equations,

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

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

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

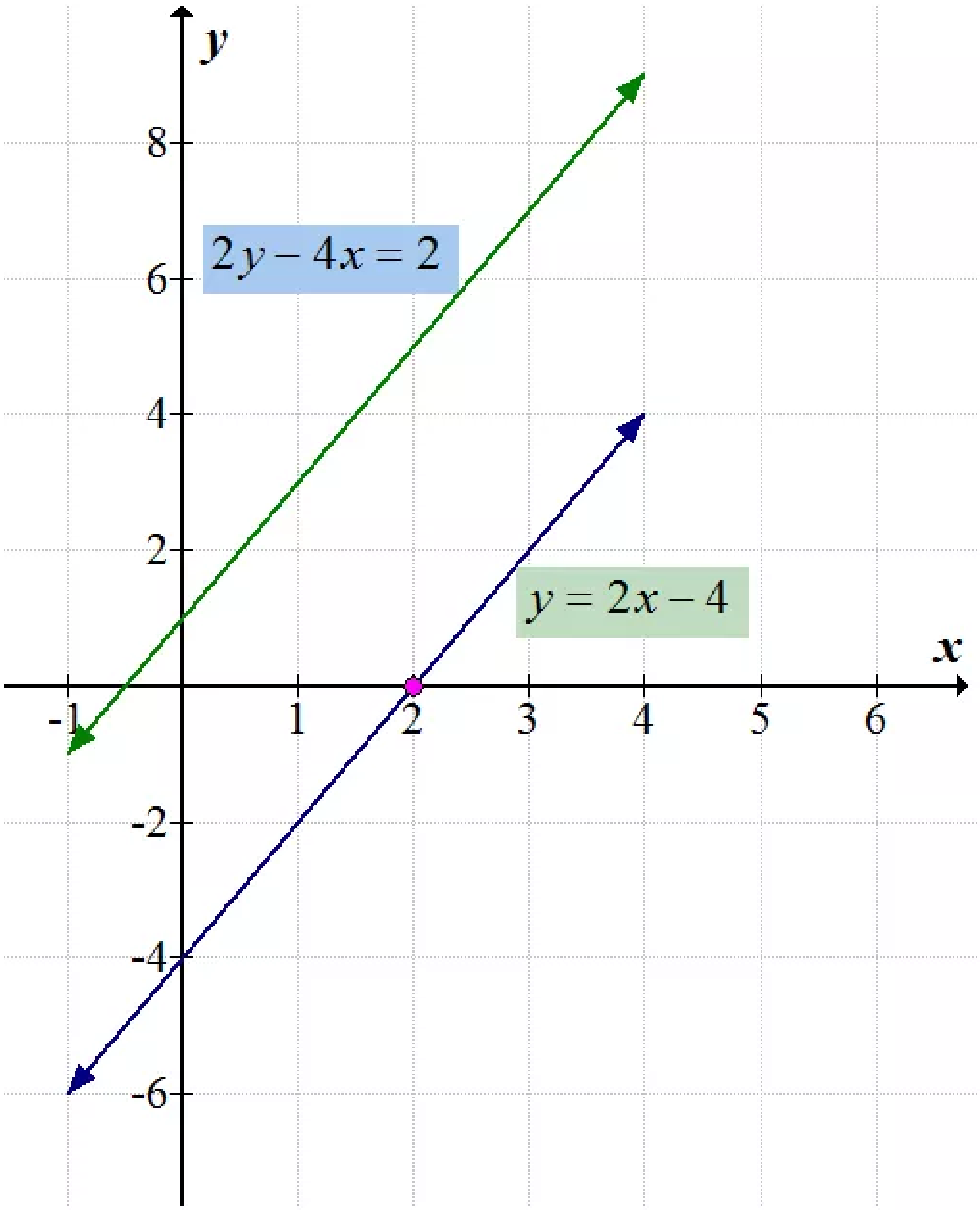
Answer 20PA.

Consider the equations,

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

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

The graph of the equations is shown below:



The lines $2y-4x=2$ and $y=2x-4$ are parallel. So the there is **no solution**

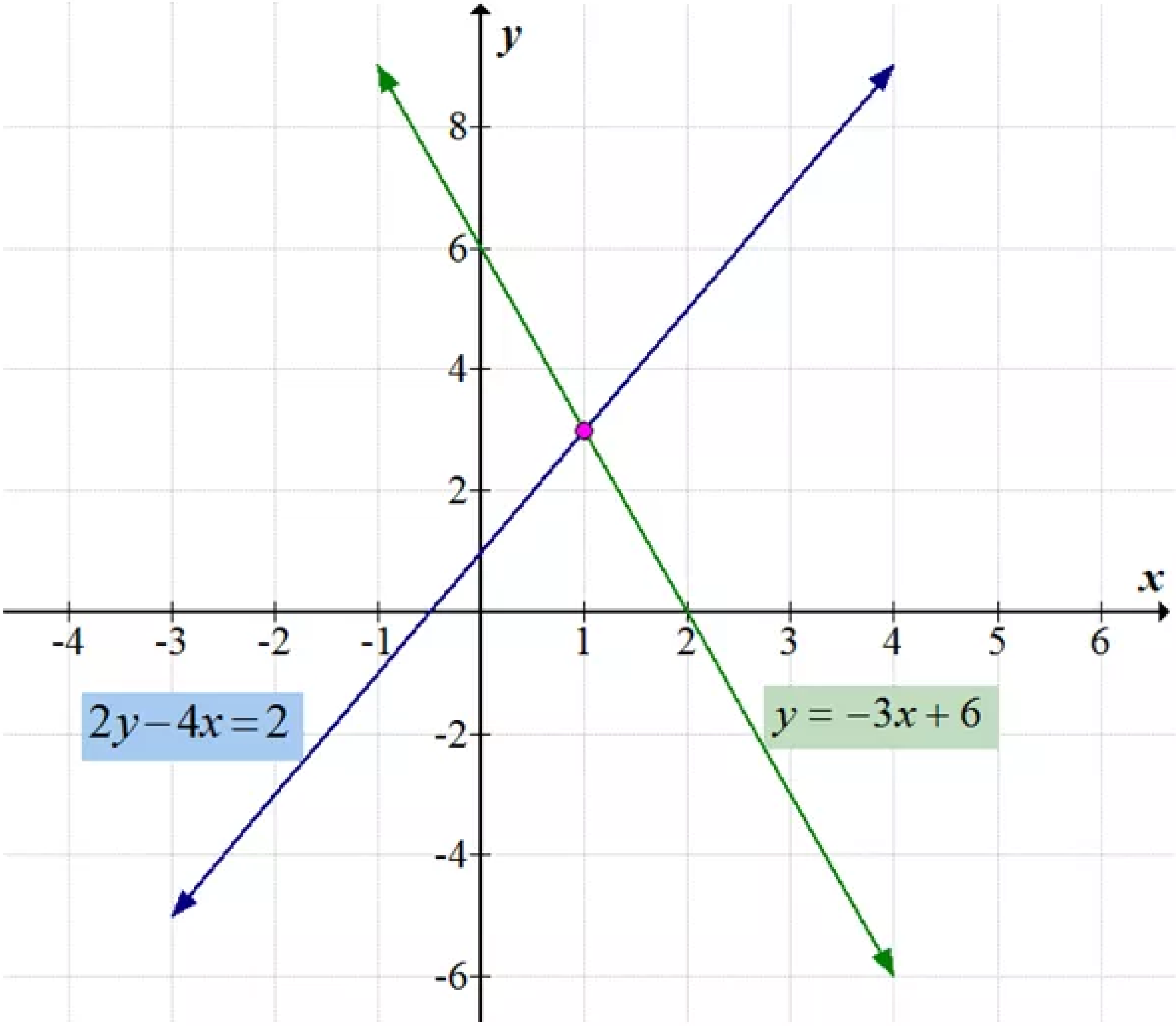
Answer 21PA.

Consider the equations,

$2y - 4x = 2$ …… (1)

$y = -3x + 6$ …… (2)

The graph of the equations is shown below:



The graphs appear to intersect at one point, so the equation has **one solution**.

Answer 22PA.

Consider the equations,

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

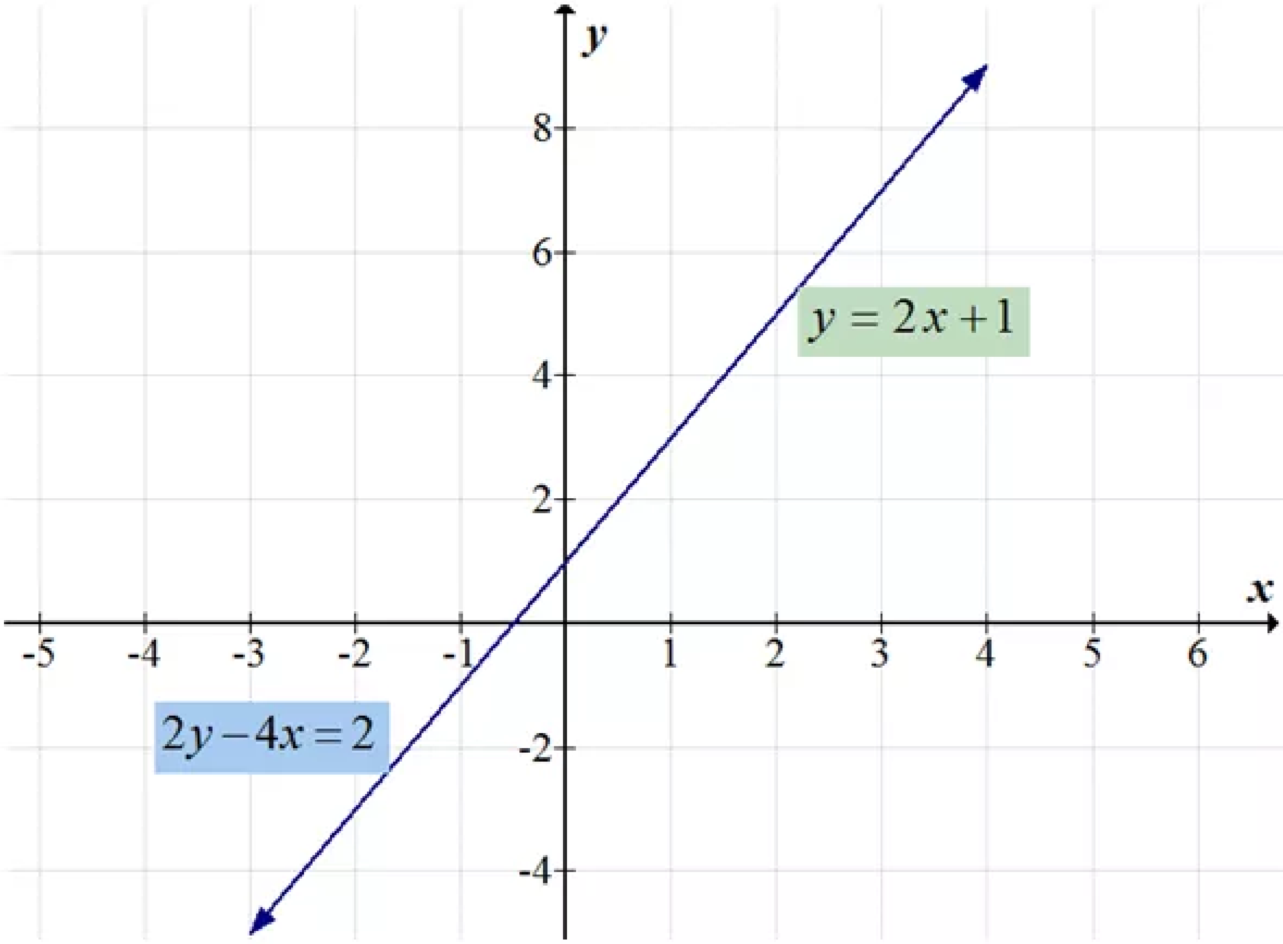
$y=2x+1$ ...... (2)

The slope intercept of the line equation (1)

$$\begin{aligned} 2y-4x&=2 && \text{First equation} \\ 2y-4x+4x&=2+4x && \text{Subtract } 4x \text{ from each side} \\ 2y&=4x+2 && \text{Combine like terms} \\ y&=2x+1 && \text{Divide each side with 2} \end{aligned}$$

The equations (1) and (2) are the same

The graph of the equations is shown below:



The graphs of the two lines $2y-4x=2$ and $y=2x+1$ are appear to the same, so the equation has **infinitely many solutions**.

Answer 23PA.

Consider the equations,

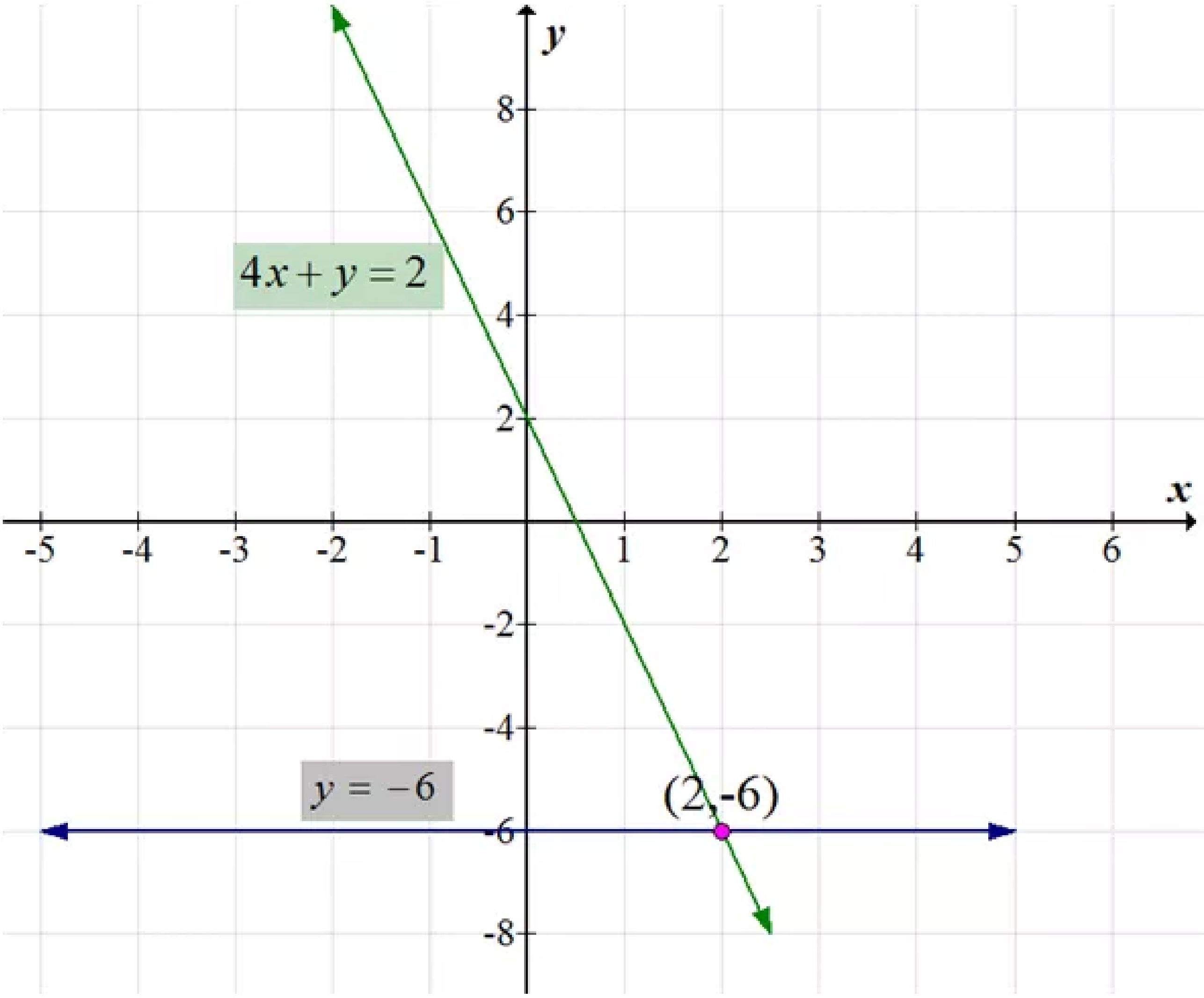
$y = -6$ ...... (1)

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

The slope intercept of the line equation (2)

$4x + y = 2$	First equation
$4x + y - 4x = 2 - 4x$	Subtract $4x$ from each side
$y = 2 - 4x$	Combine like terms
$y = -4x + 2$	Slope intercept form

The graphs of $y = -6$ and $4x + y = 2$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(2, -6)$

Check:

$y=-6$ First equation

$-6=-6$ Substitue -6 for x

$4x+y=2$ Second equation

$4(2)+(-6)=2$ Substitue 2 for x and -6 for y

$8-6=2$ Simplify

$2=2$

Hence the solution to the system of equations is $\boxed{(2,-6)}$

Answer 24PA.

Consider the equations,

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

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

The slope intercept of the line equation (2)

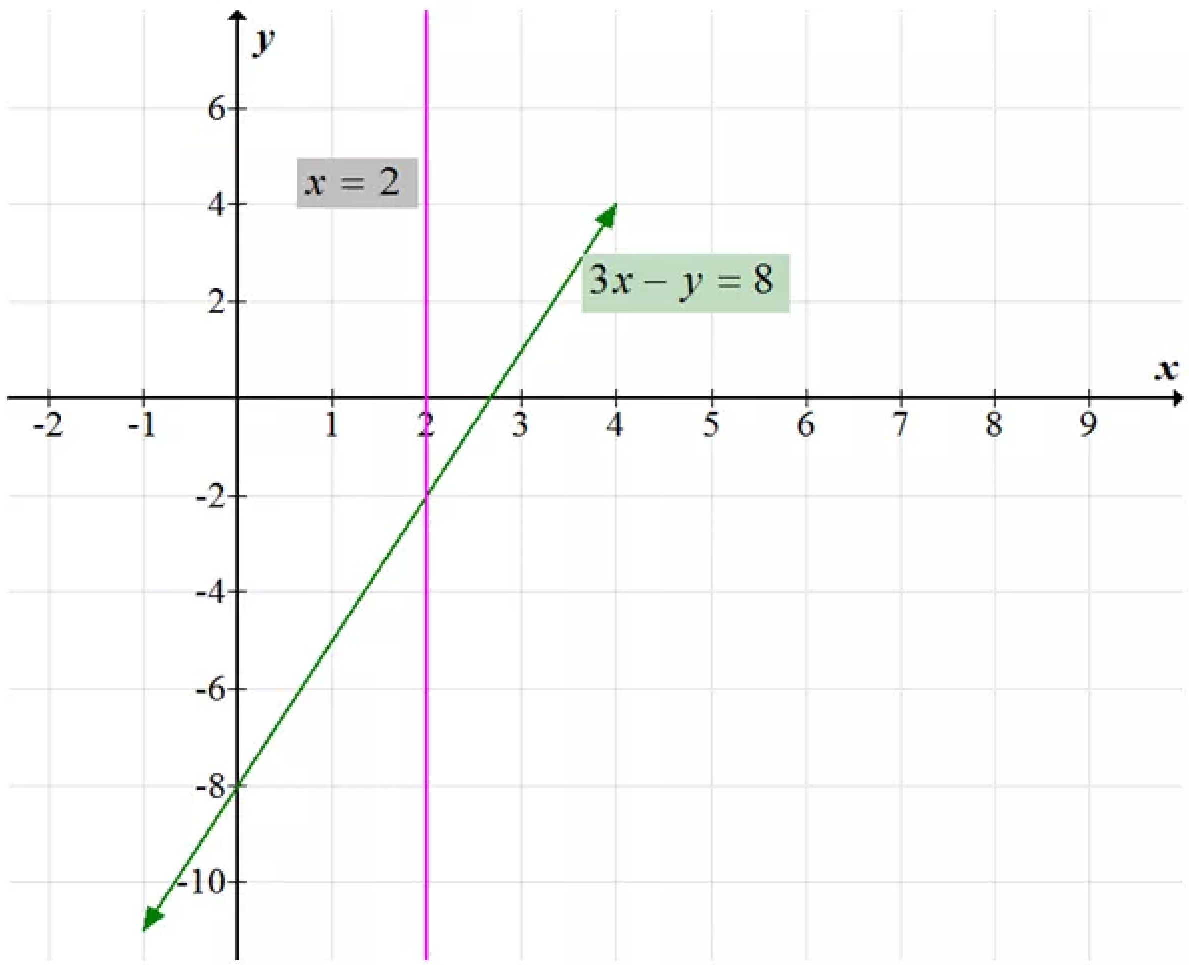
$3x-y=8$ First equation

$3x-y-3x=8-3x$ Subtract $3x$ from each side

$-y=8-3x$ Combine like terms

$y=3x-8$ Divide each side with -1

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



The graphs appear to **intersect** at the point with coordinates $(2,-2)$

Check:

$$\begin{aligned} x &= 2 && \text{First equation} \\ 2 &= 2 && \text{Substitue 2 for } x \end{aligned}$$

$$\begin{aligned} 3x - y &= 8 && \text{Second equation} \\ 3(2) - (-2) &= 8 && \text{Substitue 2 for } x \text{ and } -2 \text{ for } y \\ 6 + 2 &= 8 && \text{Simplify} \\ 8 &= 8 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(2, -2)}$

Answer 25PA.

Consider the equations,

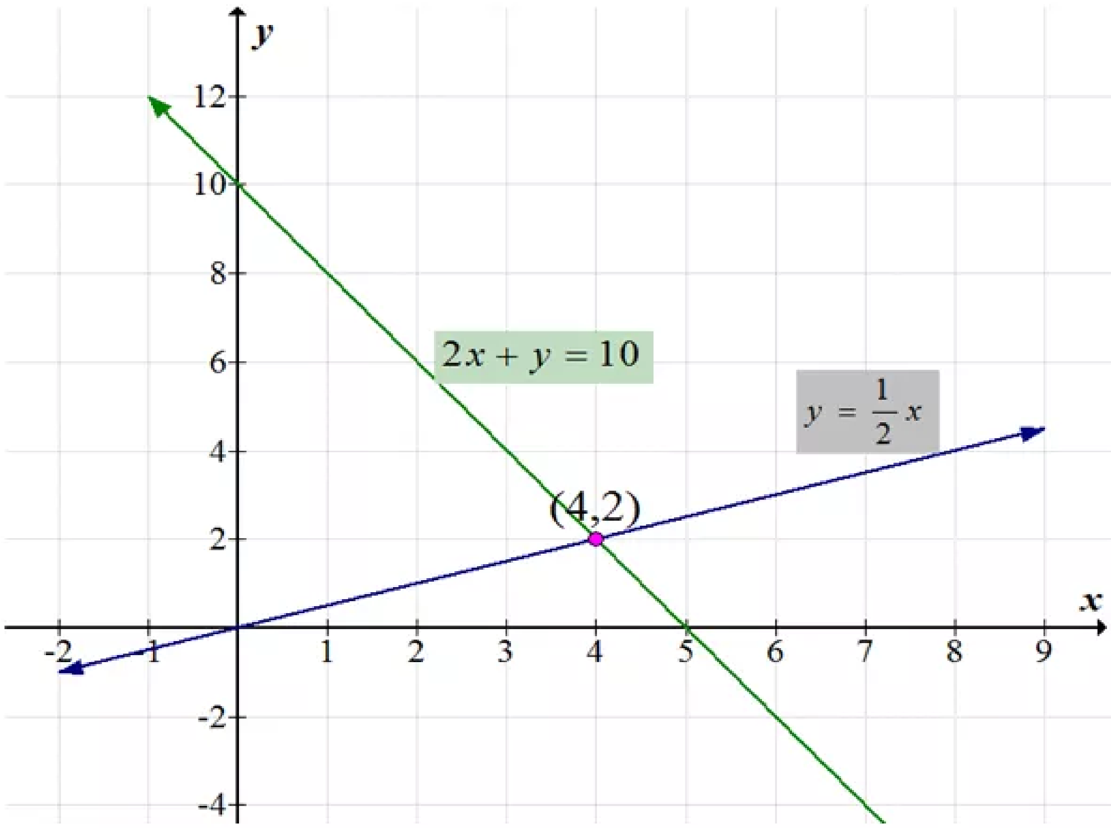
$y = \frac{1}{2}x$ ...... (1)

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

The slope intercept of the line equation (2)

$$\begin{aligned} 2x + y &= 10 && \text{Second equation} \\ 2x + y - 2x &= 10 - 2x && \text{Subtract } 2x \text{ from each side} \\ y &= 10 - 2x && \text{Combine like terms} \\ y &= -2x + 10 \end{aligned}$$

The graphs of $y = \frac{1}{2}x$ and $2x + y = 10$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(4, 2)$

Check:

$$y=\frac{1}{2}x \qquad \text{First equation}$$

$$2=\frac{1}{2}(4) \qquad \text{Substitue 4 for } x$$

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

$$2x+y=10 \qquad \text{Second equation}$$

$$2(4)+(2)=10 \qquad \text{Substitue 4 for } x \text{ and 2 for } y$$

$$8+2=10 \qquad \text{Simplify}$$

$$10=10$$

Hence the solution to the system of equations is $\boxed{(4,2)}$

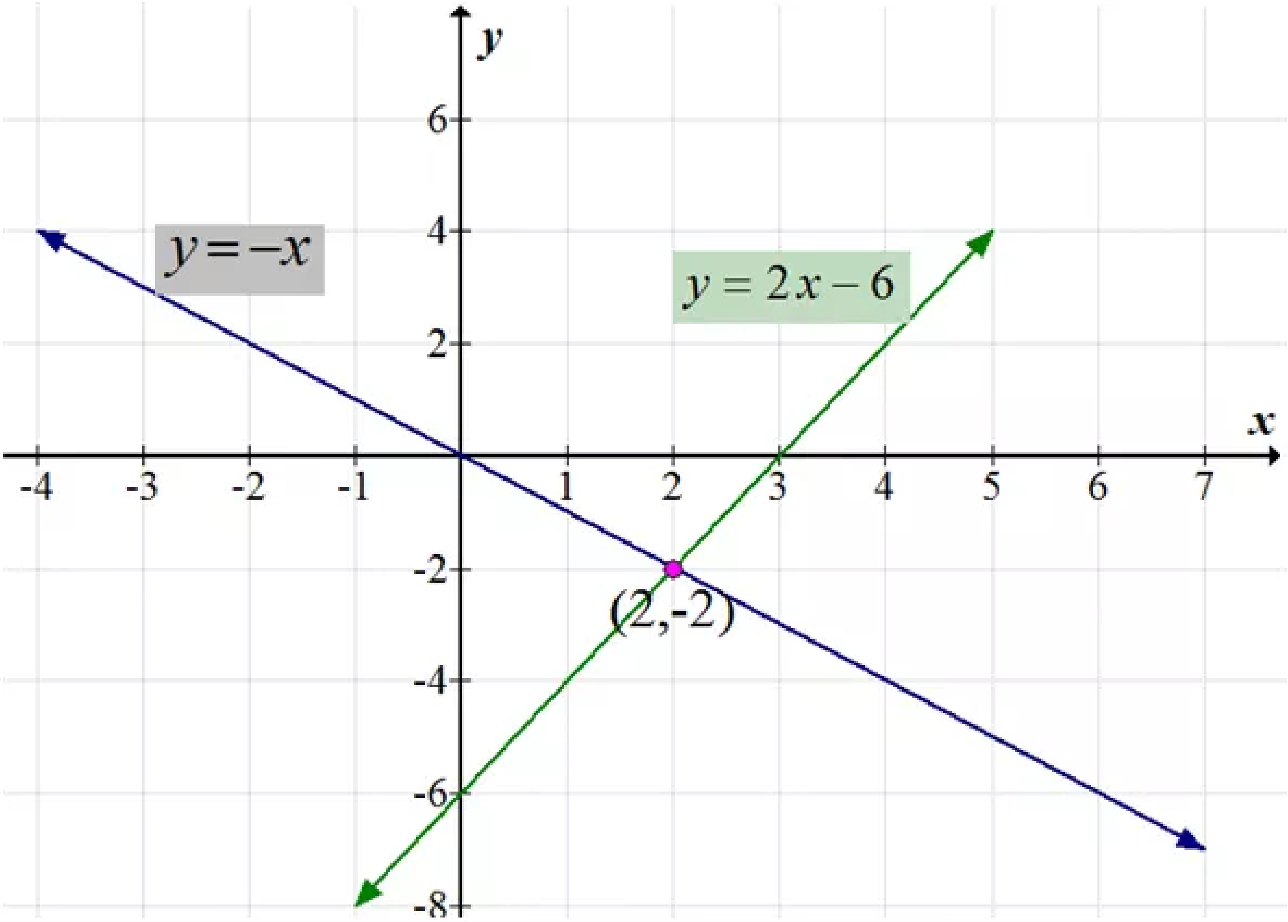
Answer 26PA.

Consider the equations,

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

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

The graphs of $y=-x$ and $y=2x-6$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(2,-2)$

Check:

$y = -x$ First equation

$-2 = -(2)$ Substitue 4 for x and -2 for y

$-2 = -2$ Simplify

$y = 2x - 6$ Second equation

$-2 = 2(2) - 6$ Substitue 2 for x and -2 for y

$-2 = 4 - 6$ Simplify

$-2 = -2$

Hence the solution to the system of equations is $\boxed{(2,-2)}$

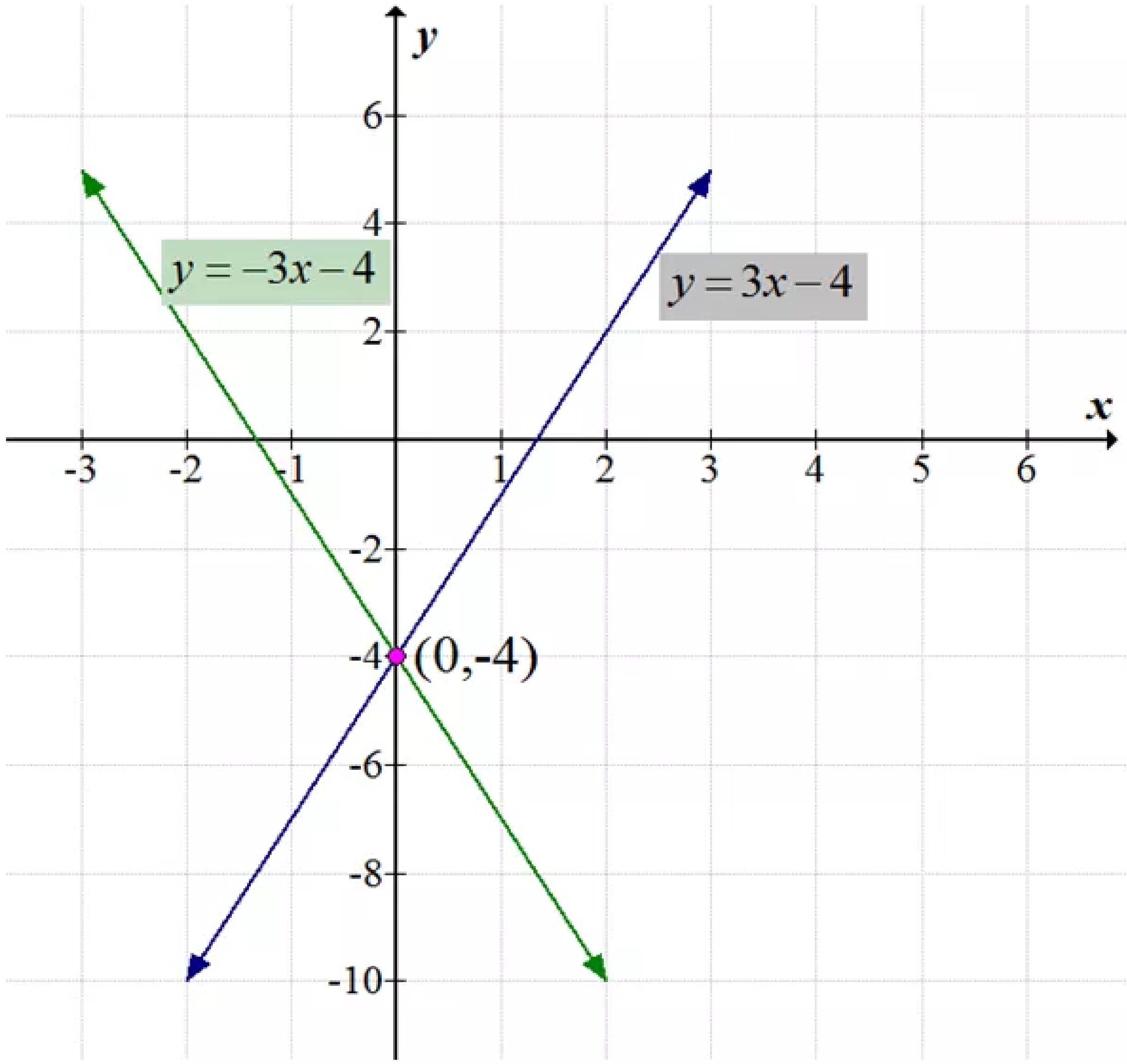
Answer 27PA.

Consider the equations,

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

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

The graphs of $y = 3x - 4$ and $y = -3x - 4$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(0,-4)$

Check:

$$\begin{aligned} y &= 3x - 4 && \text{Second equation} \\ -4 &= 3(0) - 4 && \text{Substitue 0 for } x \text{ and } -4 \text{ for } y \\ -4 &= 0 - 4 && \text{Simplify} \\ -4 &= -4 \end{aligned}$$

$$\begin{aligned} y &= -3x - 4 && \text{Second equation} \\ -4 &= -3(0) - 4 && \text{Substitue 0 for } x \text{ and } -4 \text{ for } y \\ -4 &= 0 - 4 && \text{Simplify} \\ -4 &= -4 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(0,-4)}$

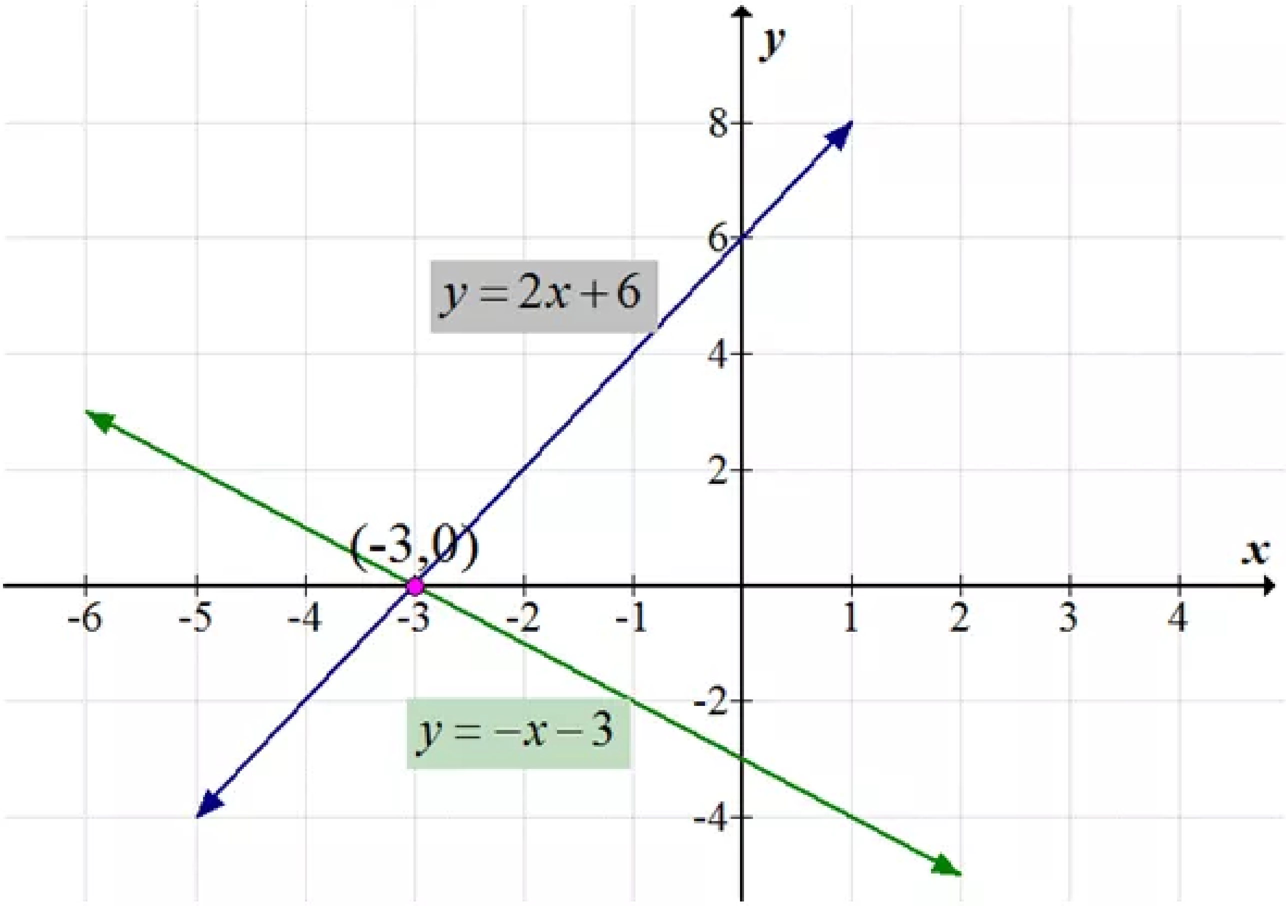
Answer 28PA.

Consider the equations,

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

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

The graphs of $y = 2x + 6$ and $y = -x - 3$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-3,0)$

Check:

$$y = 2x + 6 \quad \text{First equation}$$
$$0 = 2(-3) + 6 \quad \text{Substitue } -3 \text{ for } x \text{ and } 0 \text{ for } y$$
$$0 = -6 + 6 \quad \text{Simplify}$$
$$0 = 0$$

$$y = -x - 3 \quad \text{Second equation}$$
$$0 = -(-3) - 3 \quad \text{Substitue } -3 \text{ for } x \text{ and } 0 \text{ for } y$$
$$0 = 3 - 3 \quad \text{Simplify}$$
$$0 = 0$$

Hence the solution to the system of equations is $\boxed{(-3,0)}$

Answer 29PA.

Consider the equations,

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

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

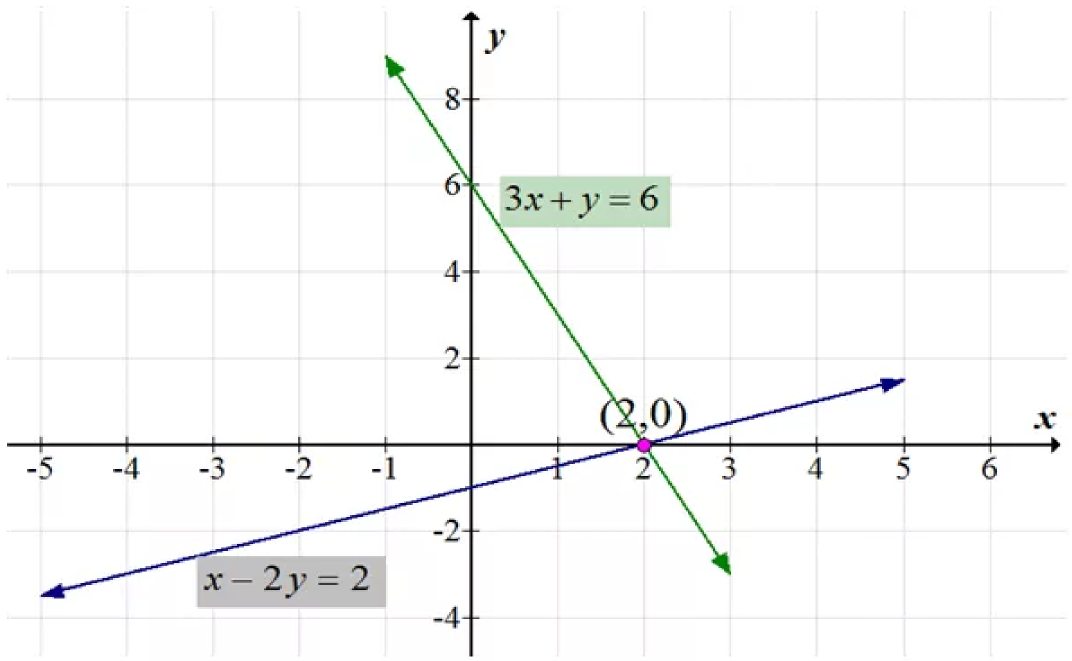
The slope intercept of the line equation (1)

$$x - 2y = 2 \quad \text{Second equation}$$
$$x - 2y - x = 2 - x \quad \text{Subtract } x \text{ from each side}$$
$$-2y = -x + 2 \quad \text{Combine like terms}$$
$$y = \frac{1}{2}x - 1 \quad \text{Divide each side with } -2$$

The slope intercept of the line equation (2)

$$3x + y = 6 \quad \text{Second equation}$$
$$3x + y - 3x = 6 - 3x \quad \text{Subtract } 3x \text{ from each side}$$
$$y = 6 - 3x \quad \text{Combine like terms}$$
$$y = -3x + 6$$

The graphs of $x - 2y = 2$ and $3x + y = 6$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(2,0)$

Check:

$$x - 2y = 2 \qquad \text{Second equation}$$
$$2 - 2(0) = 2 \qquad \text{Substitue 2 for } x \text{ and 0 for } y$$
$$2 - 0 = 2 \qquad \text{Simplify}$$
$$2 = 2$$

$$3x + y = 6 \qquad \text{Second equation}$$
$$3(2) + 0 = 6 \qquad \text{Substitue 2 for } x \text{ and 0 for } y$$
$$6 + 0 = 6 \qquad \text{Simplify}$$
$$6 = 6$$

Hence the solution to the system of equations is $\boxed{(2,0)}$

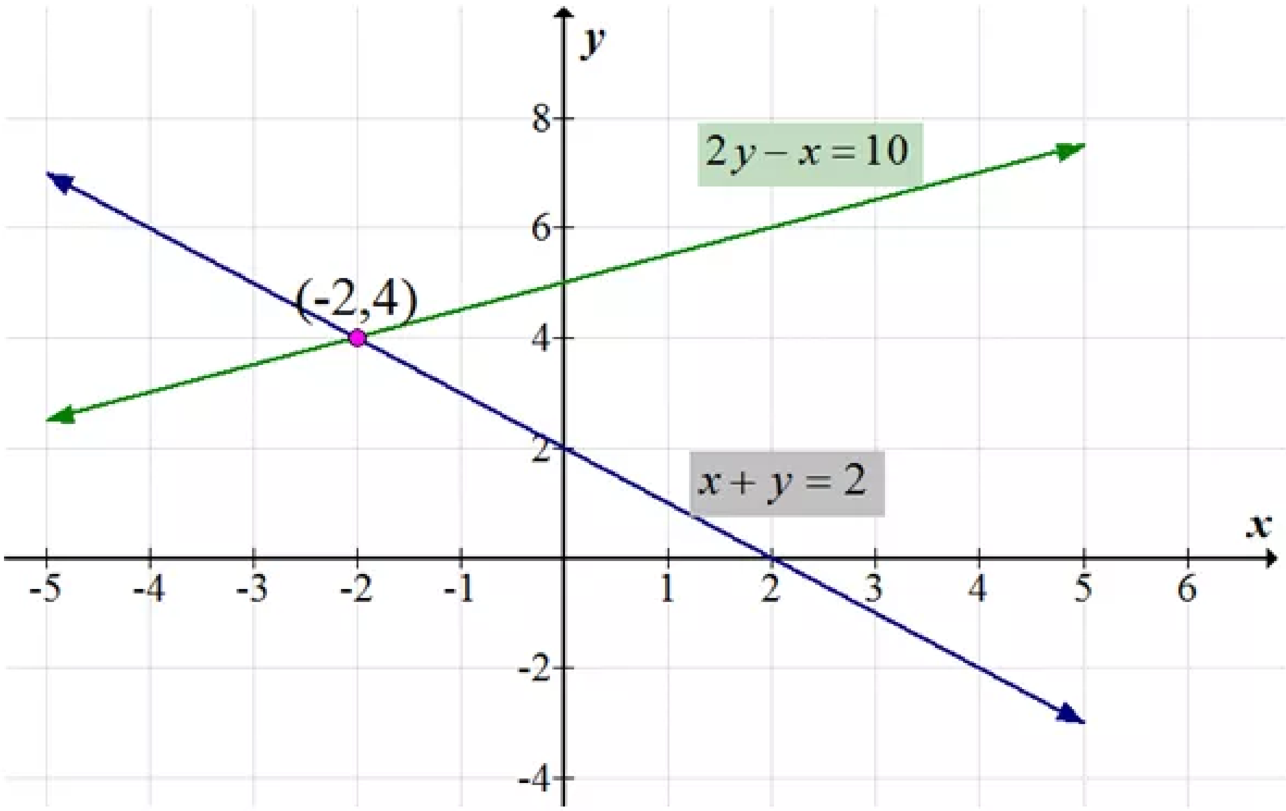
Answer 30PA.

Consider the equations,

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

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

The graphs of $x + y = 2$ and $2y - x = 10$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-2,4)$

Check:

$$\begin{aligned} x+y&=2 && \text{First equation} \\ -2+4&=2 && \text{Substitue } -2 \text{ for } x \text{ and } 4 \text{ for } y \\ 2&=2 && \text{Simplify} \end{aligned}$$

$$\begin{aligned} 2y-x&=10 && \text{First equation} \\ 2(4)-(-2)&=10 && \text{Substitue } -2 \text{ for } x \text{ and } 4 \text{ for } y \\ 8+2&=10 && \text{Simplify} \\ 10&=10 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(-2,4)}$

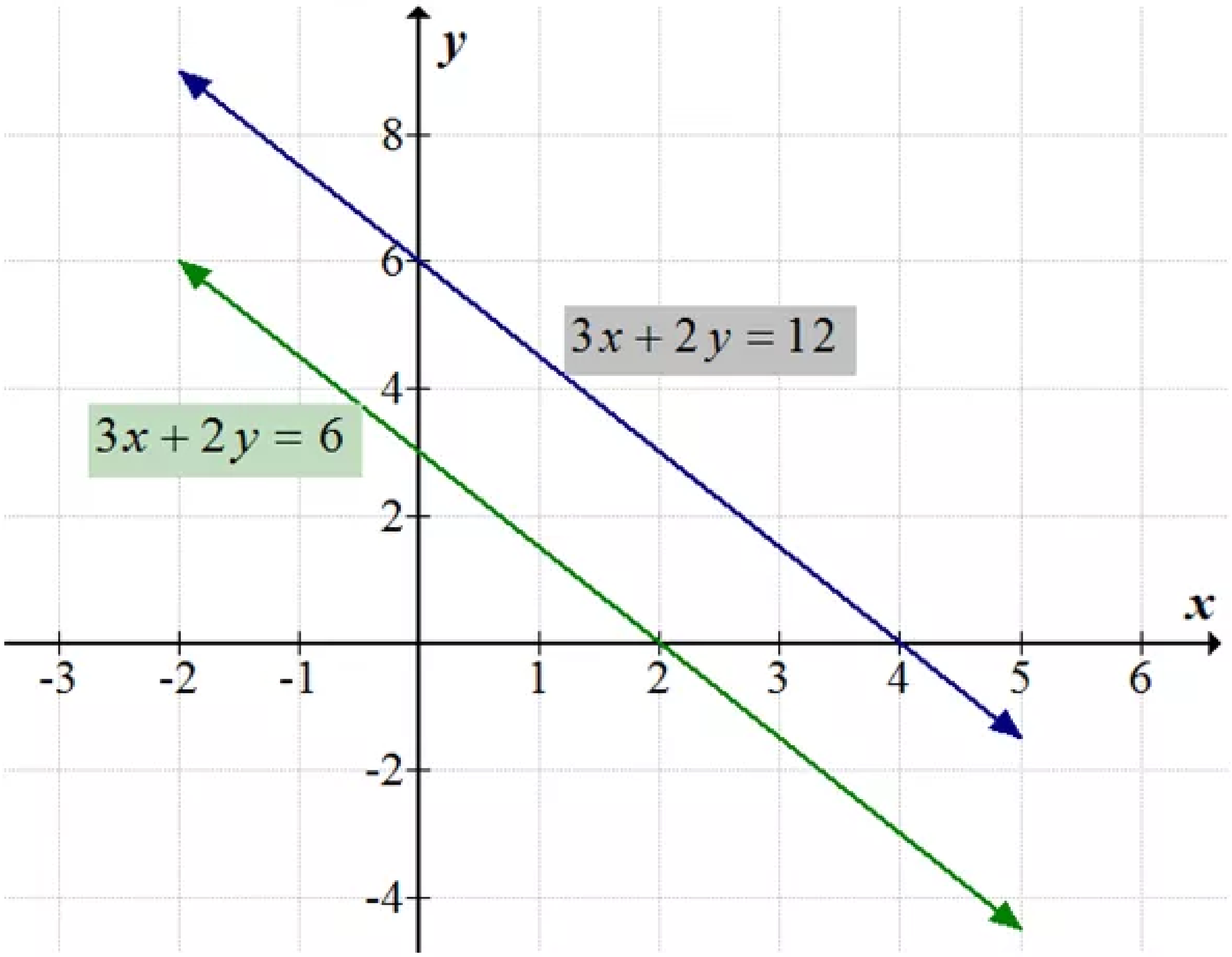
Answer 31PA.

Consider the equations,

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

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

The graphs of $3x+2y=12$ and $3x+2y=6$ is shown below:



The lines $3x+2y=12$ and $3x+2y=6$ are parallel. The system has **no solution**

Answer 32PA.

Consider the equations,

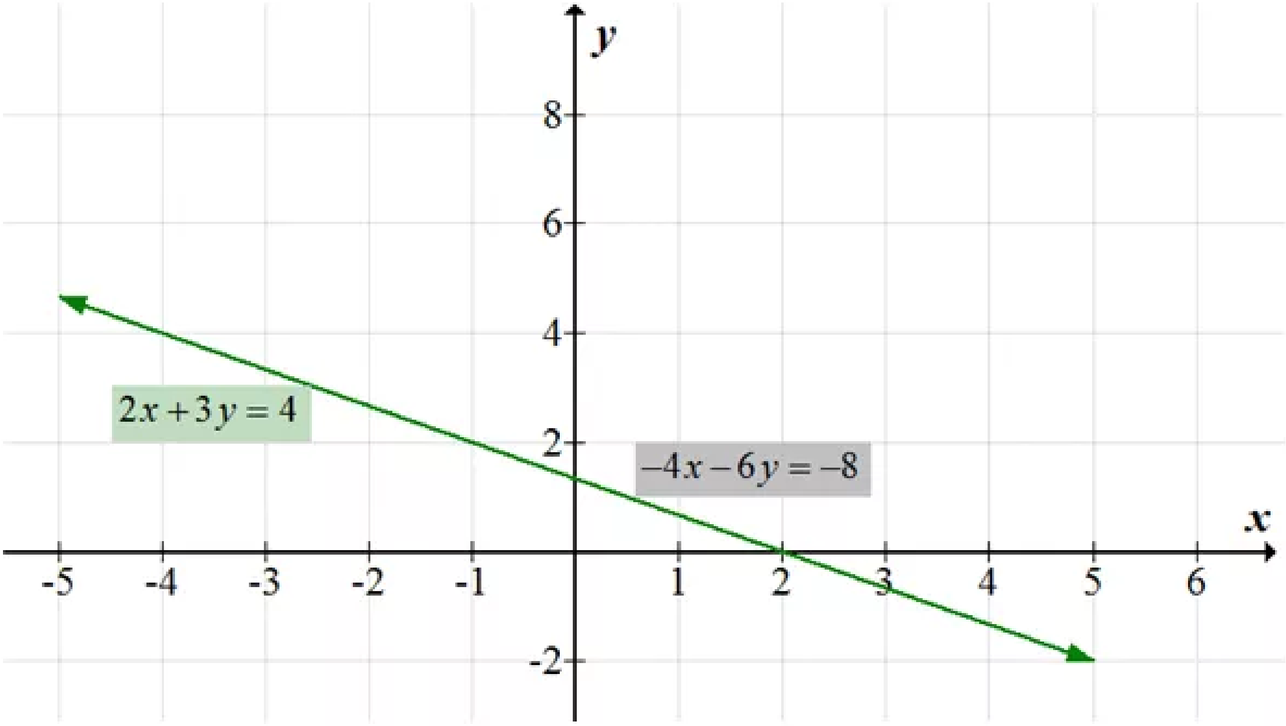
$2x+3y=4$ ...... (1)

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

$-4x-6y=-8$	Second equation
$(-4x-6y)\times -\frac{1}{2}=-8\times -\frac{1}{2}$	Multiply each side with $-\frac{1}{2}$
$2x+3y=4$	Simplify
$2x+3y=4$	First equation

Equations (1) and (2) are the same.

The graphs of $2x+3y=4$ and $-4x-6y=-8$ is shown below:



The lines $3x+2y=12$ and $3x+2y=6$ are the same. So, the system has **infinitely many solutions**.

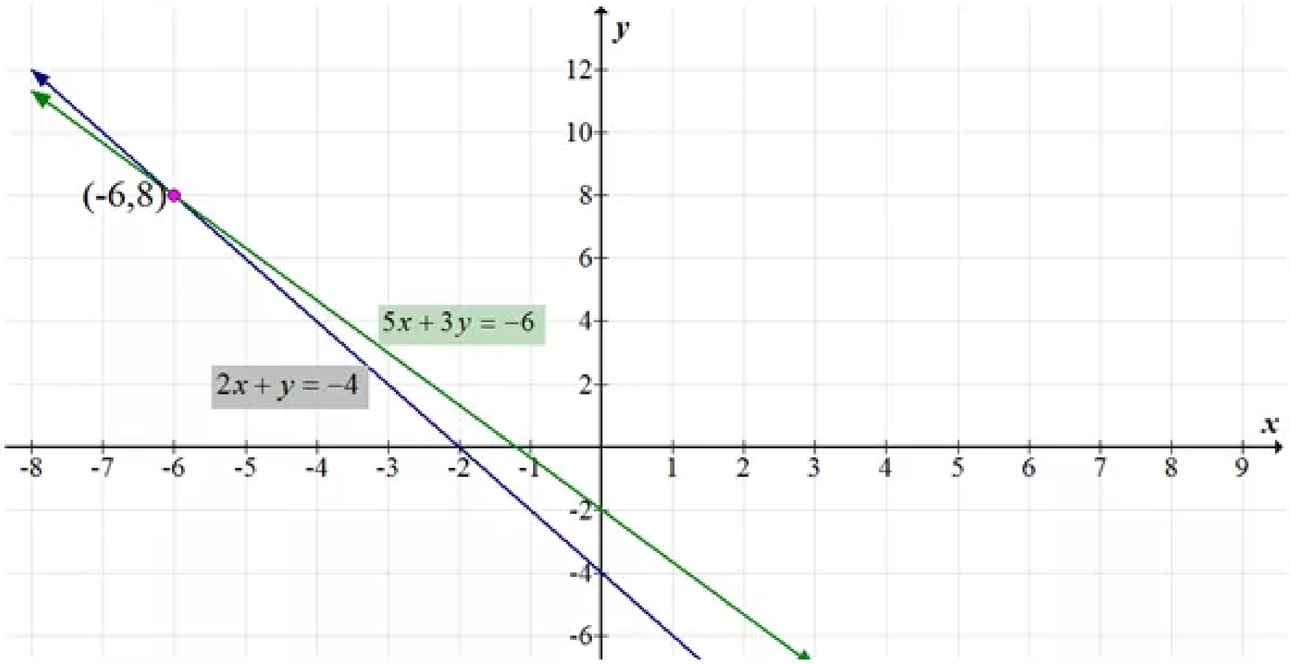
Answer 33PA.

Consider the equations,

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

$5x + 3y = -6$ ...... (2)

The graphs of $2x + y = -4$ and $5x + 3y = -6$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-6,8)$

Check:

$$\begin{aligned} 2x + y &= -4 && \text{First equation} \\ 2(-6)+(8) &= -4 && \text{Substitue } -6 \text{ for } x \text{ and } 8 \text{ for } y \\ -12+8 &= -4 && \text{Simplify} \\ -4 &= -4 \end{aligned}$$

$$\begin{aligned} 5x + 3y &= -6 && \text{Second equation} \\ 5(-6)+3(8) &= -6 && \text{Substitue } -6 \text{ for } x \text{ and } 8 \text{ for } y \\ -30+24 &= -6 && \text{Simplify} \\ -6 &= -6 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(-6,8)}$

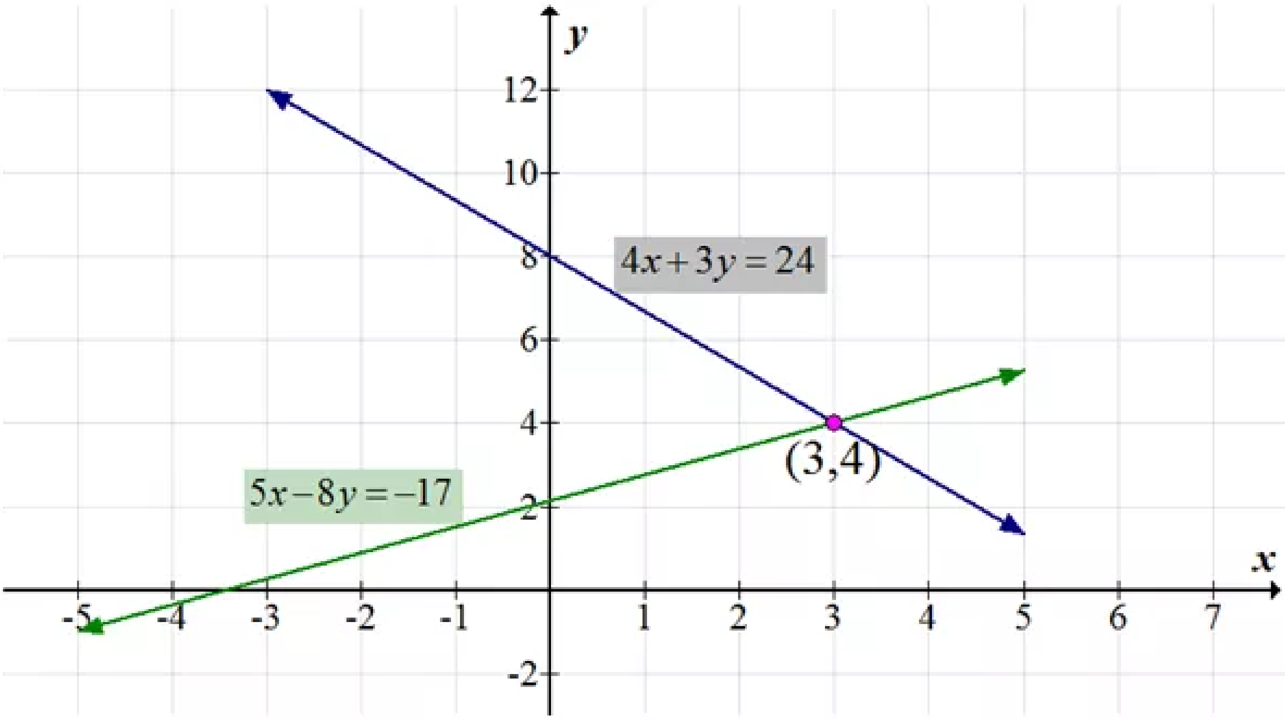
Answer 34PA.

Consider the equations,

$4x+3y=24$ ...... (1)

$5x-8y=-17$ ...... (2)

The graphs of $4x+3y=24$ and $5x-8y=-17$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(3,4)$

Check:

$$\begin{aligned} 4x+3y&=24 && \text{First equation} \\ 4(3)+3(4)&=24 && \text{Substitue 3 for } x \text{ and 4 for } y \\ 12+12&=24 && \text{Simplify} \\ 24&=24 \end{aligned}$$

$$\begin{aligned} 5x-8y&=-17 && \text{Second equation} \\ 5(3)-8(4)&=-17 && \text{Substitue 3 for } x \text{ and 4 for } y \\ 15-32&=-17 && \text{Simplify} \\ -17&=-17 \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(3,4)}$

Answer 35PA.

Consider the equations,

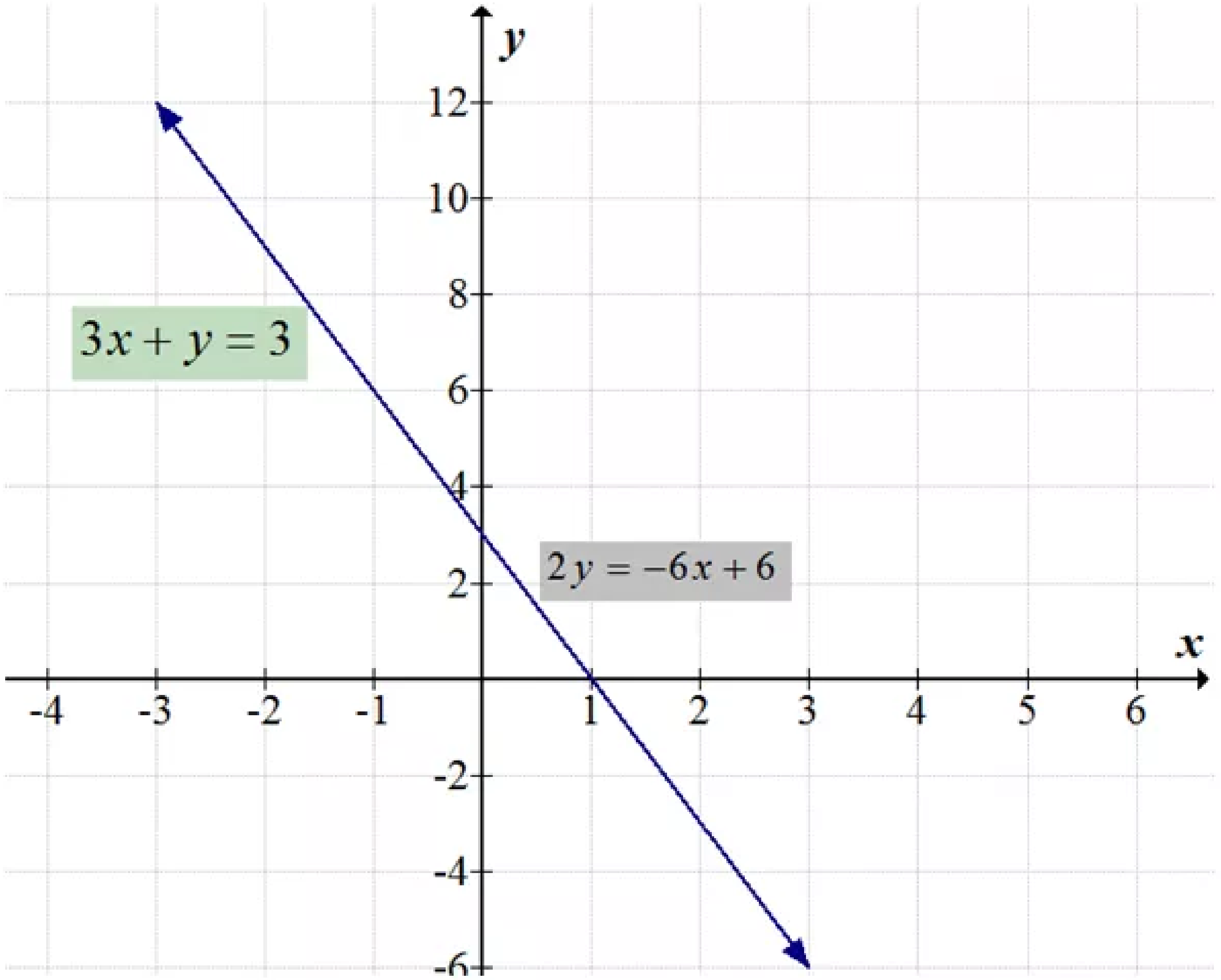
$3x + y = 3$ ...... (1)

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

$2y = -6x + 6$	Second equation
$2y + 6x = -6x + 6 + 6x$	Add $6x$ to each side
$6x + 2y = 6$	Simplify
$3x + y = 3$	Divide each side with 2

Equations (1) and (2) are the same.

The graphs of $3x + y = 3$ and $2y = -6x + 6$ is shown below:



The lines $3x + y = 3$ and $2y = -6x + 6$ are the same. So, the system has **infinitely many solutions**.

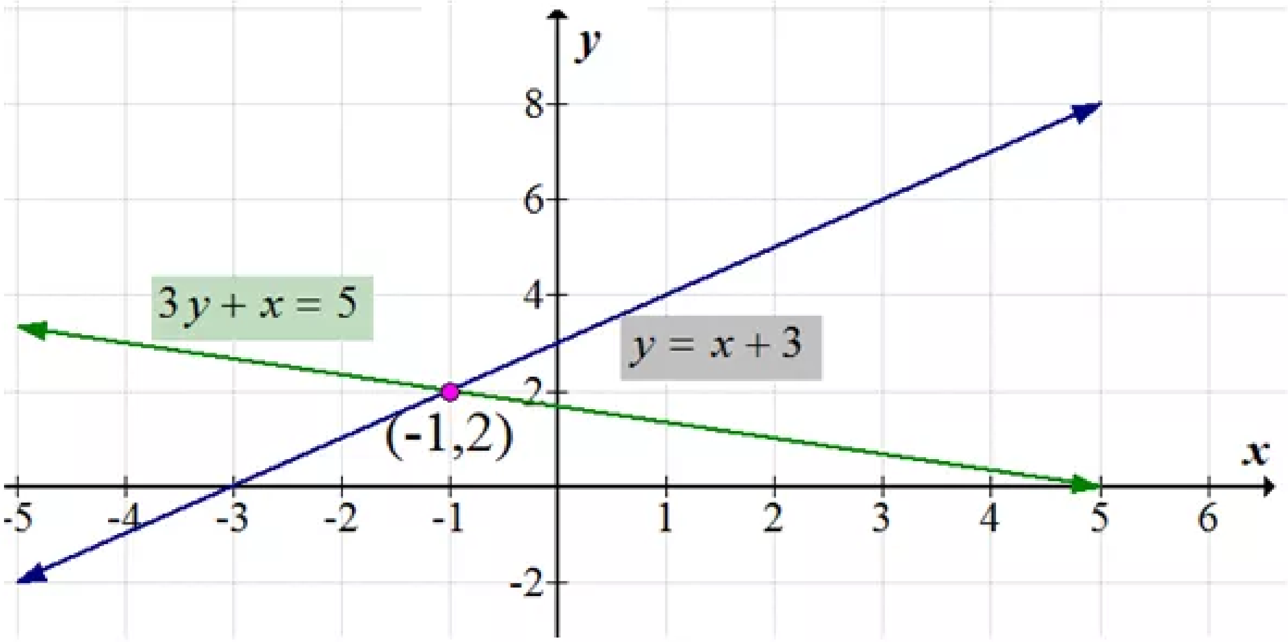
Answer 36PA.

Consider the equations,

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

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

The graphs of $y = x + 3$ and $3y + x = 5$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-1, 2)$

Check:

$y = x + 3$	First equation
$2 = -1 + 3$	Substitue -1 for x and 2 for y
$2 = 2$	Simplify

$3y + x = 5$	Second equation
$3(2) + (-1) = 5$	Substitue -1 for x and 2 for y
$6 - 1 = 5$	Simplify
$5 = 5$	

Hence the solution to the system of equations is $\boxed{(-1, 2)}$

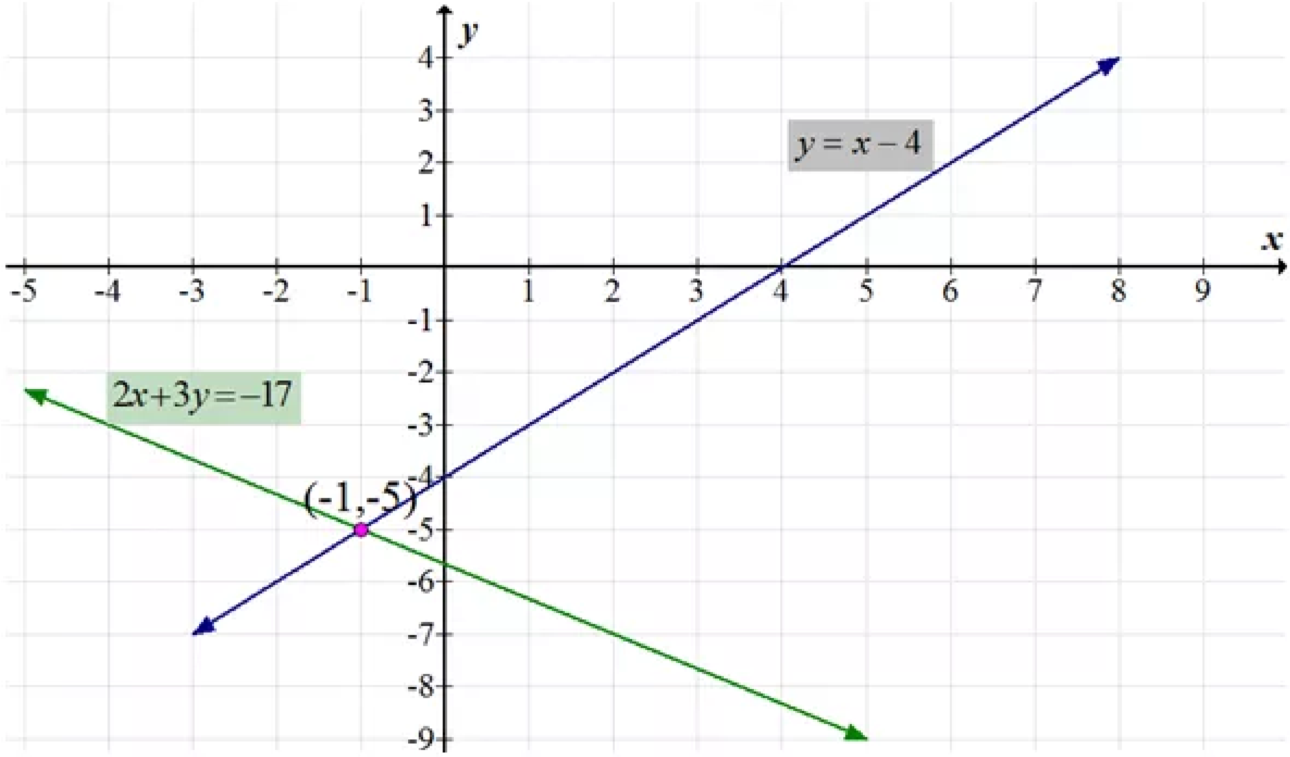
Answer 37PA.

Consider the equations,

$2x+3y=-17$ ...... (1)

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

The graphs of $2x+3y=-17$ and $y=x-4$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(-1,-5)$

Check:

$$\begin{aligned} 2x+3y&=-17 && \text{First equation} \\ 2(-1)+3(-5)&=-17 && \text{Substitue } -1 \text{ for } x \text{ and } -5 \text{ for } y \\ -2-15&=-17 && \text{Simplify} \\ -17&=-17 \end{aligned}$$

$$\begin{aligned} y&=x-4 && \text{Second equation} \\ -5&=-1-4 && \text{Substitue } -1 \text{ for } x \text{ and } -5 \text{ for } y \\ -5&=-5 && \text{Simplify} \end{aligned}$$

Hence the solution to the system of equations is $\boxed{(-1,-5)}$

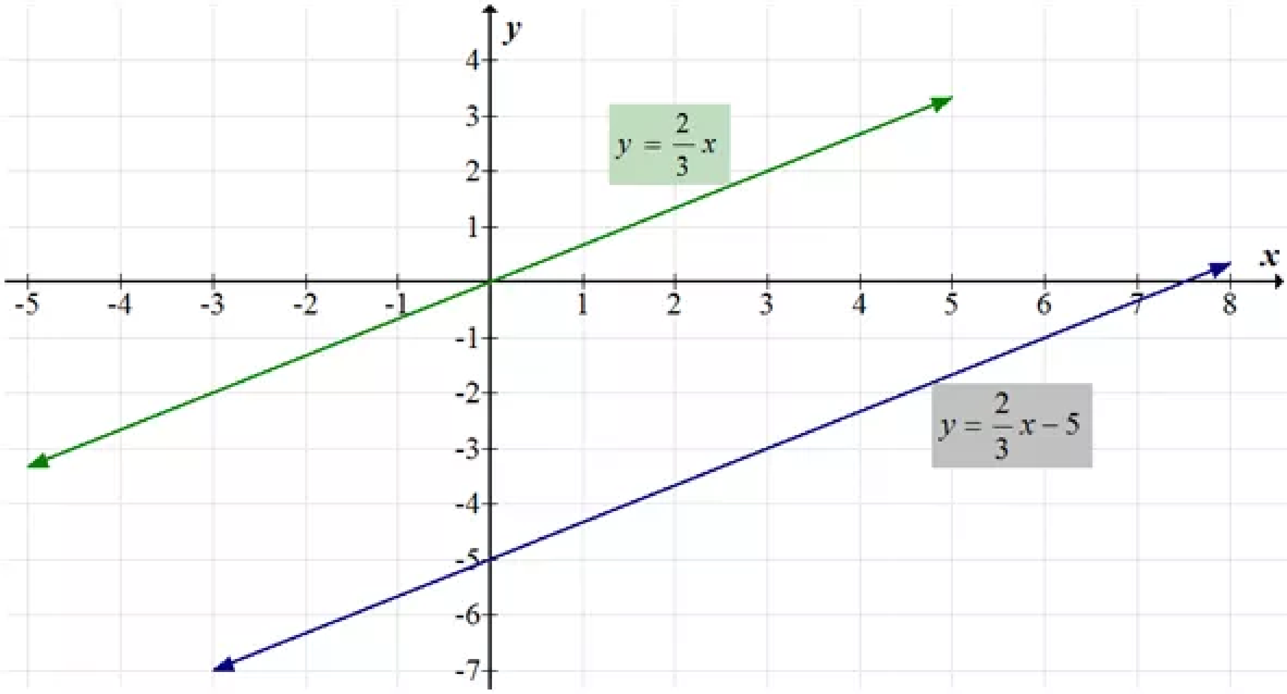
Answer 38PA.

Consider the equations,

$y = \frac{2}{3}x - 5$ ...... (1)

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

The graphs of $y = \frac{2}{3}x - 5$ and $3y = 2x$ is shown below:



The lines $y = \frac{2}{3}x - 5$ and $3y = 2x$ are parallel. So, there is no solution

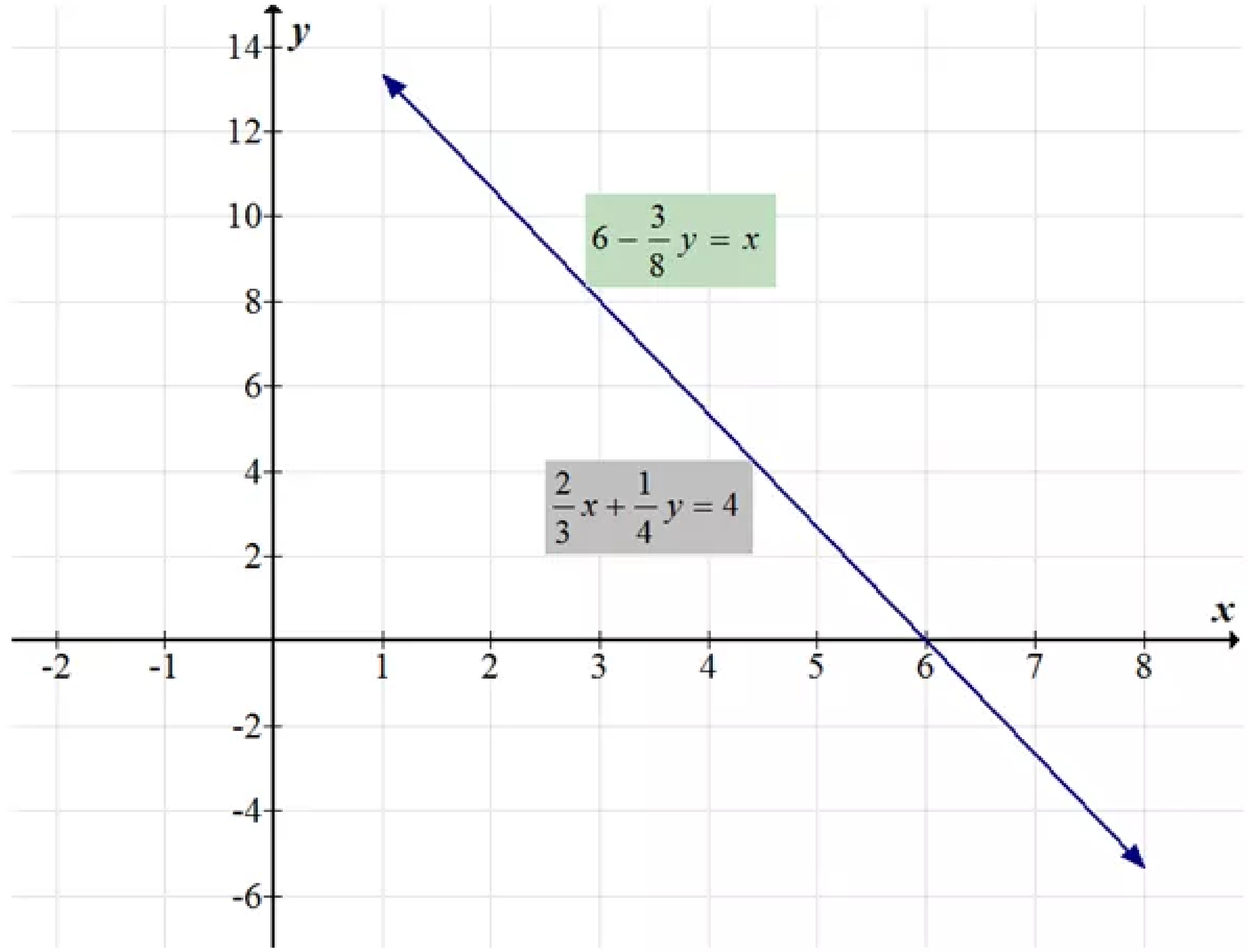
Answer 39PA.

Consider the equations,

$$6-\frac{3}{8}y=x \quad \ldots\ldots (1)$$

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

The graphs of $6-\frac{3}{8}y=x$ and $\frac{2}{3}x+\frac{1}{4}y=4$ is shown below:



The lines $6-\frac{3}{8}y=x$ and $\frac{2}{3}x+\frac{1}{4}y=4$ are the same. So, there are **infinitely many solutions**.

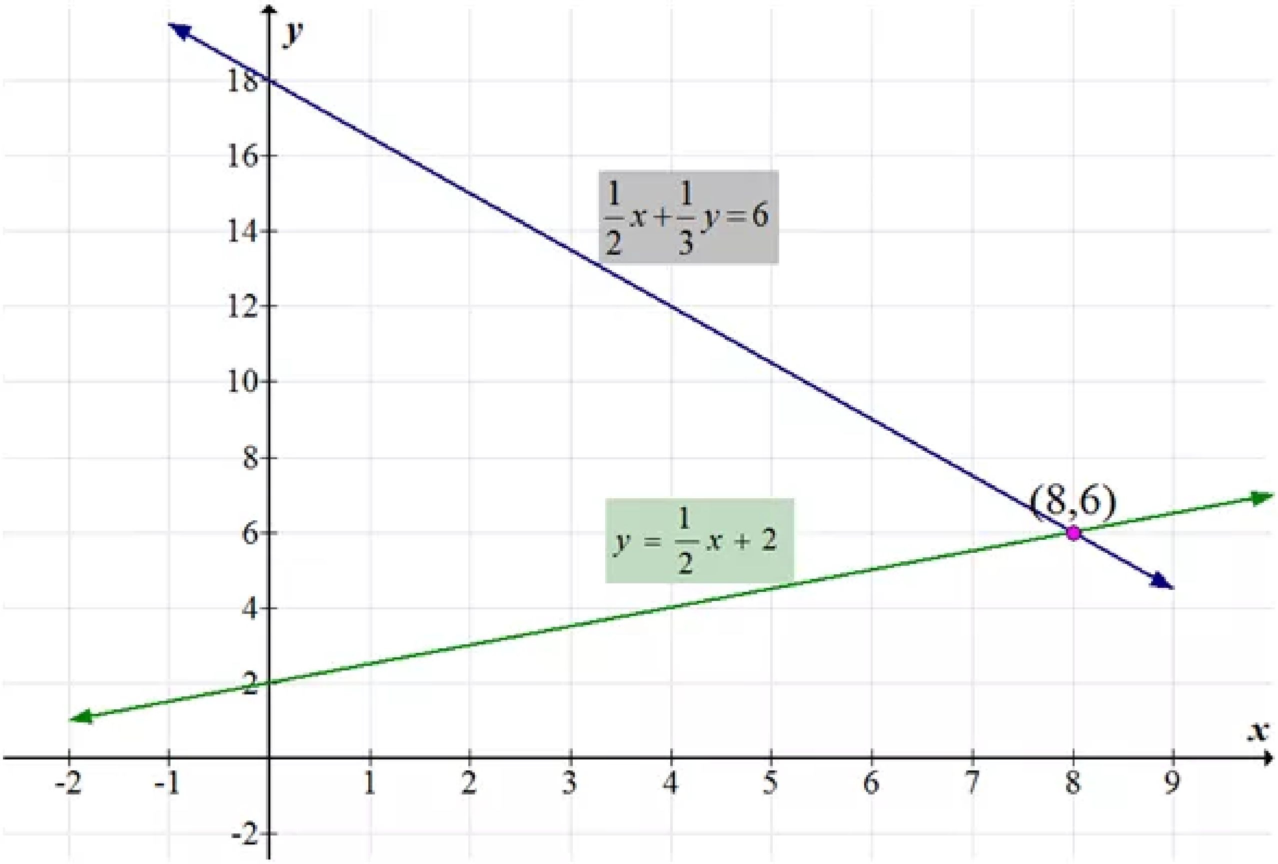
Answer 40PA.

Consider the equations,

$$\frac{1}{2}x+\frac{1}{3}y=6 \text{ ...... (1)}$$

$$y=\frac{1}{2}x+2 \text{ ...... (2)}$$

The graphs of $\frac{1}{2}x+\frac{1}{3}y=6$ and $y=\frac{1}{2}x+2$ is shown below:



The graphs appear to **intersect** at the point with coordinates $(8,6)$

Check:

$$\frac{1}{2}x+\frac{1}{3}y=6 \qquad \text{First equation}$$

$$\frac{1}{2}(8)+\frac{1}{3}(6)=6 \qquad \text{Substitue 8 for } x \text{ and 6 for } y$$

$$4+2=6 \qquad \text{Simplify}$$

$$6=6$$

$$y=\frac{1}{2}x+2 \qquad \text{Second equation}$$

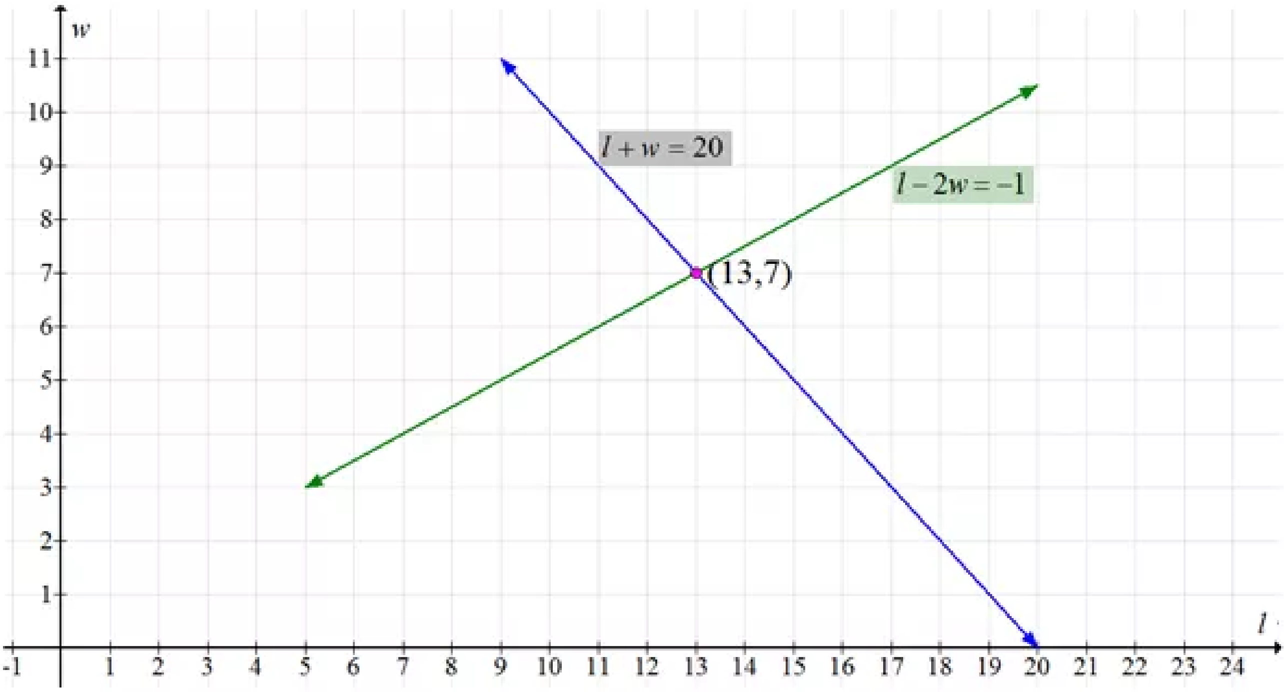
$$6=\frac{1}{2}(8)+2 \qquad \text{Substitue 8 for } x \text{ and 6 for } y$$

$$6=4+2 \qquad \text{Simplify}$$

$$6=6$$

Hence the solution to the system of equations is $\boxed{(8,6)}$

The graphs of $l-2w=-1$ and $l+w=20$ is shown below:

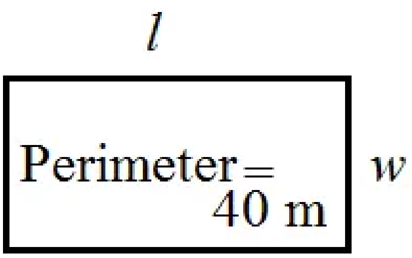


The intersection point of the two lines is $(13,7)$

Hence the **length** of the rectangle is **13 meters** and its **width** is **7 meters**

Answer 41PA.

Let l be the length of the rectangle and w be the width of the rectangle



Length of the rectangle is 1 meter less than twice its width.

That is $l = 2w - 1$

$l - 2w = 2w - 1 - 2w$

$l - 2w = -1$ ...... (1)

Perimeter of the rectangle is 40 meter

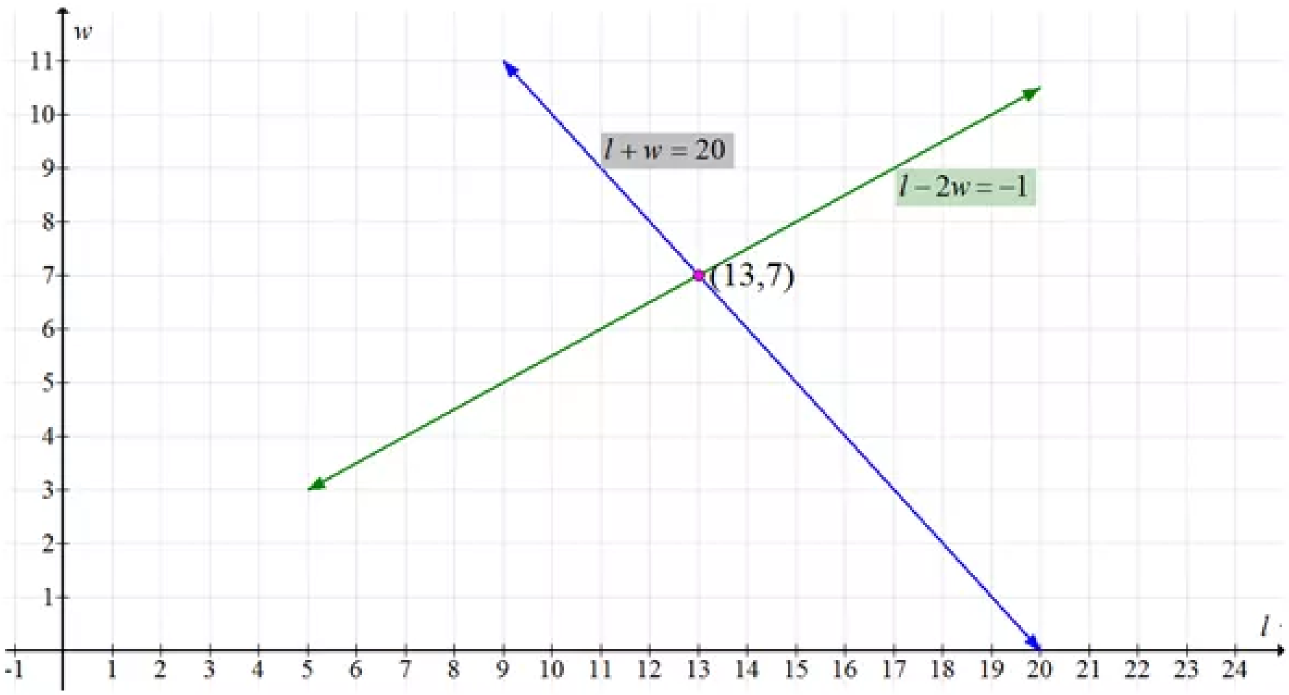
Perimeter of the rectangle is $P = 2(l + w)$

$$40 = 2(l + w)$$

$$20 = l + w \quad \text{Divide each side 2}$$

$$l + w = 20 \quad ......(2)$$

The graphs of $l - 2w = -1$ and $l + w = 20$ is shown below:



The intersection point of the two lines is $(13, 7)$

Hence the **length** of the rectangle is **13 meters** and its **width** is **7 meters**

Answer 42PA.

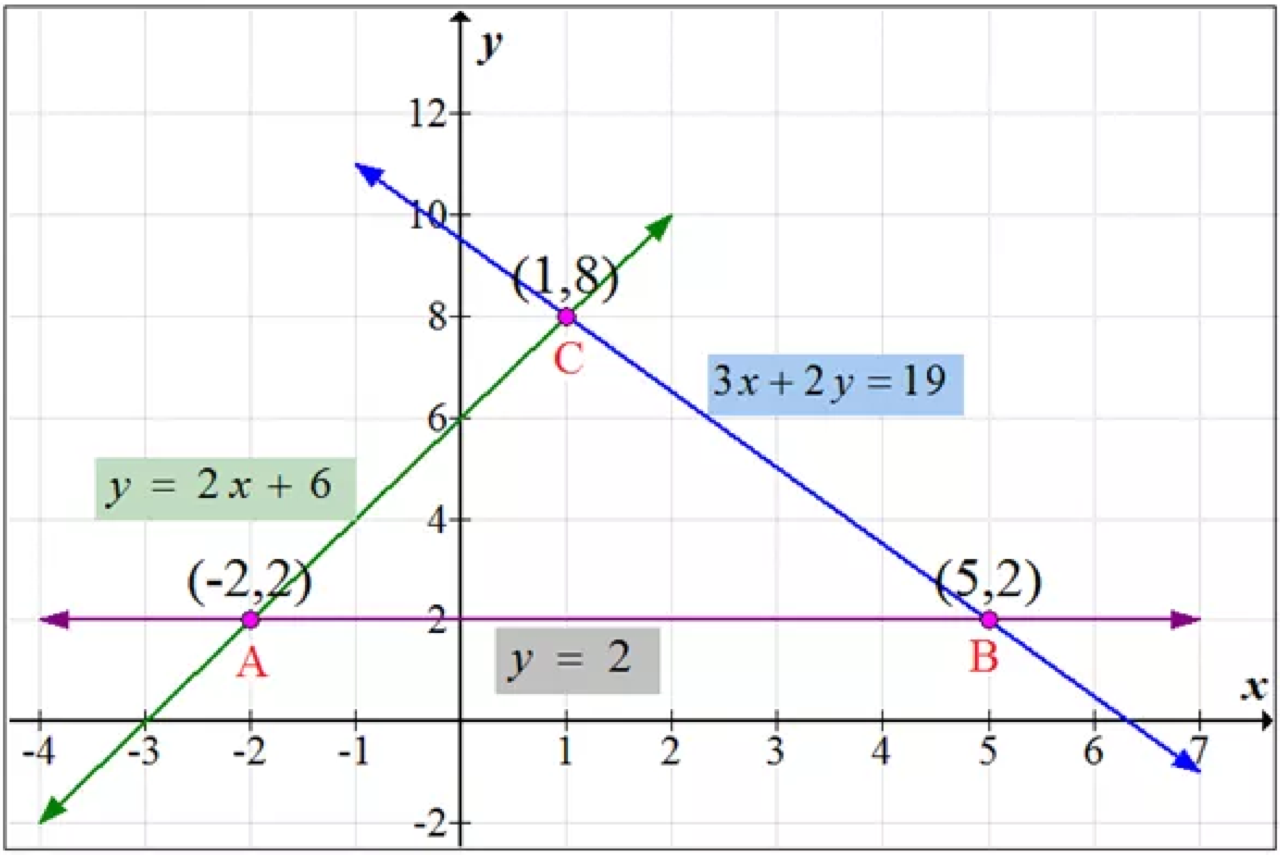
Consider the equation,

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

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

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

The graphs of the three lines are shown below:



The intersection point of the lines $y = 2x + 6$ and $3x + 2y = 19$ is $(1,8)$

The intersection point of the lines $y = 2$ and $3x + 2y = 19$ is $(5,2)$

The intersection point of the lines $y = 2x + 6$ and $y = 2$ is $(-2,2)$

Hence the coordinates of the triangle are $(1,8)$, $(5,2)$, and $(-2,2)$

Answer 43PA.

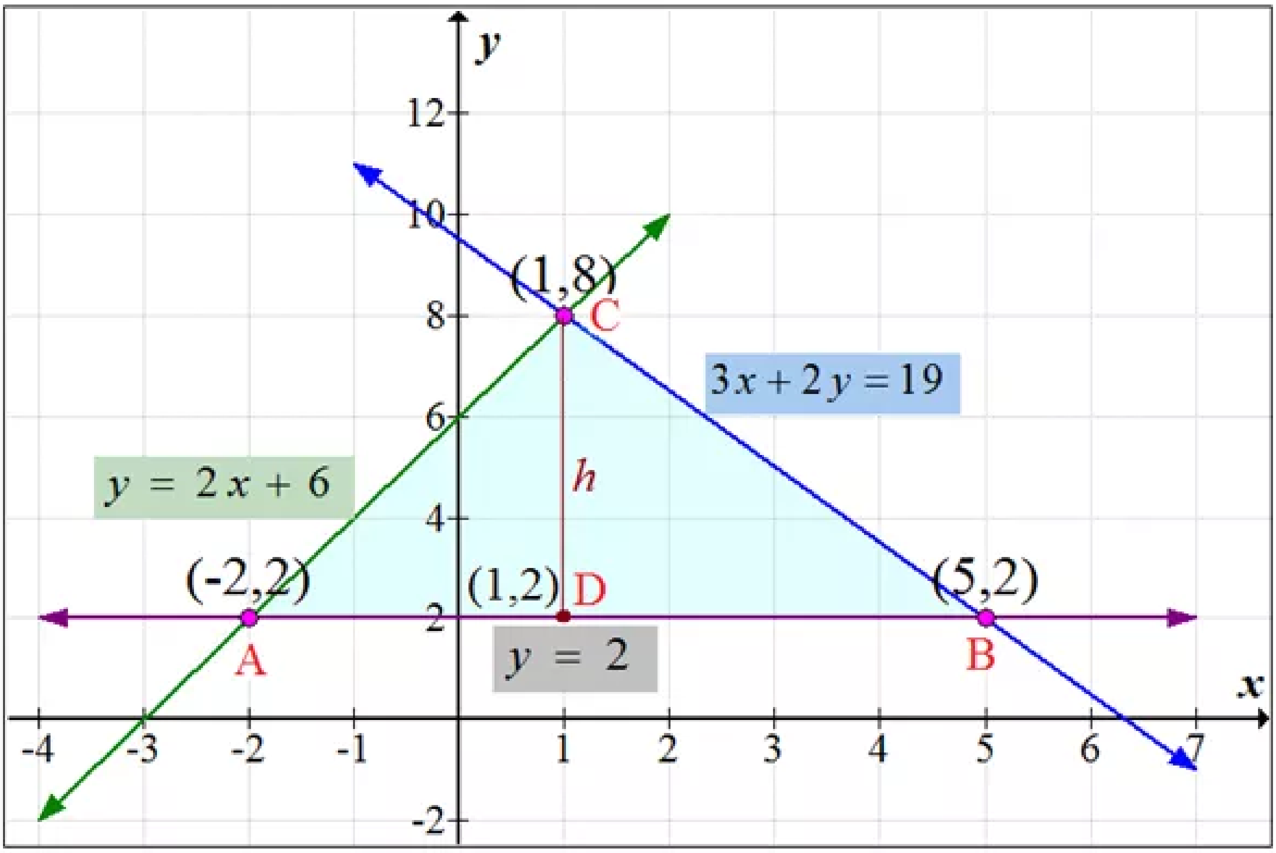
Consider the equation,

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

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

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

The graphs of the three lines are shown below:



The intersection point of the lines $y = 2x + 6$ and $3x + 2y = 19$ is $(1,8)$

The intersection point of the lines $y = 2$ and $3x + 2y = 19$ is $(5,2)$

The intersection point of the lines $y = 2x + 6$ and $y = 2$ is $(-2,2)$

Hence the coordinates of the triangle are $(1,8)$, $(5,2)$, and $(-2,2)$

The distance between (x_1, y_1) and (x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The distance between $(-2, 2)$ and $(5, 2)$ is $\mathrm{AB} = \sqrt{(5+2)^2 + (2-2)^2}$

$\mathrm{AB} = \sqrt{7^2 + 0^2}$

$\mathrm{AB} = \sqrt{7^2}$

$\mathrm{AB} = 7$

The distance between $(1, 8)$ and $(1, 2)$ is $\mathrm{CD} = \sqrt{(1-1)^2 + (2-8)^2}$

$\mathrm{CD} = \sqrt{0^2 + 6^2}$

$\mathrm{CD} = \sqrt{6^2}$

$\mathrm{CD} = 6$

Area of the triangle ABC $= \frac{1}{2}(\mathrm{AB})(\mathrm{CD})$

$= \frac{1}{2}(7)(6)$

$= 21$

Hence the area of the triangle is 21 square units

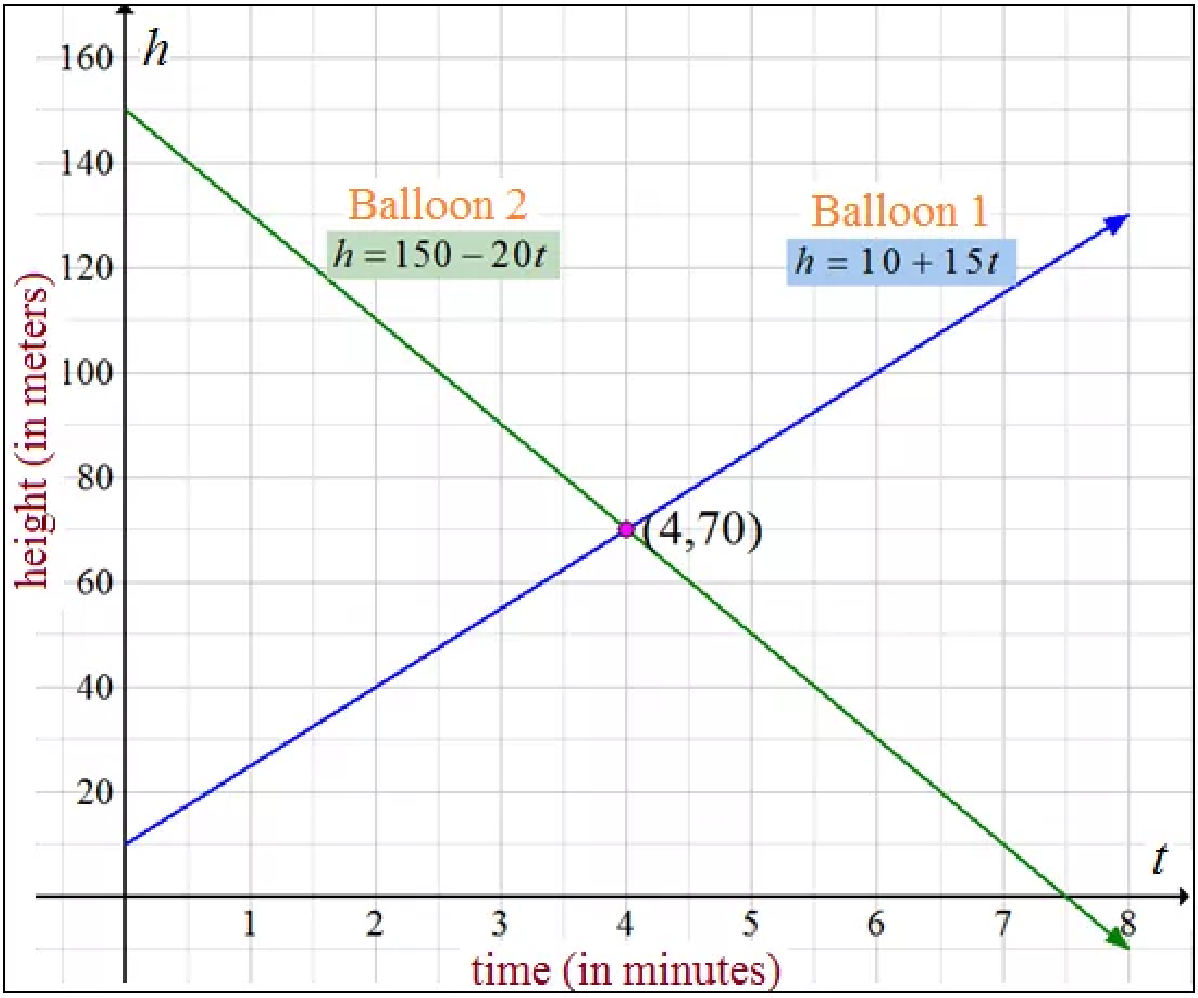
Answer 44PA.

Let h be the height reached by the balloon in the time t minutes

The balloon 1 is 10 meters above the ground and raising 15 meters per minute. Then the equation is $h = 15t + 10$ ...... (1)

The balloon 1 is 150 meters above the ground and decreasing 20 meters per minute. Then the equation is $h = -20t + 150$ ...... (2)

The graphs of the two lines are shown below:



The two lines $h = 15t + 10$ and $h = -20t + 150$ intersect at $(4, 70)$

Hence at $t = 4$ minutes the two balloons reaches the same height.

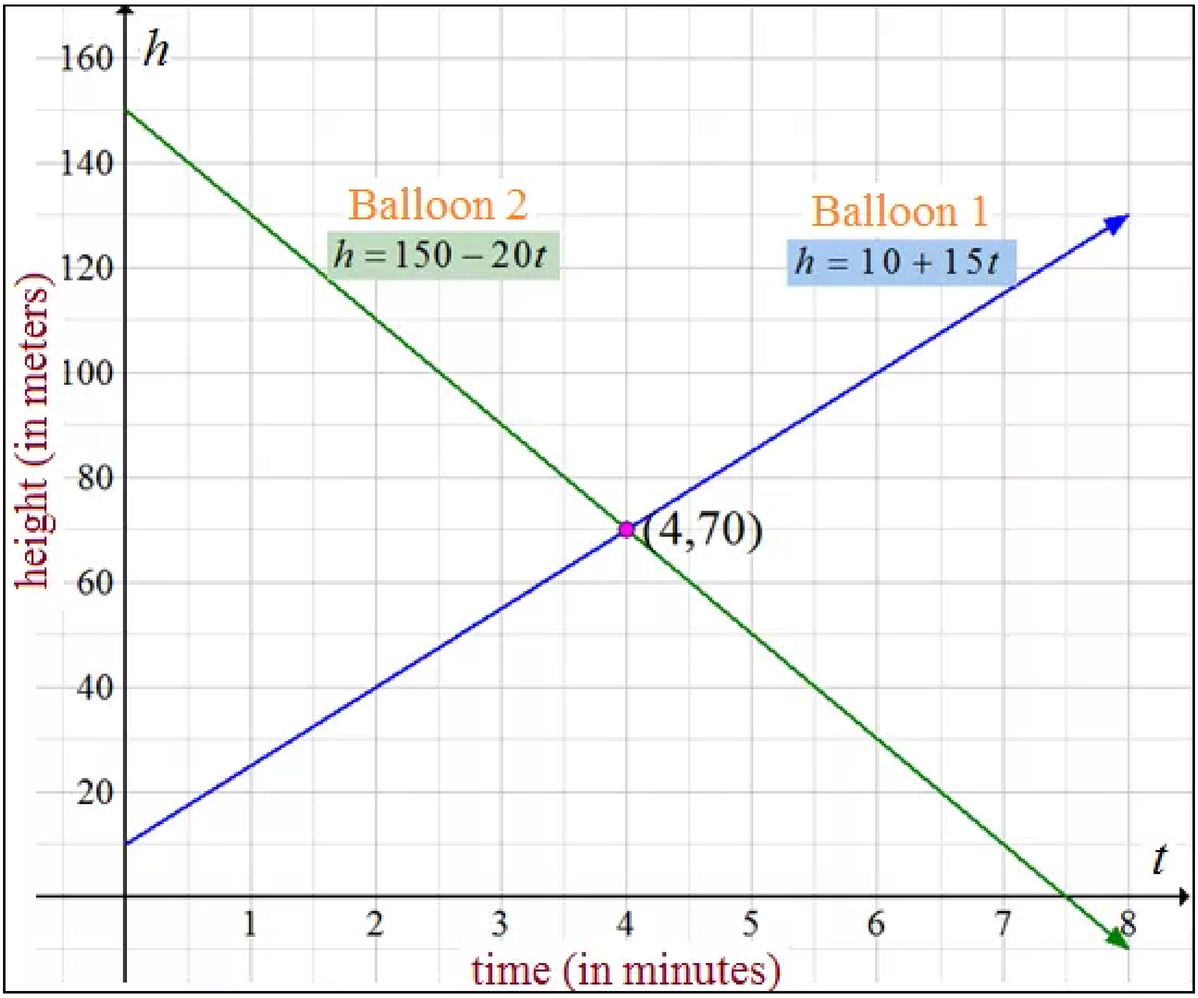
Answer 45PA.

Let h be the height reached by the balloon in the time t minutes

The balloon 1 is 10 meters above the ground and raising 15 meters per minute. Then the equation is $h = 15t + 10$ ...... (1)

The balloon 1 is 150 meters above the ground and decreasing 20 meters per minute. Then the equation is $h = -20t + 150$ ...... (2)

The graphs of the two lines are shown below:



The two lines $h = 15t + 10$ and $h = -20t + 150$ intersect at $(4, 70)$

Hence at $t = 4$ minutes the two balloons reaches the same height and the height is **70 m**

Answer 46PA.

Let *y* be the amount saved by a person and *x* be the number of weeks

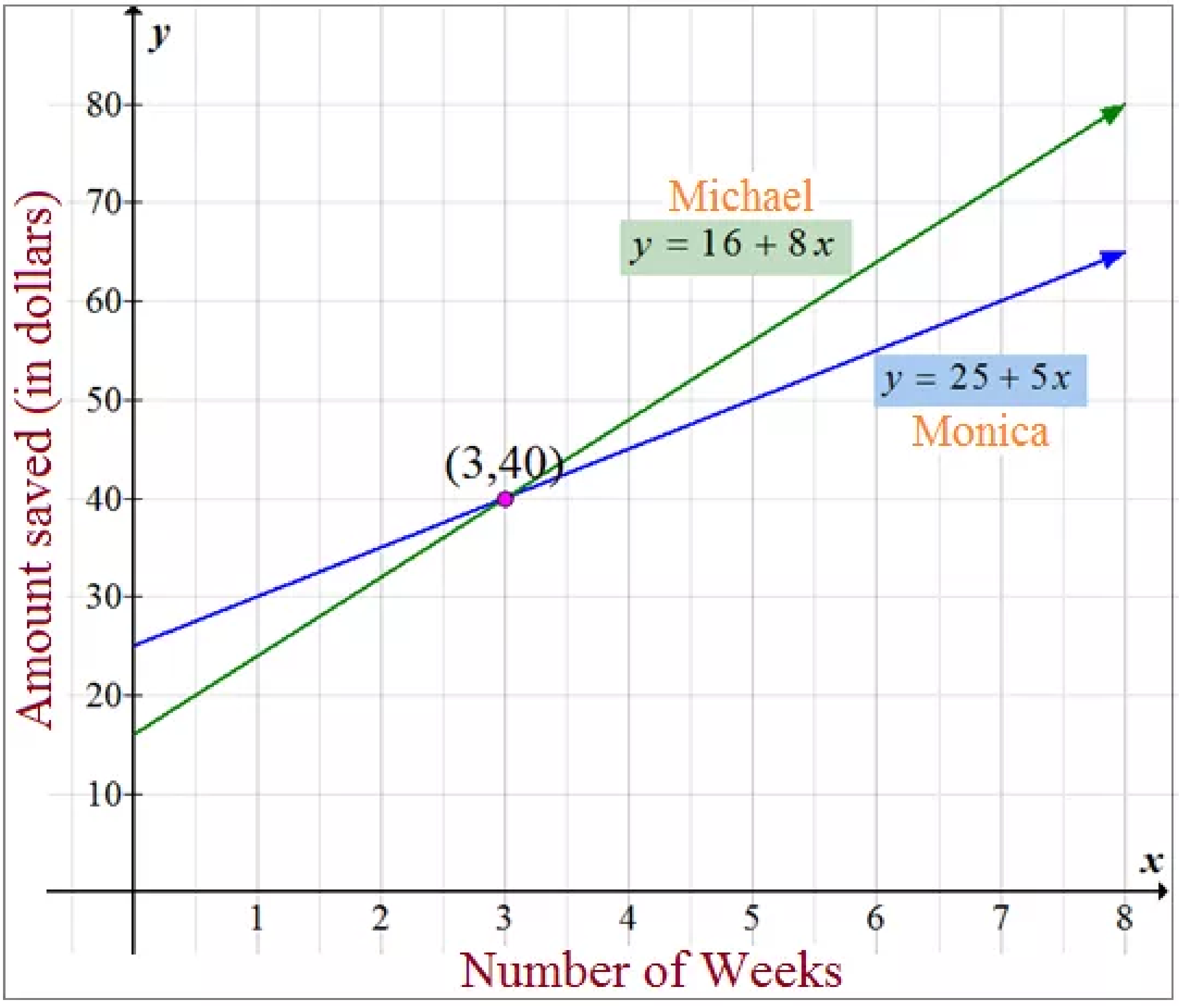
Monica has $25 and has planned to save $5 per week. Then the equation is

$y = 25 + 5x$ ...... (1)

Michael has $16 and has planned to save $8 per week. Then the equation is

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

The graphs of the two lines are shown below:



The two lines $y = 25 + 5x$ and $y = 16 + 8x$ intersect at $(3, 40)$

Hence, after **three** weeks Monica and Michael have saved the same amount

Answer 47PA.

Let *y* be the amount saved by a person and *x* be the number of weeks

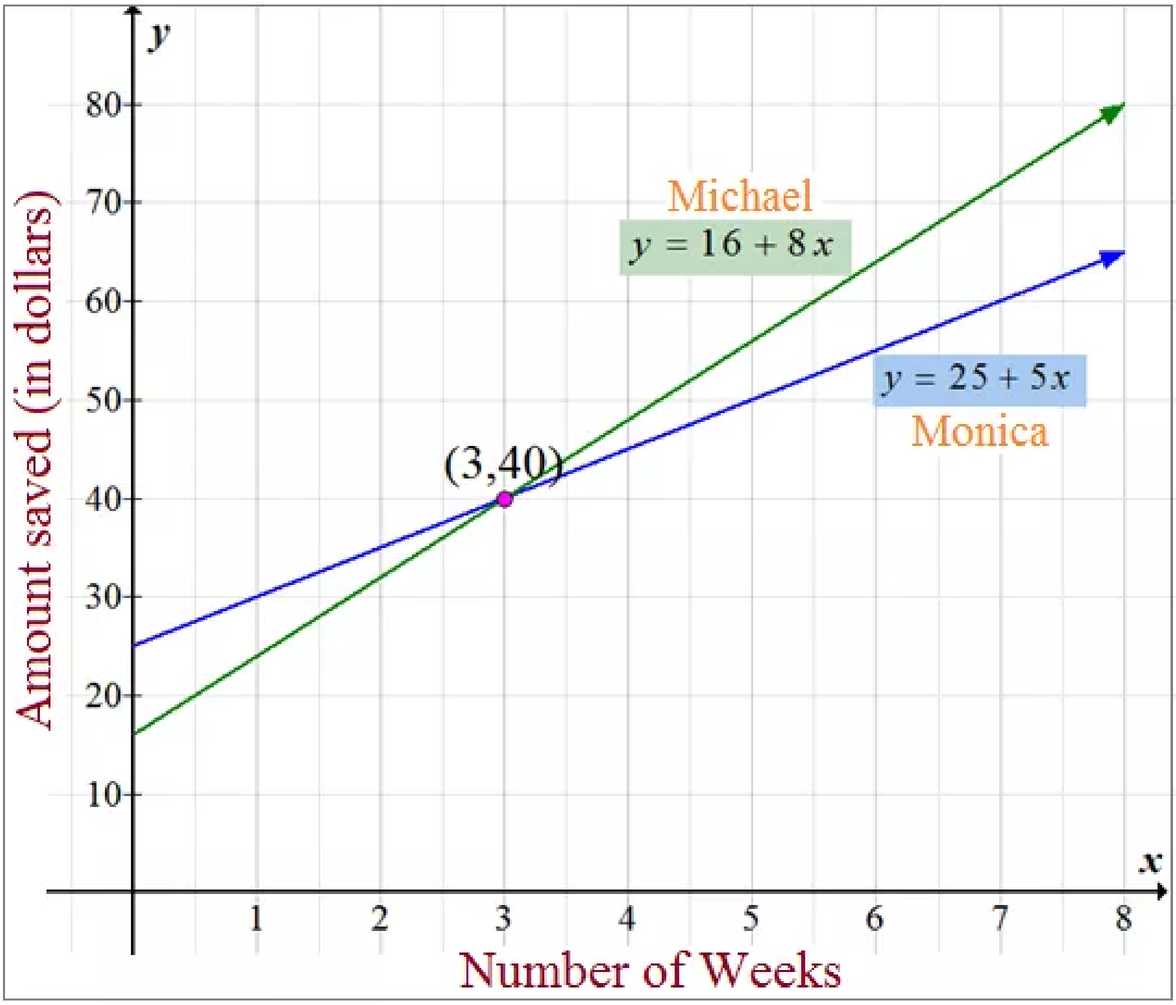
Monica has $25 and has planned to save $5 per week. Then the equation is

$y = 25 + 5x$ ...... (1)

Michael has $16 and has planned to save $8 per week. Then the equation is

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

The graphs of the two lines are shown below:



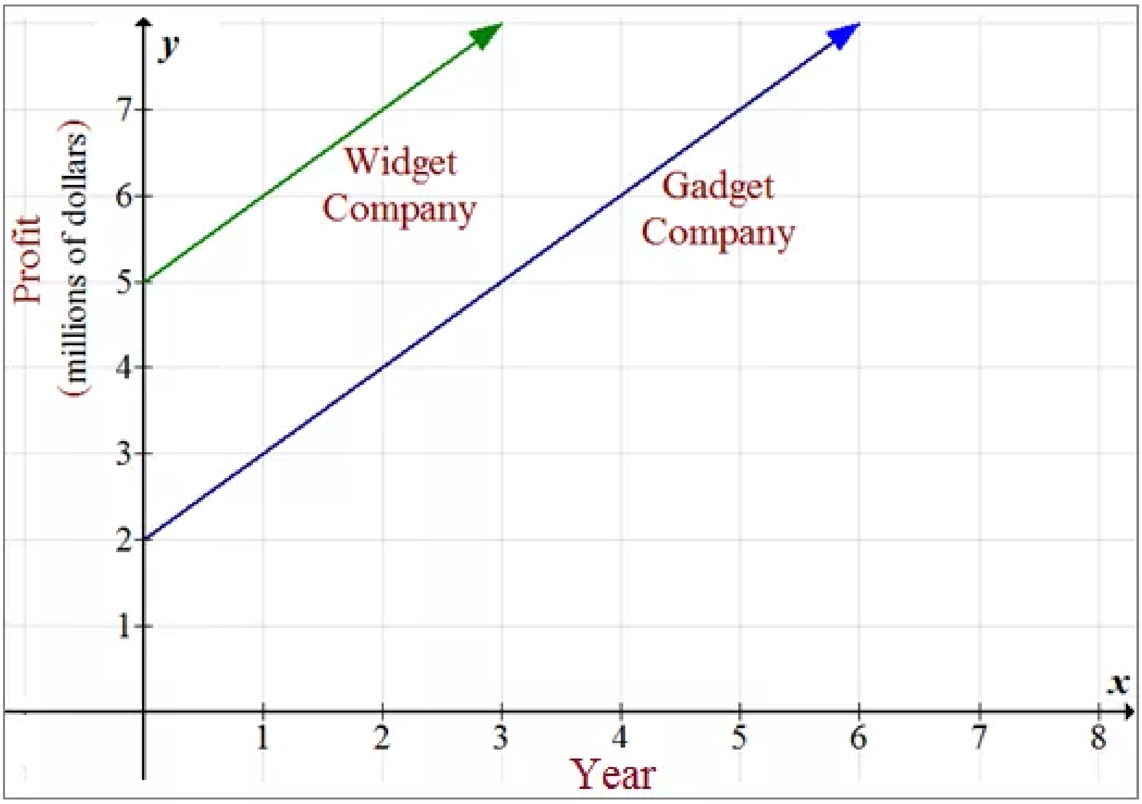
The two lines $y = 25 + 5x$ and $y = 16 + 8x$ intersect at $(3, 40)$

Hence, after **three** weeks Monica and Michael have saved the same amount.

The amount saved by the Monica and Michael after three weeks is **$40**

Answer 48PA.

The graph of Yearly Profits is given below:



From the graph observe the following table:

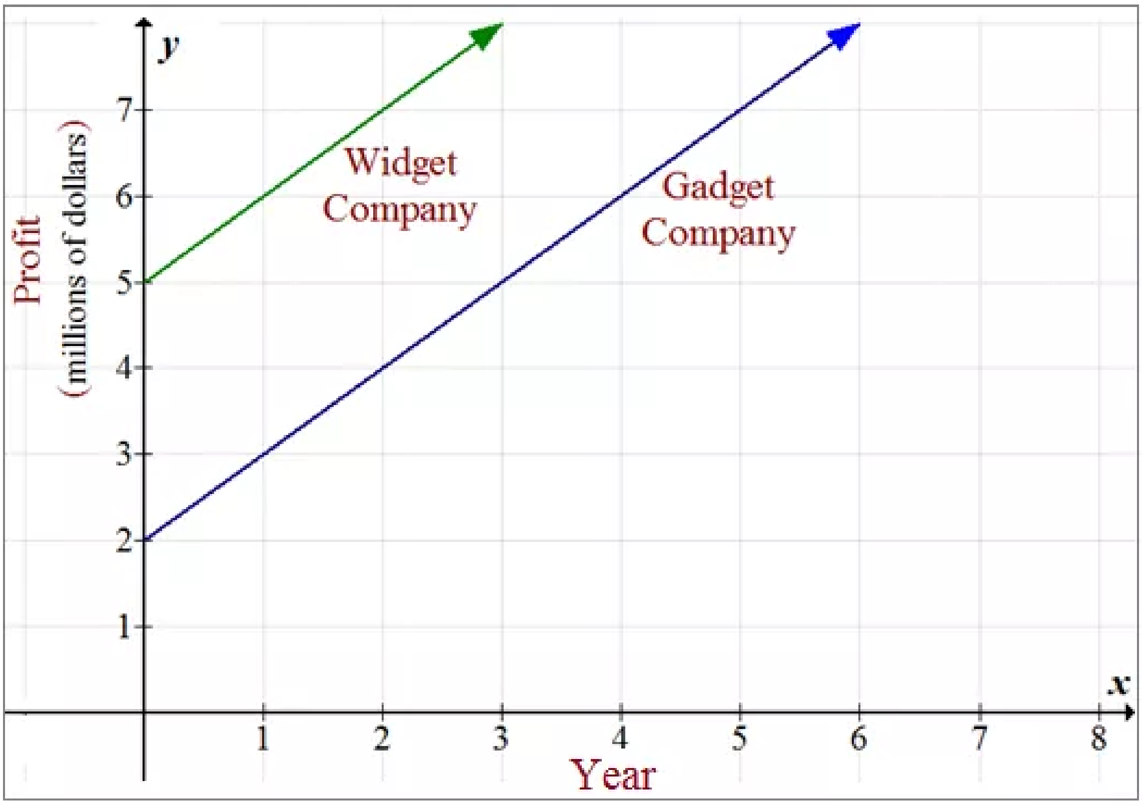
Year	0	2
Widget Company	5	7
Gadget Company	2	4

As the number of years increases, the profit of Widget Company is more when compared with Gadget Company

Hence, **Widget Company** had greater profit during the ten years.

Answer 49PA.

The graph of Yearly Profits is given below:



From the graph observe the following table:

Year	0	2
Widget Company	5	7
Gadget Company	2	4

Slope of the **green** line:

The two points on the **green** line: $(0,5)$ and $(2,7)$

Slope of the **green** line is $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$m=\frac{7-5}{2-0}$$

$$m=\frac{2}{2}$$

$$m=1$$

Slope of the **blue** line:

The two points on the **blue** line: $(0,2)$ and $(2,4)$

Slope of the **blue** line is $m=\frac{y_2-y_1}{x_2-x_1}$

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

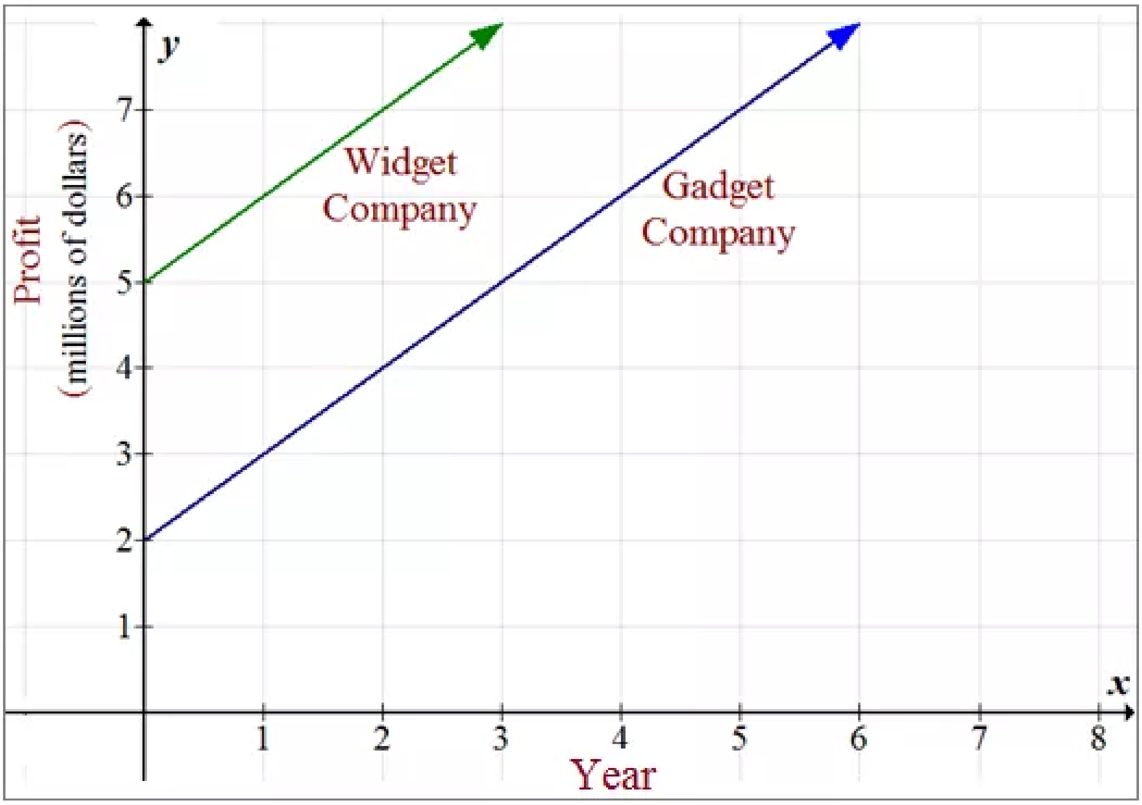
$$m=\frac{2}{2}$$

$$m=1$$

Since the slopes of the two lines are same, so both the companies have the same growth rate.

Answer 50PA.

The graph of Yearly Profits is given below:



From the graph observe the green line and blue lines are parallel.

So, the profits of the two companies will ever be equal.

Answer 51PA.

Let P be the population of the Midwest. And t represents the number of years since 1990.

During the 1990's the population of this area increased an average of about 0.4 million per year.

That is slope of the line is $m = 0.4$

In the year 1990, the population of Midwest is 60 million

The population of Midwest after t years is given by

$$P = 60 + 0.4t$$

Hence equation to represent the population of the Midwest for the years since 1990 is

$$P = 60 + 0.4t$$

Answer 52PA.

Let P be the population of the West. And t represents the number of years since 1990.

During the 1990's the population of this area increased an average of about 1 million per year.

That is slope of the line is $m = 1$

In the year 1990, the population of Midwest is 53 million

The population of West after t years is given by

$$P = 53 + t$$

Hence equation to represent the population of the Midwest for the years since 1990 is

$$P = 53 + t$$

Answer 53PA.

Let P be the population of the Midwest. And t represents the number of years since 1990.

During the 1990's the population of this area increased an average of about 0.4 million per year.

That is slope of the line is $m = 0.4$

In the year 1990, the population of Midwest is 60 million

The population of Midwest after t years is given by

$$P = 60 + 0.4t$$

Hence equation to represent the population of the Midwest for the years since 1990 is

$$P = 60 + 0.4t$$

During the 1990's the population of this area increased an average of about 1 million per year.

That is slope of the line is $m = 1$

In the year 1990, the population of Midwest is 53 million

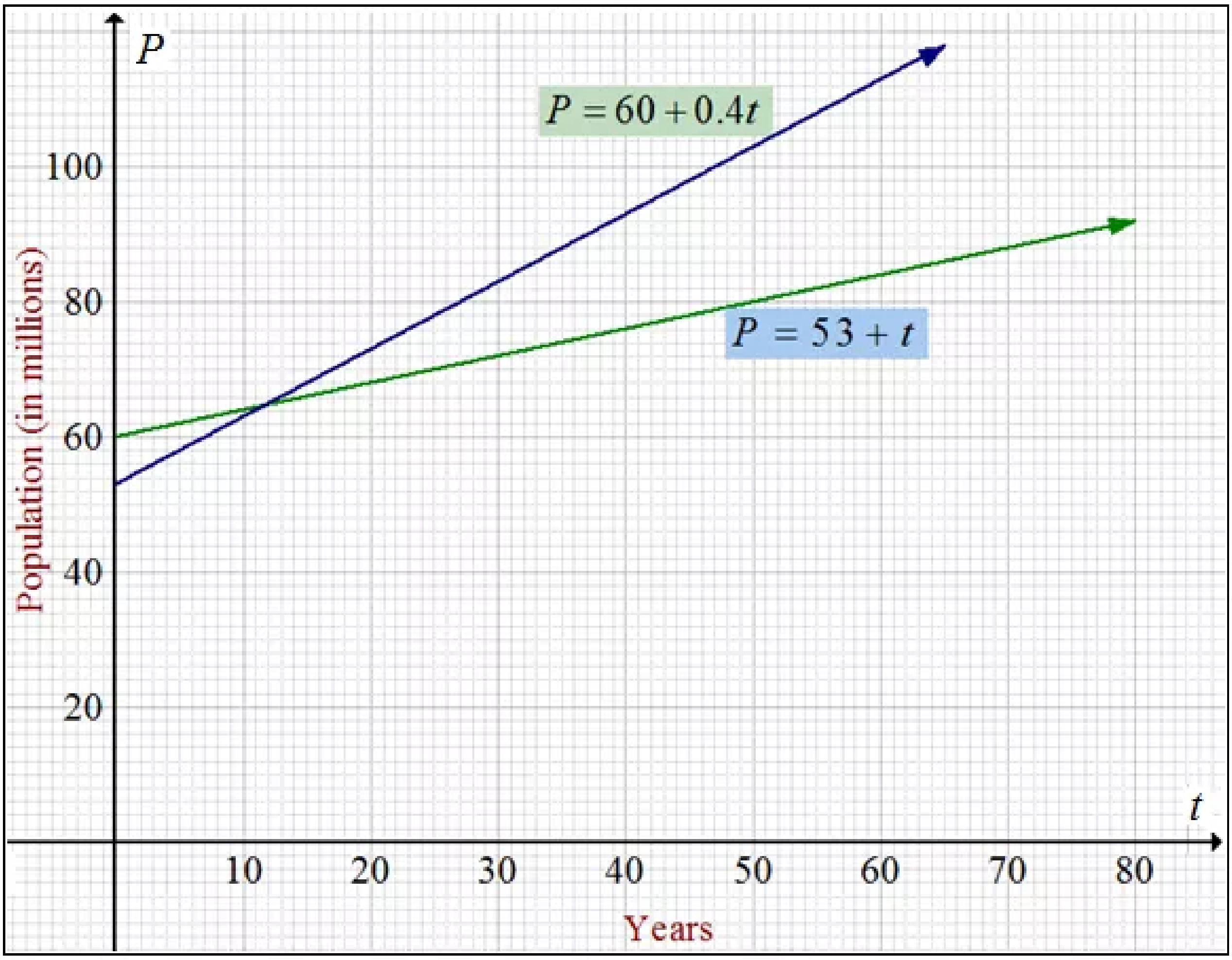
The population of West after *t* years is given by

$P = 53 + t$

Hence equation to represent the population of the Midwest for the years since 1990 is

$P = 53 + t$

Graph of the population equations $P = 60 + 0.4t$ and $P = 53 + t$ are shown below:



Answer 54PA.

If the lines having the same slope, then the lines are parallel

If the rate of growth of each of these area remains the same. Then the Population lines are parallel. That is, the populations of Midwest and west are never be equal

Answer 55PA.

Consider the equation,

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

$Ax + By = 20$ ...... (2)

Since $(2,-3)$ is the intersecting point of the lines, so the point passes from both the lines

The point passes through the line (1)

$$\begin{aligned} Ax + y &= 5 && \text{First equation} \\ A(2)+(-3) &= 5 && \text{Substitute 2 for } x \text{ and } -3 \text{ for } y \\ 2A-3 &= 5 && \text{Simplify} \\ 2A-3+3 &= 5+3 && \text{Add 3 to each side} \end{aligned}$$

$$\begin{aligned} 2A &= 8 && \text{Simplify} \\ \frac{2A}{2} &= \frac{8}{2} && \text{Divide each side with 2} \\ A &= 4 && \text{Simplify} \end{aligned}$$

Since $(2,-3)$ is the intersecting point of the lines, so the point passes from both the lines

The point passes through the line (2)

$$\begin{aligned} Ax + By &= 20 && \text{Second equation} \\ (4)(2)+B(-3) &= 20 && \text{Substitute 2 for } x \text{ and } -3 \text{ for } y \\ 8-3B &= 20 && \text{Simplify} \\ 8-3B+3B &= 20+3B && \text{Add } 3B \text{ to each side} \end{aligned}$$

$$\begin{aligned} 8 &= 20+3B && \text{Simplify} \\ -12 &= 3B && \text{Subtract 20 from each side} \\ \frac{-12}{3} &= \frac{3B}{3} && \text{Divide each side with 3} \\ B &= -4 && \text{Simplify} \end{aligned}$$

Hence the values are $A = 4$ and $B = -4$

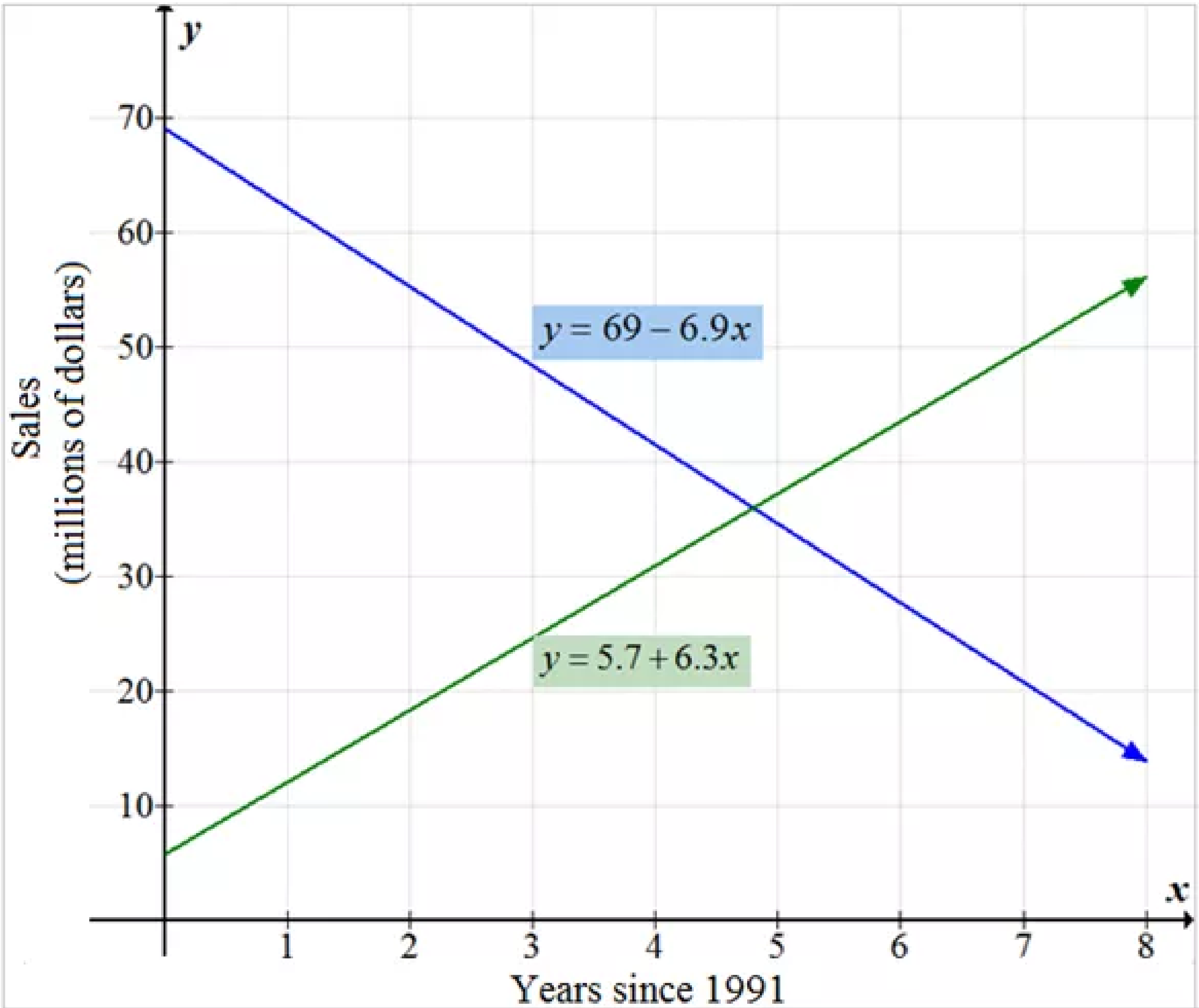
Answer 56PA.

Let x represents the years since 1991 and y represents the sales in millions of dollars

The following equations represent the sales of these singles.

Cassette singles: $y = 69 - 6.9x$

CD singles: $y = 5.7 + 6.3x$



As the year's increases, the sales of the cassettes decrease, whereas the sale of the CD singles increases.

The point at which the two graphs intersect represents the time when the sales of cassette singles equaled the sales of CD singles.

Hence, approximately in the year 1991+5=**1996** the sales of cassette singles equaled the sales of CD singles.

Answer 57PA.

In the option A, the lines are intersecting at one point. So the system of equations has one solution.

Hence option A is wrong

In the option B, the lines are parallel. So the system of equations has **no** solution.

Hence option B is **correct**

In the option C, the two lines are the same. So the system of equations has infinitely many solutions.

Hence option C is wrong

In the option D, the lines are intersecting at one point. So the system of equations has one solution.

Hence option D is wrong

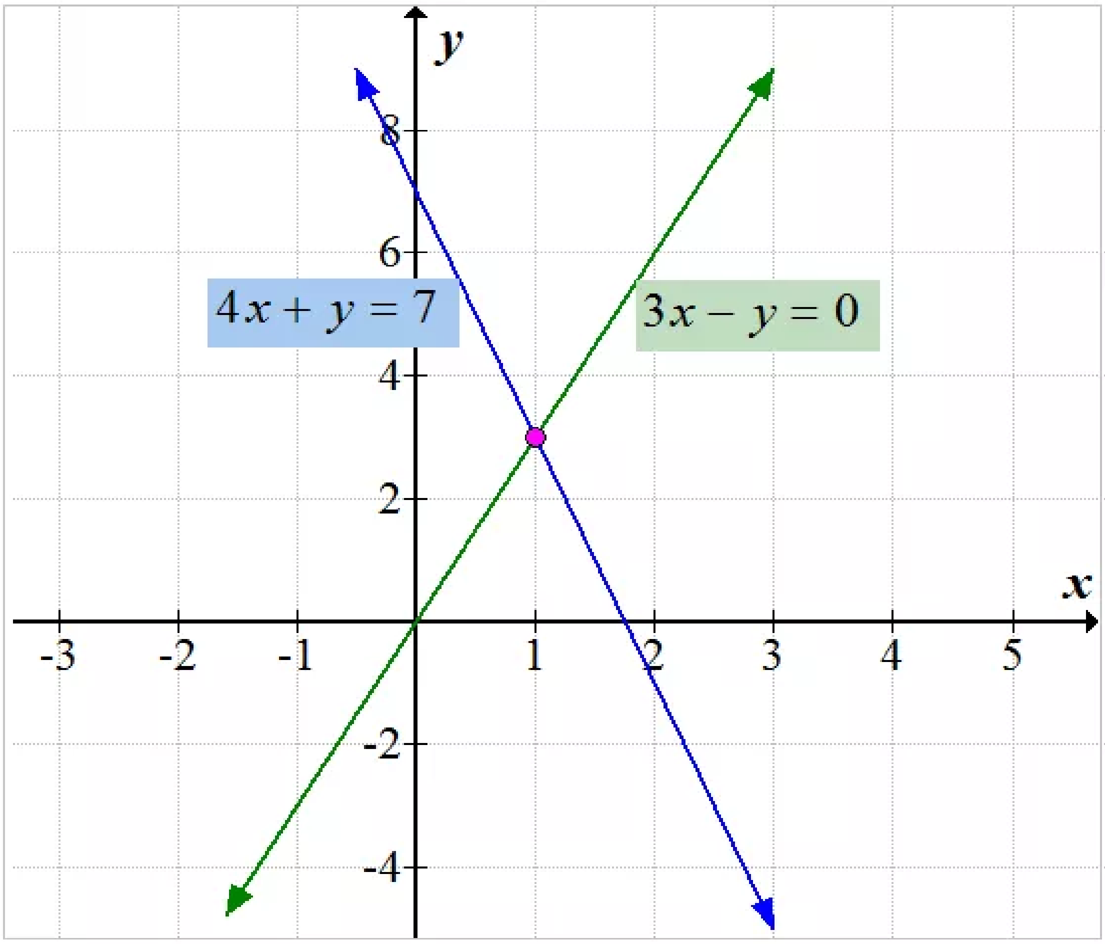
Answer 58PA.

Consider the equations,

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

$3x - y = 0$ ...... (2)

The graphs of $4x + y = 7$ and $3x - y = 0$ is shown below:



The graphs appear to **intersect** at one point. Hence the system has one solution.

Thus the correct option is **B**

Answer 59MYS.

Consider the inequality,

$y \le 2x$ ...... (1)

$$\begin{aligned} &y \le 2x \\ &4 \le 2(1) && \text{Substitute 1 for } x \text{ and 4 for } y \\ &4 \le 2 && FALSE \end{aligned}$$

The point $(1,4)$ does not satisfy the inequality (1)

$$\begin{aligned} &y \le 2x \\ &5 \le 2(-1) && \text{Substitute } -1 \text{ for } x \text{ and 5 for } y \\ &5 \le -2 && FALSE \end{aligned}$$

The point $(-1,5)$ does not satisfy the inequality (1)

$$\begin{aligned} &y \le 2x \\ &-6 \le 2(5) && \text{Substitute 5 for } x \text{ and } -6 \text{ for } y \\ &-6 \le 10 && TRUE \end{aligned}$$

The point $(5,-6)$ satisfy the inequality (1)

$$\begin{aligned} &y \le 2x \\ &0 \le 2(-7) && \text{Substitute } -7 \text{ for } x \text{ and 0 for } y \\ &0 \le -14 && FALSE \end{aligned}$$

The point $(-7,0)$ does not satisfy the inequality (1)

Hence the solution to the inequality (1) is $(5,-6)$

Answer 60MYS.

Consider the inequality,

$y < 8 - 3x$ ...... (1)

$$\begin{aligned} &y < 8 - 3x \\ &2 < 8 - 3(-4) && \text{Substitute } -4 \text{ for } x \text{ and 2 for } y \\ &2 < 8 + 12 && \text{Simplify} \\ &2 < 20 && TRUE \end{aligned}$$

The point $(-4,2)$ satisfy the inequality (1)

$$y < 8 - 3x$$
$$0 < 8 - 3(-3) \quad \text{Substitute } -3 \text{ for } x \text{ and } 0 \text{ for } y$$
$$0 < 8 + 9 \quad \text{Simplify}$$
$$0 < 17 \quad \textit{TRUE}$$

The point $(-3,0)$ satisfy the inequality (1)

$$y < 8 - 3x$$
$$4 < 8 - 3(1) \quad \text{Substitute 1 for } x \text{ and 4 for } y$$
$$4 < 8 - 3 \quad \text{Simplify}$$
$$4 < 5 \quad \textit{TRUE}$$

The point $(1,4)$ satisfy the inequality (1)

$$y < 8 - 3x$$
$$8 < 8 - 3(1) \quad \text{Substitute 1 for } x \text{ and 8 for } y$$
$$8 < 8 - 3 \quad \text{Simplify}$$
$$8 < 5 \quad \textit{FALSE}$$

The point $(1,8)$ does not satisfy the inequality (1)

Hence the solution to the inequality (1) is $\{(-4,2),(-3,0),(1,4)\}$

Answer 62MYS.

Consider the equations,

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

$$y - 1 = 4(x - 5) \quad \text{First equation}$$
$$y - 1 = 4x - 20 \quad \text{Distributive Property}$$
$$y - 1 - y = 4x - 20 - y \quad \text{Subtract } y \text{ from each side}$$
$$-1 = 4x - 20 - y \quad \text{Simplify}$$
$$-1 + 20 = 4x - 20 - y + 20 \quad \text{Add 20 to each side}$$
$$19 = 4x - y \quad \text{Simplify}$$
$$4x - y = 19 \quad \text{Standard form}$$

Hence the standard form of the equation (1) is $4x - y = 19$

Answer 63MYS.

Consider the equations,

$$y+2=\frac{1}{3}(x+3) \text{ ...... (1)}$$

$y+2=\frac{1}{3}(x+3)$	First equation
$(y+2)3=(x+3)$	Multiply each side with 3
$3y+6=x+3$	Distributive Property
$3y+6-3y=x+3-3y$	Subtract $3y$ from each side
$6=x+3-3y$	Simplify
$6-3=x+3-3y-3$	Subtract 3 from each side
$3=x-3y$	Simplify
$x-3y=3$	Standard form

Hence the standard form of the equation (1) is $x-3y=3$

Answer 64MYS.

Consider the equations,

$$y-4=-6(x+2) \text{ ...... (1)}$$

$y-4=-6(x+2)$	First equation
$y-4=-6x-12$	Distributive Property
$y-4+6x=-6x-12+6x$	Add $6x$ to each side
$y-4+6x=-12$	Simplify
$y-4+6x+4=-12+4$	Add 4 to each side
$y+6x=-8$	Simplify
$6x+y=-8$	Standard form

Hence the standard form of the equation (1) is $6x+y=-8$

Answer 65MYS.

Consider the equations,

$12x - y = 10x$ ...... (1)

$12x - y = 10x$	First equation
$12x - y - 10x = 10x - 10x$	Subtract $10x$ from each side
$2x - y = 0$	Simplify
$2x - y + y = 0 + y$	Add y to each side
$2x = y$	Simplify
$y = 2x$	Simplify

Hence $y = 2x$

Answer 66MYS.

Consider the equations,

$6a + b = 2a$ ...... (1)

$6a + b = 2a$	First equation
$6a + b - 2a = 2a - 2a$	Subtract $2a$ from each side
$4a + b = 0$	Combine like terms
$4a + b - b = 0 - b$	Subtract b from each side
$4a = -b$	Simplify
$\frac{4a}{4} = \frac{-b}{4}$	Divide each side with 4
$a = -\frac{b}{4}$	

Hence $a = -\frac{b}{4}$

Answer 67MYS.

Consider the equations,

$$\frac{7m-n}{q}=10 \quad \ldots\ldots (1)$$

$\frac{7m-n}{q}=10$	First equation
$\frac{7m-n}{q}\times q=10\times q$	Multiply each side with q
$7m-n=10q$	Simplify
$\frac{7m-n}{10}=\frac{10q}{10}$	Divide each side with 10
$\frac{7m-n}{10}=q$	Simplify
$q=\frac{7m-n}{10}$	

Hence $q=\frac{7m-n}{}$

Answer 68MYS.

Consider the equations,

$$\frac{5tz-s}{2}=6 \quad \ldots\ldots (1)$$

$\frac{5tz-s}{2}=6$	First equation
$\frac{5tz-s}{2}\times 2=6\times 2$	Multiply each side with 2
$5tz-s=12$	Simplify
$5tz-s+s=12+s$	Add s to each side
$5tz=12+s$	Simplify
$\frac{5tz}{5t}=\frac{12+s}{5t}$	Divide each side with $5t$
$z=\frac{12+s}{5t}$	Simplify

Hence $z=\frac{12+s}{5t}$