Chapter 7. Solving Systems of Linear Equations and Inequalities

Ex. 7.2

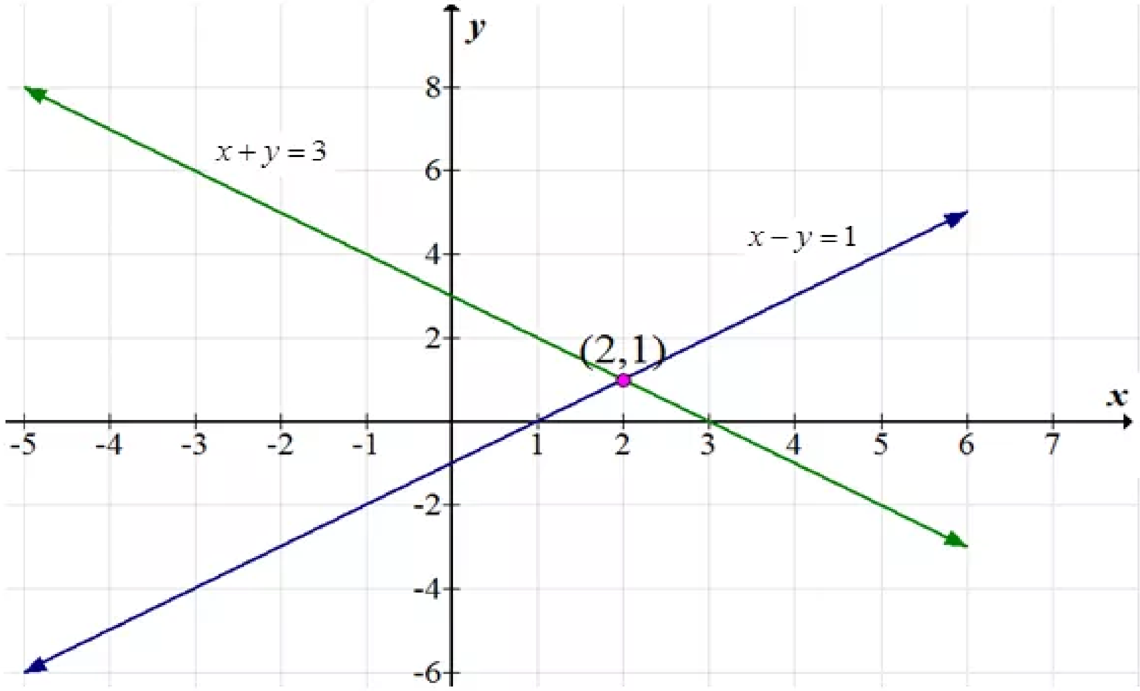
Answer 1PQ.

Consider the equations,

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

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

The graph of the equations is shown below:



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

Check:

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

$$\begin{aligned} x - y &= 1 && \text{Second equation} \\ 2 - 1 &= 1 && \text{Substitue 2 for } x \text{ and 1 for } y \\ 1 &= 1 && \text{Verified} \end{aligned}$$

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

Answer 2CU.

Consider the equations,

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

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

Since $x=4-2y$, substitute $4-2y$ for x in the First equation

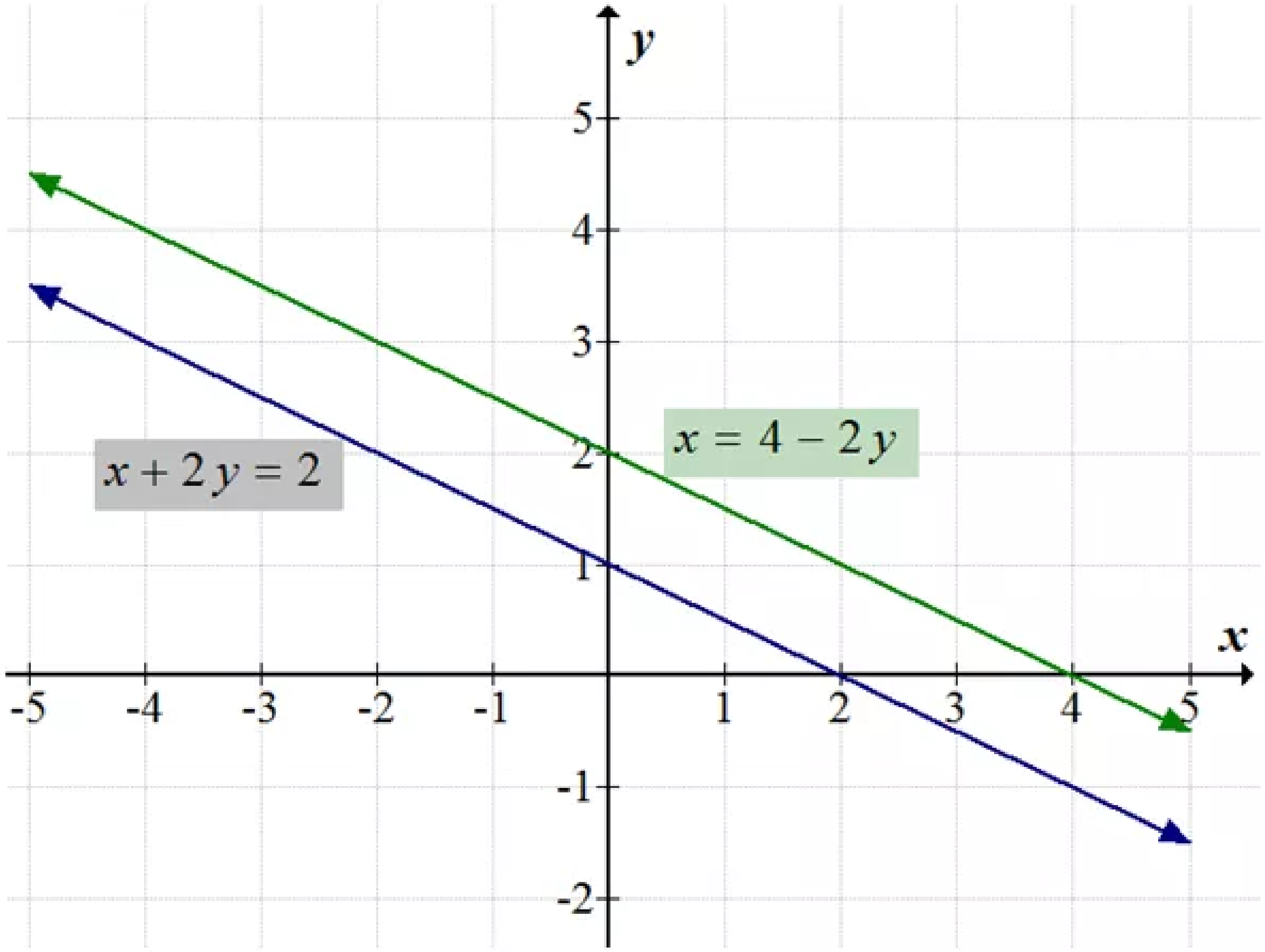
$x+2y=2$ First equation

$4-2y+2y=2$

$4=2$ Simplify

The result is false statement $(4=2)$, the system has **no solution**.

The following graph supports the above conclusion:



The two lines are parallel, and they never intersect. So, the system has no solution.

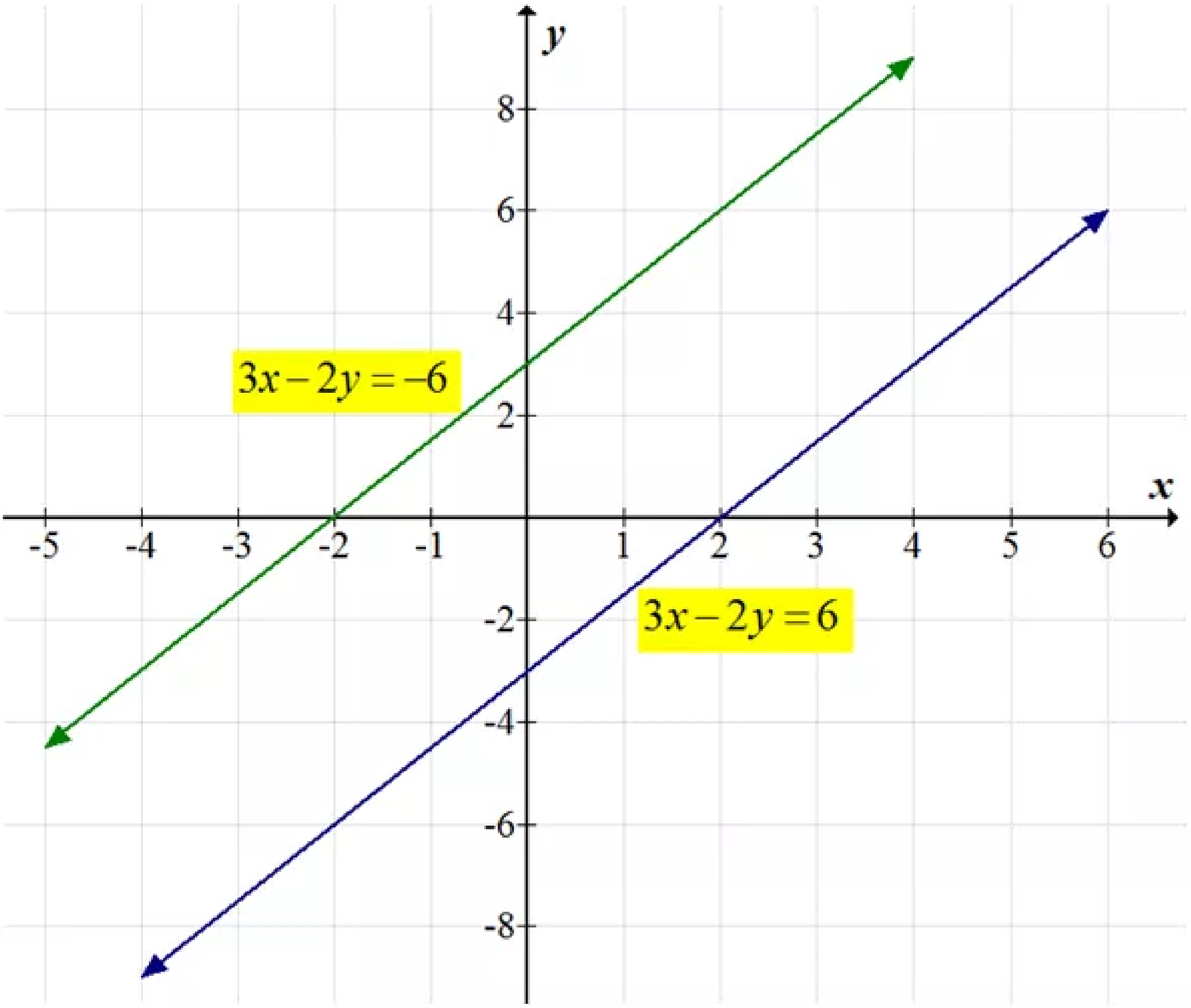
Answer 2PQ.

Consider the equations,

$3x-2y=-6$ ...... (1)

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

The graph of the equations is shown below:



Since the graphs $3x-2y=-6$ and $3x-2y=6$ are parallel, there are **no solution**

Answer 3CU.

Consider the equations,

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

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

Since $y=2-x$, substitute $2-x$ for y in the first equation

$x+y=2$

$x+2-x=2$ Substitute $y=2-x$

$2=2$ Combine like terms

The statement is true. This means that there are many infinitely many solutions of the system of equations.

The slope intercept form of the equation (1) is

$$\begin{aligned} x+y&=2 && \text{First equation} \\ x+y-x&=2-x && \text{Subtract } x \text{ from each side} \\ y&=2-x && \text{Simplify} \end{aligned}$$

The slope intercept form of the equation (2) is

$y=2-x$

Since, the slope intercept forms of both the equations are the same, so the system has **infinitely many solutions**

Answer 3PQ.

Consider the equations,

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

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

Solve the second equation for *y* since the coefficient of *y* is 1

$3x+y=-8$ Second equation

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

$y=-8-3x$ Simplify

Since $y=-8-3x$, substitute $-8-3x$ for y in the first equation

$x+y=0$

$x-8-3x=0$ Substitute $y=-8-3x$

$-2x-8=0$ Combine like terms

$-2x-8+8=0+8$ Add 8 to each side

$-2x=8$ Simplify

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

$x=-4$ Simplify

Substitute $x=-4$ in the equation $y=-8-3x$

$y=-8-3x$

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

$y=-8+12$ Simplify

$y=4$ Simplify

Hence the solution is $(-4,4)$

Answer 4CU.

Consider the equations,

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

$4x+2y=15$ ...... (2)

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

$4(2y)+2y=15$

$8y+2y=15$ Simplify

$10y=15$ Combine like terms

$y=\frac{15}{10}$ Divide each side with 10

$y=\frac{3}{2}$ Simplify

Use $x = 2y$ to find the value of x

$x = 2y$

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

$x = 3$ Simplify

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

Answer 4PQ.

Consider the equations,

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

$3x - 5y = 8$ ...... (2)

Solve the first equation for *x* since the coefficient of *x* is 1

$x - 2y = 5$ First equation

$x - 2y + 2y = 5 + 2y$ Add $2y$ from each side

$x = 5 + 2y$ Simplify

Since $x = 5 + 2y$, substitute $5 + 2y$ for x in the second equation

$3x - 5y = 8$

$3(5 + 2y) - 5y = 8$ Substitute $x = 5 + 2y$

$15 + 6y - 5y = 8$ Use the distributive property

$15 + y = 8$ Simplify

$15 + y - 15 = 8 - 15$ Subtract 15 from each side

$y = -7$ Simplify

Substitute $y = -7$ in the equation $x = 5 + 2y$

$x = 5 + 2y$

$x = 5 + 2(-7)$ Substitute $y = -7$

$x = 5 - 14$ Simplify

$x = -9$ Simplify

Hence the solution is $(-9, -7)$

Answer 5CU.

Consider the equations,

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

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

Since $y = 3x - 8$, substitute $3x - 8$ for y in the second equation

$3x - 8 = 4 - x$

$3x - 8 + x = 4 - x + x$ Add x to each side

$4x - 8 = 4$ Combine like terms

$4x - 8 + 8 = 4 + 8$ Add 8 to each side

$4x = 12$ Simplify

$x = \frac{12}{4}$ Divide each side with 4

$x = 3$ Simplify

Use $y = 3x - 8$ to find the value of y

$y = 3x - 8$

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

$y = 9 - 8$ Simplify

$y = 1$

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

Answer 5PQ.

Consider the equations,

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

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

Since $y = 2 - x$, substitute $2 - x$ for y in the first equation

$x + y = 2$

$x + 2 - x = 2$ Substitute $y = 2 - x$

$2 = 2$ Combine like terms

The statement is true. This means that there are many infinitely many solutions of the system of equations.

The slope intercept form of the equation (1) is

$x + y = 2$ First equation

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

$y = 2 - x$ Simplify

The slope intercept form of the equation (2) is

$y = 2 - x$

Since, the slope intercept forms of both the equations are the same, so the system has **infinitely many solutions**

Answer 6CU.

Consider the equations,

$2x + 7y = 3$ ...... (1)

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

Since $x = 1 - 4y$, substitute $1 - 4y$ for x in the first equation

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

$2 - 8y + 7y = 3$ Use Distributive property

$2 - y = 3$ Combine like terms

$2 - y - 2 = 3 - 2$ Subtract 2 from each side

$-y = 1$ Simplify

$-y \times -1 = 1 \times -1$ Multiply each side with -1

$y = -1$ Simplify

Use $x = 1 - 4y$ to find the value of y

$x = 1 - 4y$

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

$x = 1 + 4$ Simplify

$x = 5$

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

Answer 7CU.

Consider the equations,

$6x-2y=-4$ ...... (1)

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

Since $y=3x+2$, substitute $3x+2$ for y in the first equation

$6x-2y=-4$

$6x-2(3x+2)=-4$

$6x-6x-4=-4$ Use Distributive property

$-4=-4$ Combine like terms

The statement is true. This means that there are infinitely many solutions of the system of equations.

The Slope intercept form of equation (1)

$$\begin{aligned} 6x-2y&=-4 \\ 6x+4&=2y \\ 3x+2&=y \\ y&=3x+2 \end{aligned}$$

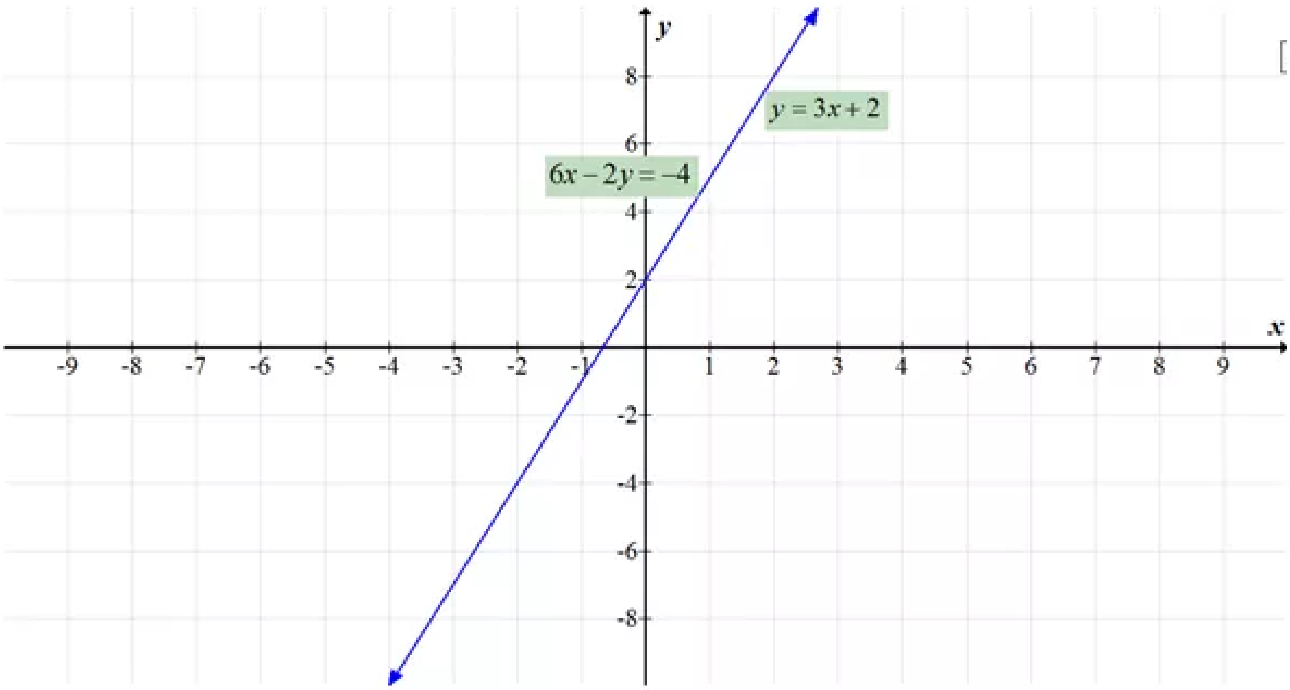
The Slope intercept form of equation (2)

$y=3x+2$

This is true because the slope intercept form of both equations is $y=3x+2$

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

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



Hence the system of equations has **infinitely many solutions**

Answer 8CU.

Consider the equations,

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

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

Solve the second equation for x since the coefficient of x is 1

$x - y = 8$ Second equation

$x - y + y = 8 + y$ Add y to each side

$x = 8 + y$ Simplify

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

$8 + y + 3y = 12$

$8 + 4y = 12$ Combine like terms

$8 + 4y - 8 = 12 - 8$ Subtract 8 from each side

$4y = 4$ Simplify

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

$y = 1$ Simplify

Use $x = 8 + y$ to find the value of y

$x = 8 + y$

$x = 8 + 1 \quad y = 1$

$x = 9$ Simplify

The solution is $\boxed{(9,1)}$

Answer 9CU.

Consider the equations,

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

$3x - 5y = 15$ ...... (2)

Since, $y = \frac{3}{5}x$, substitute $\frac{3}{5}x$ for y in the second equation

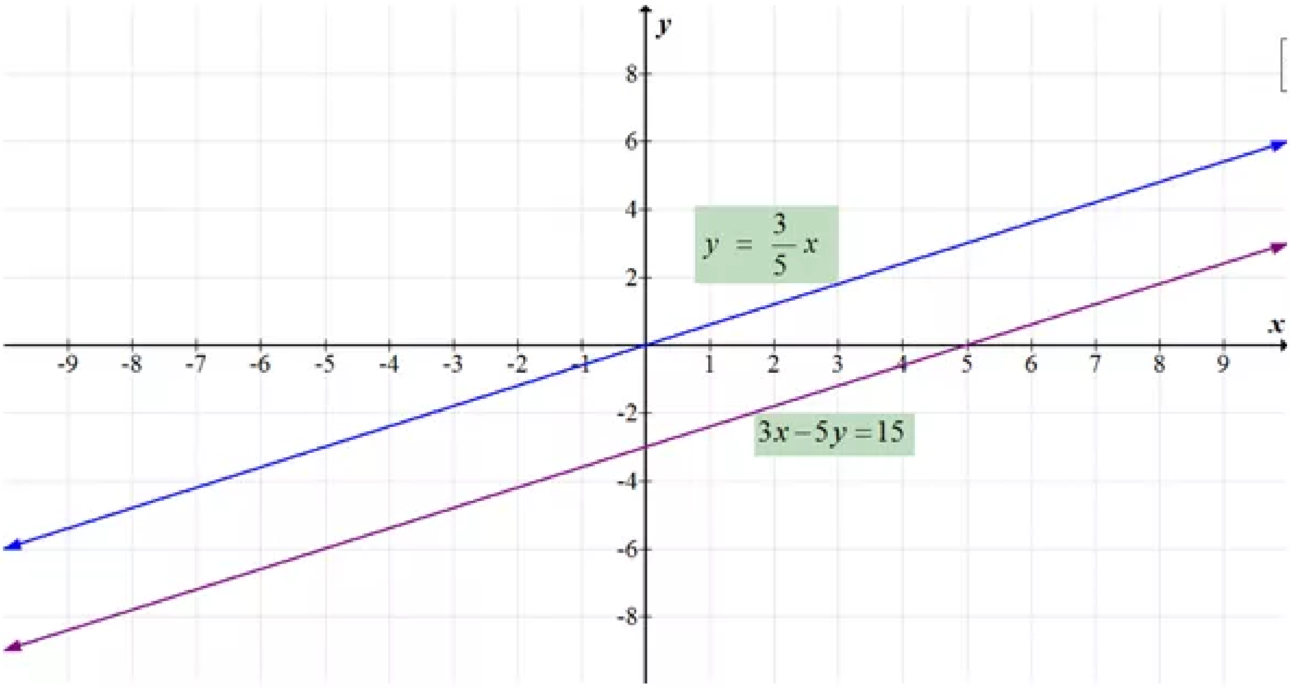
$3x - 5\left(\frac{3}{5}x\right) = 15$

$3x - 3x = 15$ Simplify

$0 = 15$ The statement is **FALSE**

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

The graphs of $y = \frac{3}{5}x$ and $3x - 5y = 15$ is shown below:



From the graph observe that the two lines $y = \frac{3}{5}x$ and $3x - 5y = 15$ are parallel. These lines never intersect. Hence the system of equations has no solution.

Answer 11P.

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 $\boxed{(2,10)}$

Answer 12PA.

Consider the equations,

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

$2x + 3y = 44$ ...... (2)

Since $x = 4y$, substitute $4y$ for x in the second equation

$2(4y) + 3y = 44$

$8y + 3y = 44$ Simplify

$11y = 44$ Combine like terms

$y = \frac{44}{11}$ Divide each side with 11

$y = 4$ Simplify

Use $x=4y$ to find the value of x

$x=4y$

$x=4(4)$ $y=4$

$x=16$ Simplify

The solution is $\boxed{(16,4)}$

Answer 13PA.

Consider the equations,

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

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

Since $x=4y+5$, substitute $3y-2$ for x in the second equation

$4y+5=3y-2$

$4y+5-3y=-2$ Subtract $3y$ from each side

$4y-3y=-2-5$ Subtract 5 from each side

$y=-7$ Combine like terms

Use $x=4y+5$ to find the value of x

$x=4y+5$

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

$x=-28+5$ Simplify

$x=-23$

The solution is $\boxed{(-23,-7)}$

Answer 14PA.

Consider the equations,

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

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

Since $y = 2x + 3$, substitute $2x + 3$ for y in the second equation

$2x + 3 = 4x - 1$

$2x + 3 - 4x = -1$ Subtract $4x$ from each side

$2x - 4x = -1 - 3$ Subtract 3 from each side

$-2x = -4$ Combine like terms

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

$x = 2$ Simplify

Use $y = 2x + 3$ to find the value of y

$y = 2x + 3$

$y = 2(2) + 3 \quad x = 2$

$y = 4 + 3$ Simplify

$y = 7$

The solution is $\boxed{(2,7)}$

Answer 15PA.

Consider the equations,

$4c = 3d + 3$ ...... (1)

$c = d - 1$ ...... (2)

Since $c = d - 1$, substitute $d - 1$ for c in the first equation

$4(d - 1) = 3d + 3$

$4d - 4 = 3d + 3$ Use the Distributive property

$4d - 4 - 3d = 3$ Subtract $3d$ from each side

$4d - 3d = 3 + 4$ Add 4 from each side

$d = 7$ Combine like terms

Use $c=d-1$ to find the value of c

$c=d-1$

$c=7-1 \quad d=7$

$c=6$ Simplify

The solution is $\boxed{(6,7)}$

Answer 16PA.

Consider the equations,

$4x+5y=11$ ...... (1)

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

Since $y=3x-13$, substitute $3x-13$ for y in the first equation

$4x+5(3x-13)=11$

$4x+15x-65=11$ Use the Distributive property

$4x+15x=11+65$ Add 65to each side

$19x=76$ Combine like terms

$x=\frac{76}{19}$ Divide each side with 19

$x=4$ Simplify

Use $y=3x-13$ to find the value of y

$y=3x-13$

$y=3(4)-13 \quad x=4$

$y=12-13$ Simplify

$y=-1$ Simplify

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

Answer 17PA.

Consider the equations,

$8x+2y=13$ ...... (1)

$4x+y=11$ ...... (2)

Solve the second equation for *y* since the coefficient of *y* is 1

$4x+y=11$ Second equation

$4x+y-4x=11-4x$ Subtract $4x$ from each side

$y=11-4x$ Simplify

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

$8x+2(11-4x)=13$

$8x+22-8x=13$ Use the Distributive property

$22=13$ **This is not possible**

Since, the result $(22=13)$ is false, so the system of equations has **no solution**

Answer 18PA.

Consider the equations,

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

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

Solve the second equation for *y* since the coefficient of *y* is 1

$-3x+y=-9$ Second equation

$-3x+y+3x=-9+3x$ Add $3x$ to each side

$y=3x-9$ Simplify

Since $y=3x-9$, substitute $3x-9$ for y in the first equation

$2x-(3x-9)=-4$

$2x-3x+9=-4$ Use the Distributive property

$-x+9=-4$ Combine like terms

$-x+9-9=-4-9$ Subtract 9 from each side

$-x=-13$ Combine like terms

$x=13$ Multiply each side with -1

Use $y=3x-9$ to find the value of y

$y=3x-9$

$y=3(13)-9 \quad x=13$

$y=39-9$ Simplify

$y=30$ Simplify

The solution is $\boxed{(13,30)}$

Answer 19PA.

Consider the equations,

$3x-5y=11$ ...... (1)

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

Solve the second equation for *x* since the coefficient of *x* is 1

$x-3y=1$ Second equation

$x-3y+3y=1+3y$ Add to each side

Simplify

Since $x=1+3y$, substitute $1+3y$ for x in the first equation

$3(1+3y)-5y=11$

$3+9y-5y=11$ Use the Distributive property

$3+4y=11$ Combine like terms

$3+4y-3=11-3$ Subtract 9 from each side

$4y=8$ Combine like terms

$y=\frac{8}{4}$ Divide each side with 4

$y=2$ Simplify

Use $x=1+3y$ to find the value of y

$x=1+3y$

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

$x=1+6$ Simplify

$x=7$ Simplify

The solution is $\boxed{(7,2)}$

Answer 20PA.

Consider the equations,

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

$-3x+y=15$ ...... (2)

Solve the second equation for *y* since the coefficient of *y* is 1

$-3x+y=15$ Second equation

$-3x+y+3x=15+3x$ Add $3x$ to each side

$y=3x+15$ Simplify

Since $y=3x+15$, substitute $3x+15$ for y in the first equation

$2x+3(3x+15)=1$

$2x+9x+45=1$ Use the Distributive property

$11x+45=1$ Combine like terms

$11x+45-45=1-45$ Subtract 9 from each side

$11x=-44$ Combine like terms

$x=-\frac{44}{11}$ Multiply each side with 11

$x=-4$ Simplify

Use $y=3x+15$ to find the value of y

$y=3x+15$

$y=3(-4)+15 \quad x=-4$

$y=-12+15$ Simplify

$y=3$ Simplify

The solution is $\boxed{(-4,3)}$

Answer 21PA.

Consider the equations,

$c - 5d = 2$ ...... (1)

$2c + d = 4$ ...... (2)

Solve the second equation for *d* since the coefficient of *d* is 1

$2c + d = 4$ Second equation

$2c + d - 2c = 4 - 2c$ Subtract $2c$ from each side

$d = 4 - 2c$ Simplify

Since $d = 4 - 2c$, substitute $4 - 2c$ for d in the first equation

$c - 5(4 - 2c) = 2$

$c - 20 + 10c = 2$ Use the Distributive property

$-20 + 11c = 2$ Combine like terms

$-20 + 11c = 20 + 2$ Add 20 to each side

$11c = 22$ Combine like terms

$c = \frac{22}{11}$ Divide each side with 11

$c = 2$ Simplify

Use $d = 4 - 2c$ to find the value of c

$d = 4 - 2c$

$d = 4 - 2(2)$ $c = 2$

$d = 4 - 4$ Simplify

$d = 0$ Simplify

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

Answer 22PA.

Consider the equations,

$5r - s = 5$ ...... (1)

$-4r + 5s = 17$ ...... (2)

Solve the first equation for s since the coefficient of s is 1

$5r - s = 5$ First equation

$5r - s - 5r = 5 - 5r$ Subtract $5r$ from each side

$-s = 5 - 5r$ Simplify

$s = 5r - 5$

Since $s = 5r - 5$, substitute $5r - 5$ for s in the second equation

$-4r + 5(5r - 5) = 17$

$-4r + 25r - 25 = 17$ Use the Distributive property

$21r - 25 = 17$ Combine like terms

$21r - 25 + 25 = 17 + 25$ Add 25 to each side

$21r = 42$ Combine like terms

$r = \frac{42}{21}$ Divide each side with 21

$r = 2$ Simplify

Use $s = 5r - 5$ to find the value of s

$s = 5r - 5$

$s = 5(2) - 5 \quad r = 2$

$s = 10 - 5$ Simplify

$s = 5$ Simplify

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

Answer 23PA.

Consider the equations,

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

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

Solve the second equation for *x* since the coefficient of *x* is 1

$x+2y=6$ Second equation

$x+2y-2y=6-2y$ Add $2y$ to each side

$x=6-2y$ Combine like terms

Since $x=6-2y$, substitute $6-2y$ for x in the first equation

$3(6-2y)-2y=12$

$18-6y-2y=12$ Use the Distributive property

$18-8y=12$ Combine like terms

$18-8y-18=12-18$ Subtract 18 from each side

$-8y=-6$ Combine like terms

$y=\frac{-6}{-8}$ Divide each side with -8

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

Use $x=6-2y$ to find the value of y

$x=6-2y$

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

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

$x=\frac{9}{2}$ Simplify

The solution is $\boxed{\left(\frac{9}{2},\frac{3}{4}\right)}$

Answer 24PA.

Consider the equations,

$x-3y=0$ ...... (1)

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

Solve the first equation for *x* since the coefficient of *x* is 1

$x-3y=0$ First equation

$x-3y+3y=0+3y$ Add $3y$ to each side

$x=3y$ Combine like terms

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

$3(3y)+y=7$

$9y+y=7$ Simplify

$10y=7$ Combine like terms

$y=\frac{7}{10}$ Divide each side with 10

$y=0.7$ Simplify

Use $x=3y$ to find the value of y

$x=3y$

$x=3(0.7)$ $y=0.7$

$x=2.1$ Simplify

The solution is $\boxed{(2.1,0.7)}$

Answer 25PA.

Consider the equations,

$-0.3x + y = 0.5$ ...... (1)

$0.5x - 0.3y = 1.9$ ...... (2)

Solve the first equation for y since the coefficient of y is 1

$-0.3x + y = 0.5$ First equation

$-0.3x + y + 0.3x = 0.5 + 0.3x$ Add $3y$ to each side

$y = 0.5 + 0.3x$ Combine like terms

Since $y = 0.5 + 0.3x$, substitute $0.5 + 0.3x$ for y in the second equation

$0.5x - 0.3(0.5 + 0.3x) = 1.9$

$0.5x - 0.15 - 0.09x = 1.9$ Use the Distributive law

$0.41x - 0.15 = 1.9$ Combine like terms

$0.41x - 0.15 + 0.15 = 1.9 + 0.15$ Add 0.15 to each side

$0.41x = 2.05$ Simplify

$x = \frac{2.05}{0.41}$ Divide each side with 0.41

$x = 5$ Simplify

Use $y = 0.5 + 0.3x$ to find the value of y

$y = 0.5 + 0.3x$

$y = 0.5 + 0.3(5)$ $x = 5$

$y = 0.5 + 1.5$ Simplify

$y = 2.0$

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

Answer 26PA.

Consider the equations,

$0.5x-2y=17$ ...... (1)

$2x+y=104$ ...... (2)

Solve the second equation for *y* since the coefficient of *y* is 1

$2x+y=104$ First equation

$2x+y-2x=104-2x$ Add $2x$ to each side

$y=104-2x$ Combine like terms

Since $y=104-2x$, substitute $104-2x$ $0.5+0.3x$ for y in the first equation

$0.5x-2(104-2x)=17$

$0.5x-208+4x=17$ Use the Distributive law

$-208+4.5x=17$ Combine like terms

$-208+4.5x+208=17+208$ Add 208 to each side

$4.5x=225$ Simplify

$x=\frac{225}{4.5}$ Divide each side with 4.5

$x=50$ Simplify

Use $y=104-2x$ to find the value of y

$y=104-2x$

$y=104-2(50)$ $x=50$

$y=104-100$ Simplify

$y=4$

The solution is $\boxed{(50,4)}$

Answer 27PA.

Consider the equations,

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

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

Since $y = 2x - 1$, substitute $y = \frac{1}{2}x + 3$ for y in the second equation

$2x - 1 = \frac{1}{2}x + 3$

$2x - 1 - \frac{1}{2}x = \frac{1}{2}x + 3 - \frac{1}{2}x$ Subtract $\frac{1}{2}x$ from each side

$-1 + \frac{3}{2}x = 3$ Combine like terms

$-1 + \frac{3}{2}x + 1 = 3 + 1$ Add 1 to each side

$\frac{3}{2}x = 4$ Simplify

$\frac{3}{2}x \times 2 = 4 \times 2$ Multiply each side with 2

$3x = 8$ Simplify

$x = \frac{8}{3}$ Divide each side with 3

Use $y = 2x - 1$ to find the value of y

$y = 2x - 1$

$y = 2\left(\frac{8}{3}\right) - 1 \quad x = \frac{8}{3}$

$y = \frac{16}{3} - 1$ Simplify

$y = \frac{13}{3}$ Simplify

The solution is $\boxed{\left(\frac{8}{3}, \frac{13}{3}\right)}$

Answer 28PA.

Consider the equations,

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

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

Since $x=\frac{1}{2}y+3$, substitute $\frac{1}{2}y+3$ for x in the second equation

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

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

$6=6$ Combine like terms

The statement is true. This means that there are infinitely many solutions of the system of equations.

The Slope intercept form of equation (1)

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

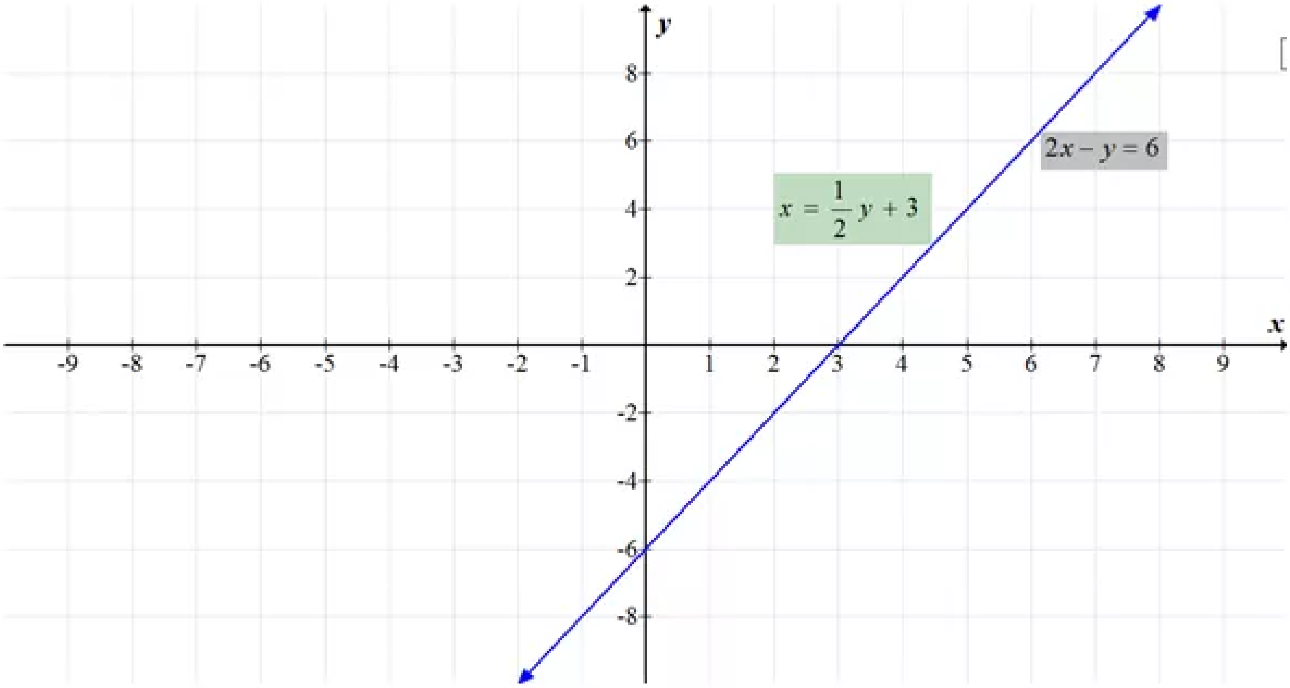
The Slope intercept form of equation (2)

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

This is true because the slope intercept form of both equations is $y=2x-6$

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

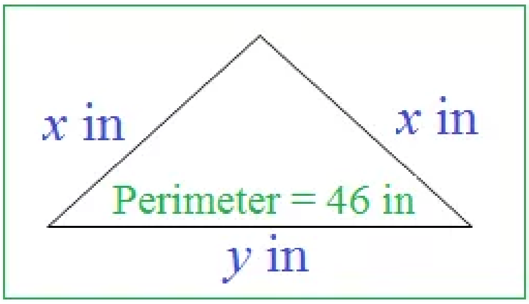
That is, the equations are equivalent, and have the same graph.



Hence the system od equations has **infinitely many solutions**

Answer 29PA.

Consider the following figure,



The base of the triangle is 4 inches longer than the length of the other side

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

The Perimeter of the triangle is the sum of all sides of the triangle

That is $x + x + y = 46$ or $2x + y = 46$ ...... (2)

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

$2x + y = 46$

$2x + x + 4 = 46$

$3x + 4 = 46$ Combine like terms

$3x + 4 - 4 = 46 - 4$ Subtract 4 from each side

$3x = 42$ Simplify

$x = \frac{42}{3}$ Divide each side with 3

$x = 14$ Simplify

Use $y = x + 4$ to find the value of *y*

$y = x + 4$ Equation (1)

$y = 14 + 4$ $x = 14$

$y = 18$ Simplify

Hence, the length of the **base** of the triangle is **18 inches** and its **side** is **14 inches**

Answer 30PA.

Let the number of pounds of sun flower seeds be *x* and the number of pounds of raisins is *y*

The mix will have three times the number of pounds of raisins as sunflower seeds

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

The Sunflower seeds cost $4.00 per pound and raisins cost 1.50 per pound and they spent $34.00 on both the flowers.

That is $4x + 1.5y = 34$ ...... (2)

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

$4x + 1.5y = 34$

$4x + 1.5(3x) = 34$

$4x + 4.5x = 34$

$8.5x = 34$ Combine like terms

$x = \frac{34}{8.5}$ Divide each side with 8.5

$x = 4$ Simplify

Use $y = 3x$ to find the value of *y*

$y = 3x$ Equation (1)

$y = 3(4)$ $x = 14$

$y = 12$ Simplify

Hence, the number of pounds of raisins is **12** and number of pounds of sunflower is **4**

Answer 31PA.

Let $x=$the 25% acid solution and $y=$the 50% of acid solution

Use the table to organize the information:

	25% of Acid	50% of Acid	34% of Acid
Total Gallons	x	y	500
Gallons of Acid	$0.25x$	$0.50y$	$0.34(500)=170$

The system of equations is

$x+y=500$ ...... (1)

$0.25x+0.50y=170$ ...... (2)

Use substitution to solve the system

$x+y=500$ First equation

$x+y-x=500-x$ Subtract x from each side

$y=500-x$ ...... (3)

Since, $y=500-x$, substitute $500-x$ for y in the second equation

$0.25x+0.50y=170$ Second Equation

$0.25x+0.50(500-x)=170$

$0.25x+250-0.5x=170$ Use the Distributive Property

$-0.25x+250=170$ Combine like terms

$-0.25x+250-250=170-250$ Subtract 250 from each side

$-0.25x=-80$ Combine like terms

$x=\dfrac{-80}{-0.25}$ Divide each side with -0.25

$x=320$ Simplify

Use $y = 500 - x$ to find the value of y

$y = 500 - x$ Equation (3)

$y = 500 - 320 \quad x = 320$

$y = 180$ Simplify

Hence, **320** gallons of 25% acid and **180** gallons of 50% acid should be used.

Answer 32PA.

The sum of the supplement angles is 180 degrees.

That is $X + Y = 180$

The measure of angle X is 24 degrees greater than the measure of angle Y

That is $X = 24 + Y$

The system of equations is

$X + Y = 180$ ...... (1)

$X = 24 + Y$ ...... (2)

Since, $X = 24 + Y$, substitute $24 + Y$ for X in the second equation

$X + Y = 180$ First Equation

$24 + Y + Y = 180$

$24 + 2Y = 180$ Combine like terms

$24 + 2Y - 24 = 180 - 24$ Subtract 24 from each side

$2Y = 156$ Combine like terms

$Y = \frac{156}{2}$ Divide each side with 2

$Y = 78$ Simplify

Use $X = 24 + Y$ to find the value of X

$X = 24 + Y$ Equation (2)

$X = 24 + 78 \quad Y = 78$

$X = 102$ Simplify

Hence, $X = \boxed{102°}$ and $Y = \boxed{78°}$

Answer 33PA.

Let the number of games won by New York Yankees is x and the Cincinnati Reds is y

The number matches won by both the teams is 31.

That is $x+y=31$ ...... (1)

The Yankees had won 5.2 times as many World Series as the Reds.

That is $x=5.2y$ ...... (2)

Since, $x=5.2y$, substitute $5.2y$ for x in the first equation

$x+y=31$ First Equation

$5.2y+y=31$

$6.2y=31$ Combine like terms

$y=\frac{31}{6.2}$ Divide each side with 6.2

$y=5$ Simplify

Use $x=5.2y$ to find the value of x

$x=5.2y$ Equation (2)

$x=5.2(5)$ $y=5$

$x=26$ Simplify

Hence, the number of games won by New York Yankees is $\boxed{26}$ and the Cincinnati Reds is $\boxed{5}$

Answer 34PA.

Let $$x$ be the total price of the automobiles that Ms.J must sell each month.

Let $$y$ be the total amount she gets.

	Amount through commission	Fixed amount per month
I Automobile Dealer	2% of $x = 0.02x$	$600
II Automobile Dealer	1.5% of $x = 0.015x$	$1000

The total amount she gets from the I automobile dealer is

$y = 0.02x + 600$ ...... (1)

The total amount she gets from the I automobile dealer is

$y = 0.015x + 1000$ ...... (2)

From the equations (1) and (2)

$$\begin{aligned}
0.02x + 600 &= 0.015x + 1000 && \\
0.005x + 600 &= 1000 && \text{Subtract } 0.015 \text{ from each side} \\
0.005x &= 400 && \text{Subtract } 400 \text{ from each side} \\
x &= 80000 && \text{Divide each side with } 0.005 \text{ each side}
\end{aligned}$$

Hence **$80,000** is the total price of the automobiles that Ms.Jones must sell each month to make the same income from either dealership.

Answer 35PA.

Let $$x$ be the total price of the automobiles that Ms.J must sell each month.

Let $$y$ be the total amount she gets.

	Amount through commission	Fixed amount per month
I Automobile Dealer	2% of $x = 0.02x$	$600
II Automobile Dealer	1.5% of $x = 0.015x$	$1000

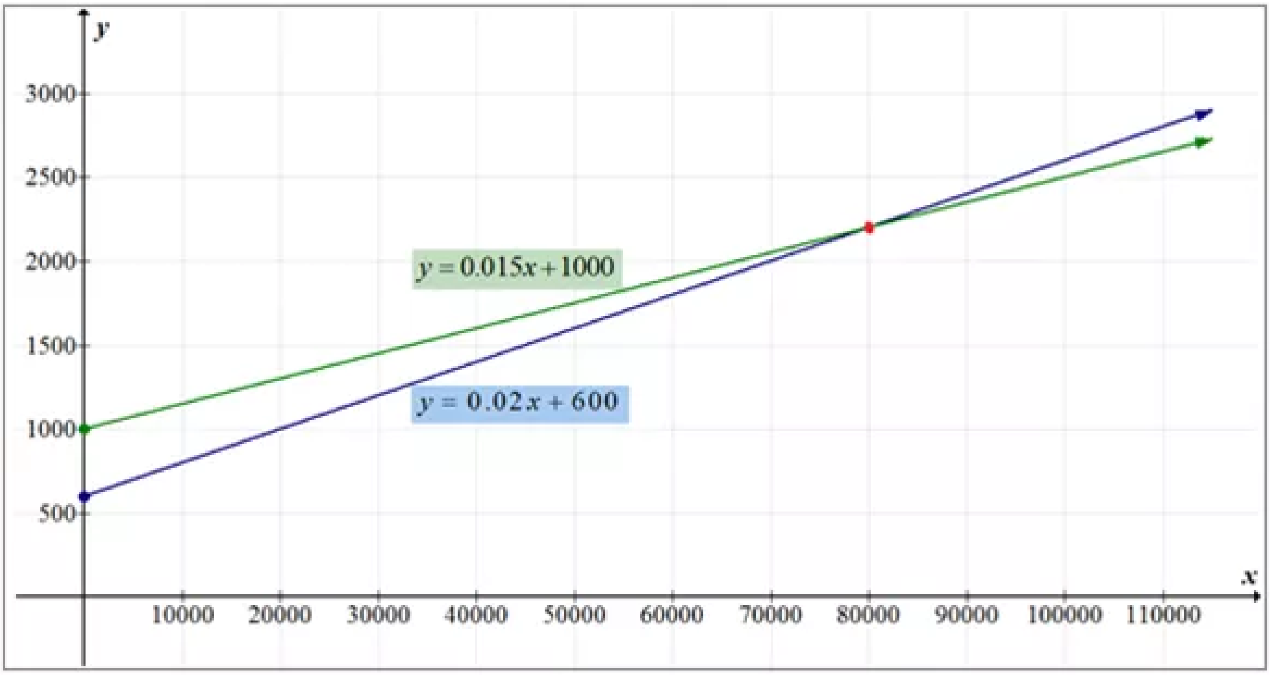
The total amount she gets from the I automobile dealer is

$y = 0.02x + 600$ ...... (1)

The total amount she gets from the I automobile dealer is

$y = 0.015x + 1000$ ...... (2)

The graphs of $y = 0.02x + 600$ and $y = 0.015x + 1000$ are shown below:



If she makes a business more than $80,000 then the II Automobile dealer is the best, otherwise the I Automobile dealer.

Answer 36PA.

Let *x* represents the number of years

Let *y* (inches) be the height of the tree.

Tree	Growth rate	Initial height of tree
A blue spruce	6 inches/year	4 feet $= 4 \times 30 = 120$ inches
A hemlock	4 inches/year	6 feet $= 6 \times 30 = 180$ inches

The height of the blue spruce is

$y = 6x + 120$ ...... (1)

The height of a hemlock is

$y = 4x + 180$ ...... (2)

From the equations (1) and (2)

$6x + 120 = 4x + 180$

$2x + 120 = 180$ Subtract $4x$ from each side

$2x = 60$ Subtract 120 from each side

$x = 30$ Divide each side with 2 each side

Hence, after **30 years** the two trees may be same height.

Answer 37PA.

Let *x* represents the number of years

Let *y* (in millions) be the total tourists in the *x*th year.

Place	Average rate of Tourists per year	Number of tourists
South America and Caribbean	0.8 million/year	40.3 million
Middle East	1.8 million/year	17.0 million

The total number of tourists visited South America and Caribbean is given by the equation

$y = 0.8x + 40.3$ ...... (1)

The total number of tourists visited Middle East is given by the equation

$y = 1.8x + 17.0$ ...... (2)

From the equations (1) and (2)

$1.8x + 17 = 0.8x + 40.3$

$0.8x + 17 = 40.3$ Subtract $0.8x$ from each side

$0.8x = 23.3$ Subtract 17 from each side

$x = 29.125$ Divide each side with 0.8 each side

Hence, after **29 years** the number of tourists to South America and the Caribbean to equal the number to tourists to the Middle East

Answer 39PA.

Consider the equations,

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

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

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

Since, $2x = z + 2$, substitute $z + 2$ for $2x$ in the first equation

$2x + 3y - z = 17$ First Equation

$z + 2 + 3y - z = 17$

$2 + 3y = 17$ Combine like terms

$2 + 3y - 2 = 17 - 2$ Subtract 2 from each side

$3y = 15$ Combine like terms

$\frac{3y}{3} = \frac{15}{3}$ Divide each side with 3

$y = 5$ Simplify

Use $y = -3z - 7$ to find the value of z

$y = -3z - 7$ Equation (2)

$5 = -3z - 7 \quad y = 5$

$5 + 7 = -3z - 7 + 7$ Add 7 to each side

$12 = -3z$ Simplify

$\frac{12}{-3} = \frac{-3z}{-3}$ Divide each side with 3

$-4 = z$ Simplify

$z = -4$

Use $2x = z + 2$ to find the value of x

$2x = z + 2$ Equation (3)

$2x = -4 + 2 \quad z = -4$

$2x = -2$ Simplify

$\frac{2x}{2} = \frac{-2}{2}$ Divide each side with 3

$x = -1$ Simplify

Hence, $x = \boxed{-1}, \; y = \boxed{5}, \text{ and } z = \boxed{-4}$

Answer 40PA.

Americans spend more time online than they spend reading daily newspapers. If *x* represents the number of years since 1993 and *y* represents the average number of hours per person per year, the following system represents the situation.

Reading daily newspapers: $y = -2.8x + 170$ ...... (1)

Online: $y = 14.4x + 2$ ...... (2)

Since, $y = 14.4x + 2$, substitute $14.4x + 2$ for y in the first equation

$y = -2.8x + 170$ First Equation

$14.4x + 2 = -2.8x + 170$

$14.4x + 2.8x + 2 = -2.8x + 170 + 2.8x$ Add $2.8x$ from each side

$17.2x + 2 = 170$ Combine like terms

$17.2x + 2 - 2 = 170 - 2$ Subtract 2 from each side

$17.2x = 168$ Combine like terms

$x = \frac{168}{17.2}$ Divide each side with 17.2

$x \approx 10$ Simplify

Use $y = 14.4x + 2$ to find the value of y

$y = 14.4x + 2$ Equation (2)

$y = 14.4(10) + 2 \quad x \approx 10$

$y = 146$ Simplify

Hence, approximately after 10 years, that is in the year 1993+10= **2003**, the number of hours spent reading daily newspapers is the same as hours spent online.

Answer 41PA.

Consider the equations,

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

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

Solve the first equation for *x* since the coefficient of *x* is 1

$x + 4y = 1$ First equation

$x + 4y - 4y = 1 - 4y$ Subtract $4y$ from each side

$x = 1 - 4y$ Simplify

The *x* value not matches with option **B** and the option is matches with **A**

Solve the second equation for *x*

$2x - 3y = -9$ First equation

$2x = 3y - 9$ Add $3y$ from each side

$x = \frac{3}{2}y - \frac{9}{2}$ Simplify

The *x* value not matches with option **C** and **D**

Answer 42PA.

Consider the equations,

$x - 3y = -9$ ...... (1)

$5x - 2y = 7$ ...... (2)

Solve the first equation for *x* since the coefficient of *x* is 1

$x - 3y = -9$ First equation

$x - 3y + 3y = -9 + 3y$ Add $3y$ from each side

$x = -9 + 3y$ Simplify

Since $x = -9 + 3y$, substitute $-9 + 3y$ for x in the second equation

$5x - 2y = 7$

$5(-9 + 3y) - 2y = 7$ Substitute $x = -9 + 3y$

$-45 + 15y - 2y = 7$ Use the distributive property

$-45 + 13y = 7$ Simplify

$13y = 52$ Add 45 to each side

$y = 4$ Divide each side with 13

Substitute $y = 4$ in the equation $x = -9 + 3y$

$x = -9 + 3y$

$x = -9 + 3(4)$ Substitute $y = 4$

$x = -9 + 12$ Simplify

$x = 3$ Simplify

The value of *y* is 4. And the value of *x* is **3**

Hence the correct option is **C**

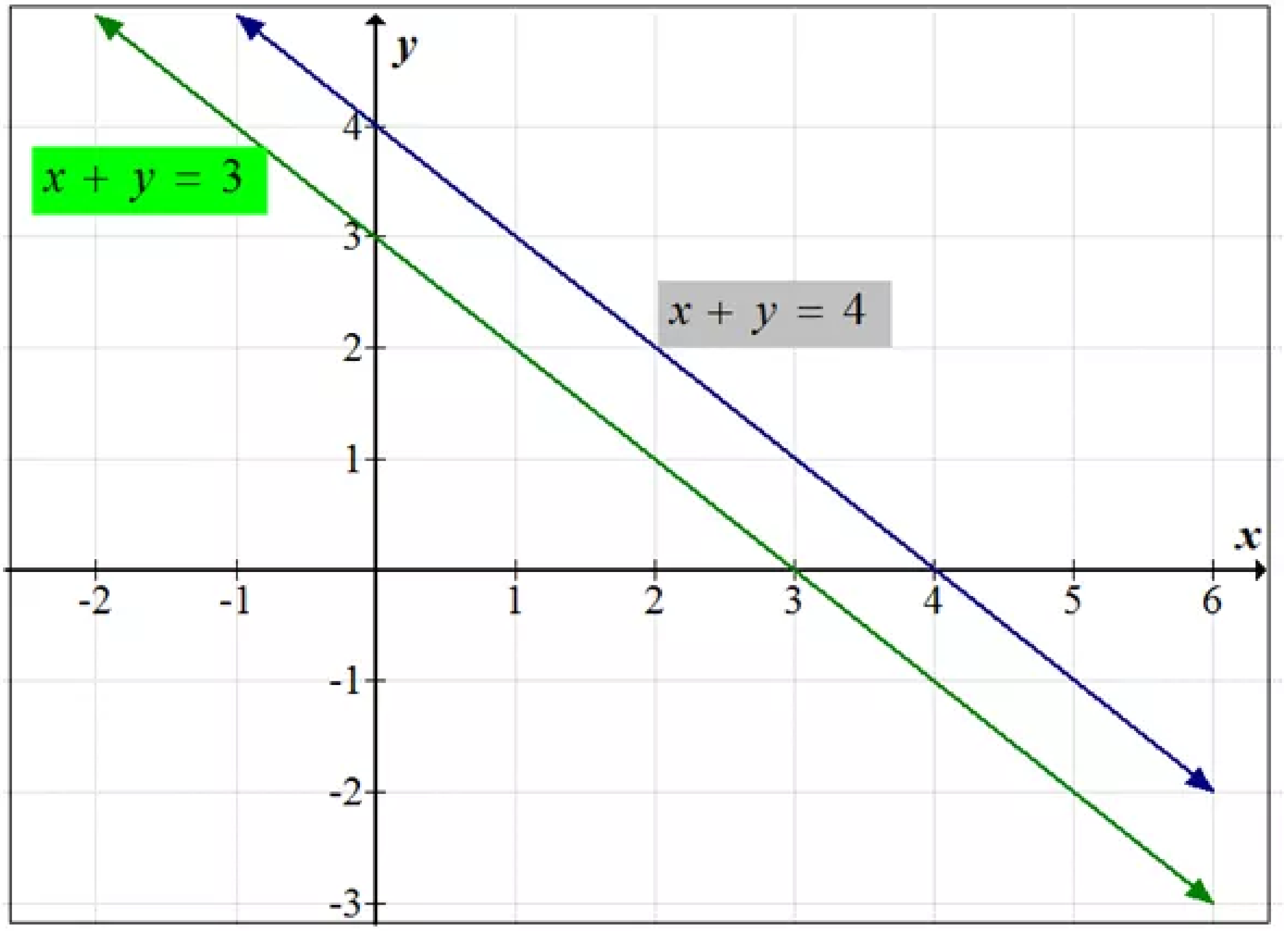
Answer 43MYS.

Consider the equations,

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

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

The graph of the equations is shown below:



Since the graphs $x+y=3$ and $x+y=4$ are parallel, there are **no solution**

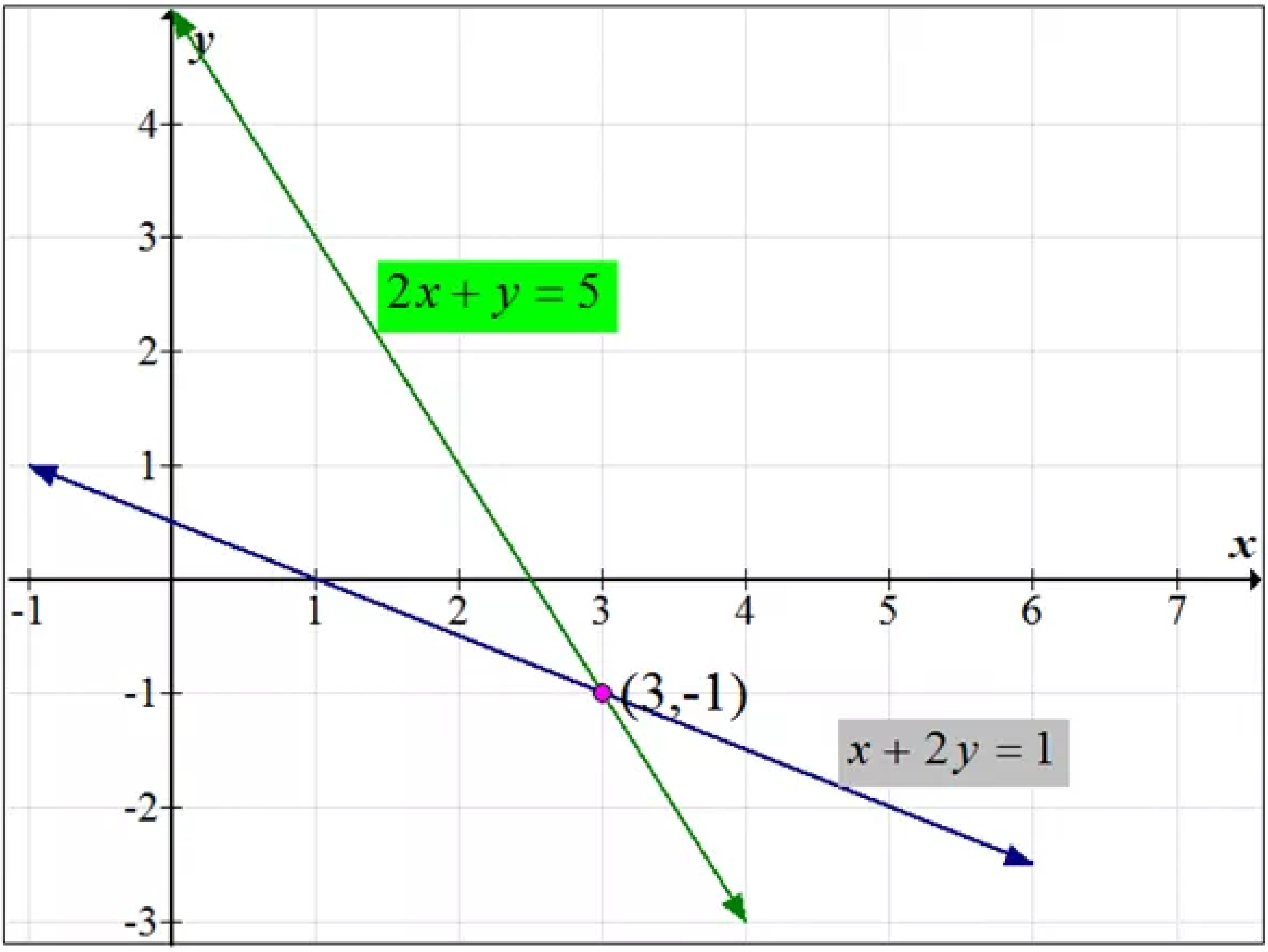
Answer 44MYS.

Consider the equations,

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

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

The graph of the equations is shown below:



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

Check:

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

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

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

Answer 45MYS.

Consider the equations,

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

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

The graph of the equations is shown below:

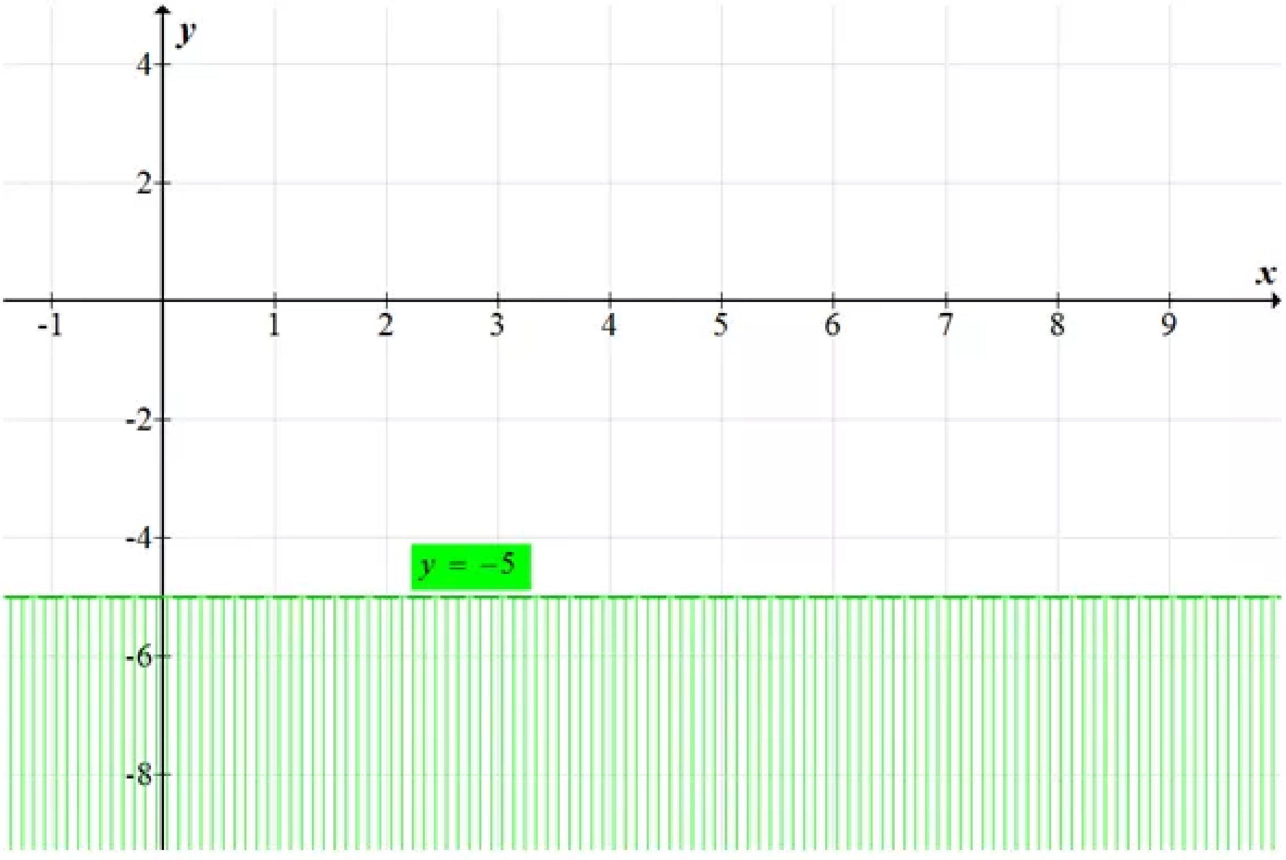
Since the graphs $2x + y = 3$ and $4x + 2y = 6$ are coincide, there are infinitely many solutions.

Answer 46MYS.

Consider the inequality,

$y < -5$ ...... (1)

The graph of the inequality is shown below:



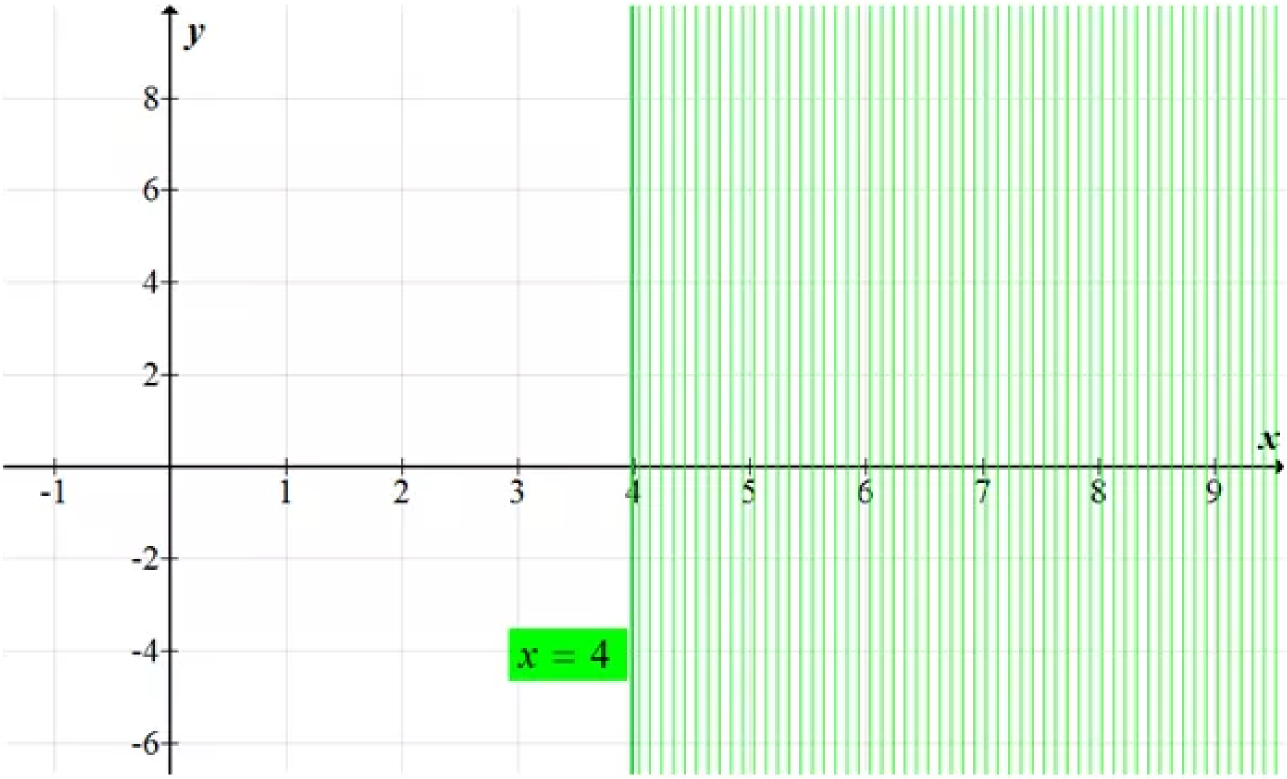
The graph of $y = -5$ is dashed and is not included in the graph of $y < -5$

Answer 47MYS.

Consider the inequality,

$x \geq 4$ ...... (1)

The graph of the inequality is shown below:



The graph of $x = 4$ is included in the graph of $x \geq 4$

Answer 48MYS.

Consider the inequality,

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

The graph of the inequality is shown below:

The graph of $2x + y = 6$ dashed line is not included in the graph of $2x + y > 6$

Answer 49MYS.

For every 5 pair of jeans 1 pound of denim is left.

For 250 pairs of jeans x pounds of denim is left.

Hence the ratio is

$$\frac{5}{250}=\frac{1}{x} \quad \ldots\ldots (1)$$

$5x=250$ On cross multiplication

$\frac{5x}{5}=\frac{250}{5}$ Divide each side with 5

$x=50$ Simplify

Therefore, the number of pounds left from 250 pairs jeans is **50**

Answer 50MYS.

Consider the expression,

$$6a-9a$$

$$\begin{aligned} 6a-9a &= a(6-9) && \text{Factor out } a \\ &= a(-3) && \text{Subtract} \\ &= -3a && \text{Simplify} \end{aligned}$$

Hence, $6a-9a=\boxed{-3a}$

Answer 51MYS.

Consider the expression,

$$8t+4t$$

$$\begin{aligned} 8t+4t &= t(8+4) && \text{Factor out } t \\ &= t(12) && \text{Add} \\ &= 12t && \text{Simplify} \end{aligned}$$

Hence, $8t+4t=\boxed{12t}$

Answer 52MYS.

Consider the expression,

$$-7g-8g$$

$$\begin{aligned} -7g-8g &= g(-7-8) && \text{Factor out } g \\ &= g(-15) && \text{Add} \\ &= -15g && \text{Simplify} \end{aligned}$$

Hence, $-7g-8g = \boxed{-15g}$

Answer 53MYS.

Consider the expression,

$$7d-(2d+b)$$

$$\begin{aligned} 7d-(2d+b) &= 7d-2d-b && \text{Remove the parentheses} \\ &= (7-2)d-b && \text{Factor out } g \\ &= 5d-b && \text{Simplify} \end{aligned}$$

Hence, $7d-(2d+b) = \boxed{5d-b}$