Chapter 4. Graphing Relations and Functions

Answer 1PT3.

If a figure is turned about a given point, then this transformation is called rotation, so the letter that best matches from reflection, rotation, and translation is rotation.

Hence, the correct option is $\boxed{b}$.

A translation is sliding the object over a certain distance.

Thus, for the description "a figure slid horizontally, vertically, or both" the letter that best match from reflection, rotation, and translation is translation.

Hence, the correct option is $\boxed{c}$.

If a figure is flipped over a line, then it creates a mirror image of the original figure.

Therefore if a figure flipped over a line, then the letter that best matches from reflection, rotation, and translation is reflection.

Hence, the correct option is $\boxed{a}$.

Answer 1STP.

The present population of School is 315.

First find the 2% of 315.

Let n be the 2% of 315.

Translate the words of the problem as follows:

$$\begin{array}{ccccc} \underbrace{\text{a number } n} & \underbrace{\text{is}} & \underbrace{2\%} & \underbrace{\text{of}} & \underbrace{315} \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ n & = & 0.02 & \times & 315 \end{array}$$

Solve the equation $n = 0.02 \times 315$ for n.

$$\begin{aligned} n &= 0.02 \times 315 && \text{Multiply} \\ &\approx 6 \end{aligned}$$

Therefore, 2% of 315 is around 6.

Since the population is increase by 2% next year, so the number of students in the next year will be

$$315 + 6 = 321$$

Hence, the correct option is $\boxed{B}$

Answer 2STP.

The distance total distance to reach Mc Station in miles is

$$1675 + 508 = 2183$$

Two women already crossed the 1675 miles in 89 days.

The object is to find the percentage of the distance remained.

The balance distance to be travel is 508 miles.

Let 508 be n% of total distance 2183.

Translate the words of the problem as follows:

508 is $n\%$ of 315

$$508 = \frac{n}{100} \times 2183$$

Solve the equation $508 = 2183\left(\frac{n}{100}\right)$ for n.

$$508 = 2183\left(\frac{n}{100}\right) \quad \text{Multiply each by 100}$$

$$50800 = 2183n \quad \text{Divide each by 2183}$$

$$\frac{50800}{2183} = n \quad \text{Simplify}$$

$$23 \approx n$$

Therefore, the two women have to still travel 23% of the total distance.

Hence the correct option is $\boxed{C}$

Answer 3STP.

In a surveyed conducted in a school only 2 out of 5 students said that they eat five servings of fruits or vegetables daily. This means $\frac{2}{5}$th of the students eating five serving of fruits or vegetables daily.

The total number of students in the school is 470.

Therefore, the number of students eating five serving of fruits or vegetables daily is equal to " $\frac{2}{5}$th of 470".

Translate the words of the problem as follows:

$\frac{2}{5}$th of 470

$$\frac{2}{5} \times 470$$

Thus, the required number is $\frac{2}{5} \times 470 = 188$

Hence, the correct option is $\boxed{B}$

Answer 4PT.

Consider,

$K(0,-5)$

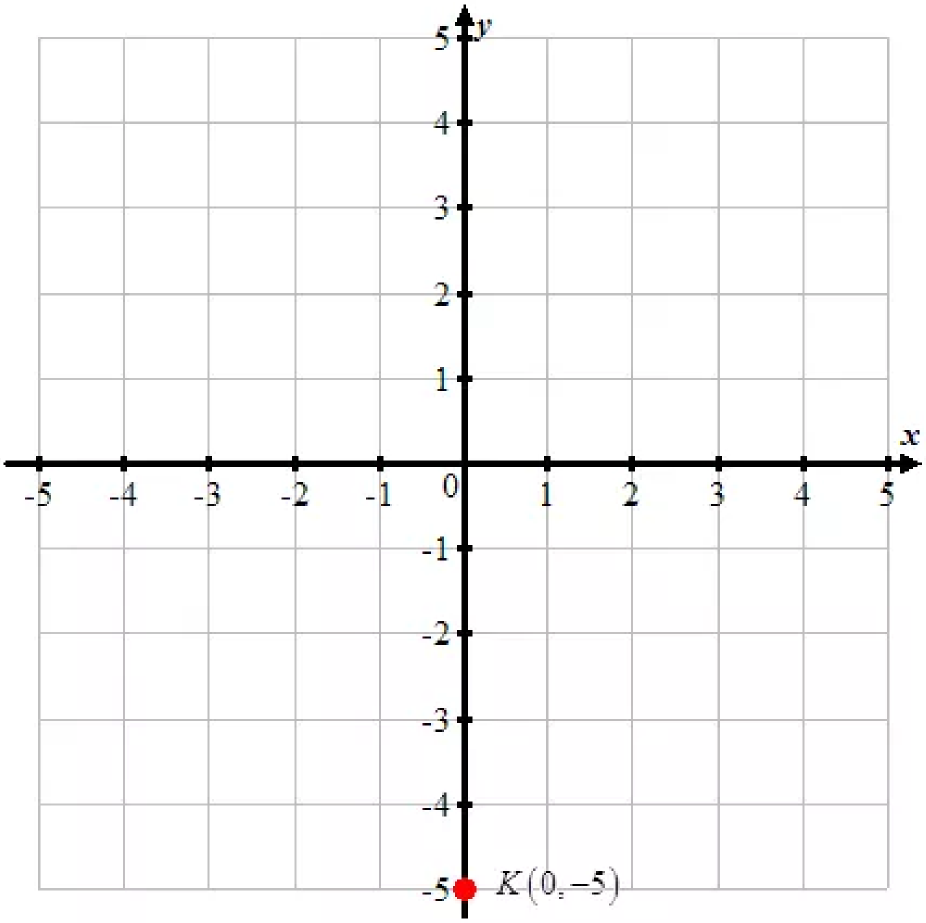
The object is to plot the point on a coordinate plane .

Step 1: Start at the origin.

Step 2: Since the *x*-coordinate is 0, the point will be located on the *y*-axis.

Step 3: Move down 5 units since the *y*-coordinate is -5.

Step 4: Draw a dot and label it *K*.



Consider,

$M(3,-5)$

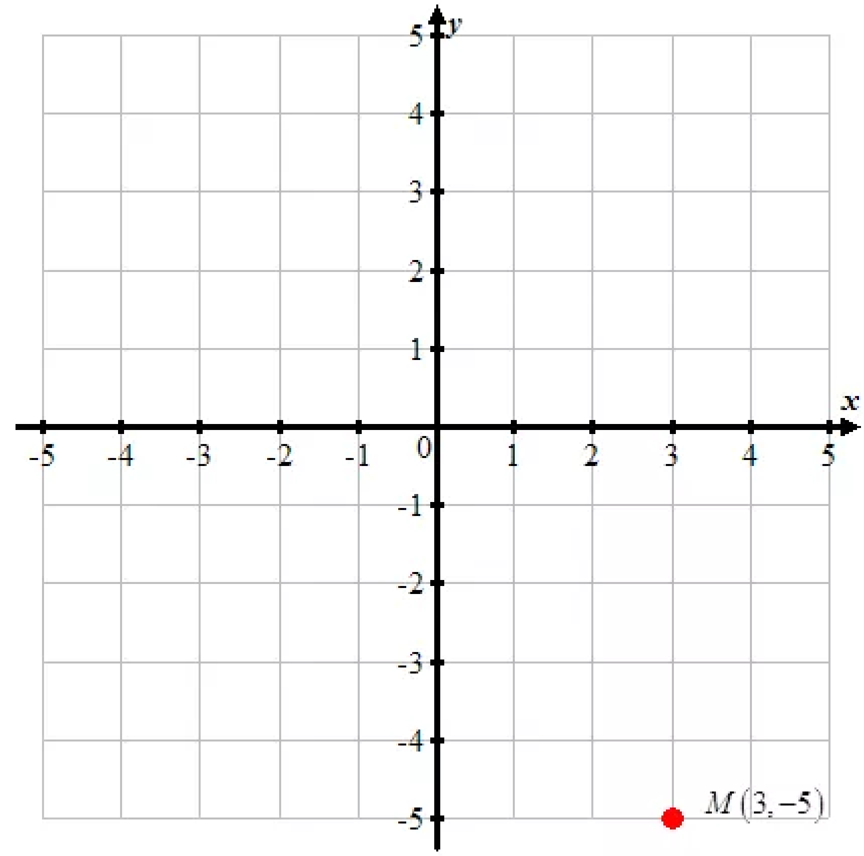
The object is to plot the point on a coordinate plane.

Step 1: Start at the origin.

Step 2: Move right 3 units since the *x*-coordinate is 3.

Step 3: Move down 5 units since the *y*-coordinate is -5.

Step 4: Draw a dot and label it *M*.



Consider,

$N(-2,-3)$

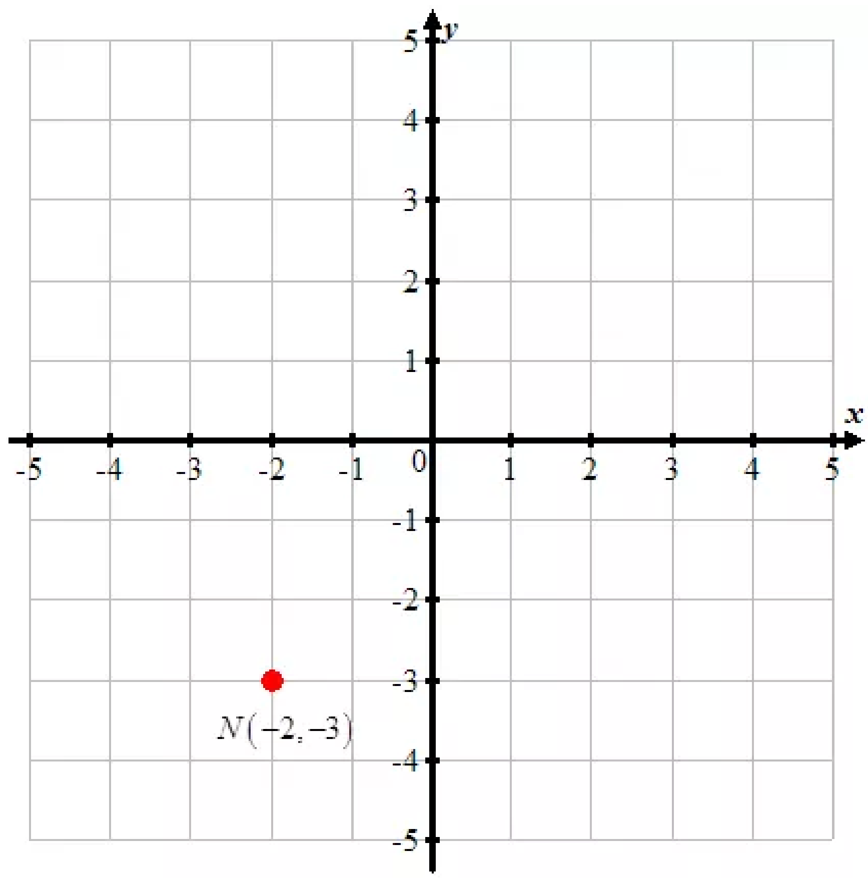
The object is to plot the point on a coordinate plane

Step 1: Start at the origin.

Step 2: Move left 2 units since the *x*-coordinate is -2.

Step 3: Move down 3 units since the *y*-coordinate is -3.

Step 4: Draw a dot and label it *N*.



Answer 4STP.

Consider the equation:

$$13x = 2(5x+3)$$

The objective is to solve the equation for x.

Use the properties of equality and inverse operations to solve the equation.

$$13x = 2(5x+3) \quad \text{Original equation}$$
$$13x = 10x+6 \quad \text{Distributive property}$$
$$-10x+13x = -10x+10x+6 \quad \text{Add } -10x \text{ to both sides of the equation}$$
$$3x = 6 \quad \text{Perform the operation for like terms}$$
$$\frac{3x}{3} = \frac{6}{3} \quad \text{Divide both sides of the equation by 3}$$
$$x = 2 \quad \text{Perform the division}$$

The solution of $13x = 2(5x+3)$ is $x = \boxed{2}$.

Since the option A is 0, so A is not correct option.

Since the option C is 3, so C is not correct option.

Since the option D is 4, so D is not correct option.

Hence, the correct option is $\boxed{B}$

Answer 5PT.

Consider,

$$P(25,1)$$

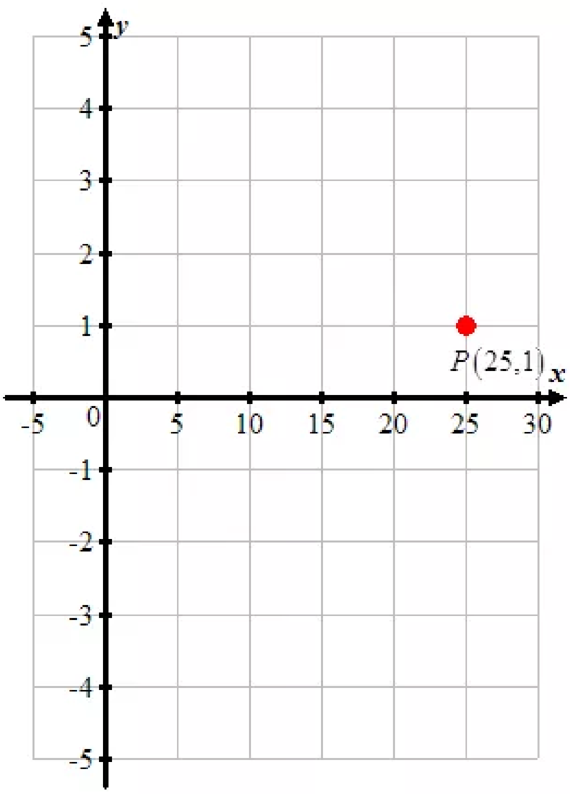
The object is to plot the point on a coordinate plane and identify the quadrant in which this point is located.

Step 1: Start at the origin.

Step 2: Move right 25 units since the *x*-coordinate is 1.

Step 3: Move up 1 unit since the *y*-coordinate is 1.

Step 4: Draw a dot and label it *P*.

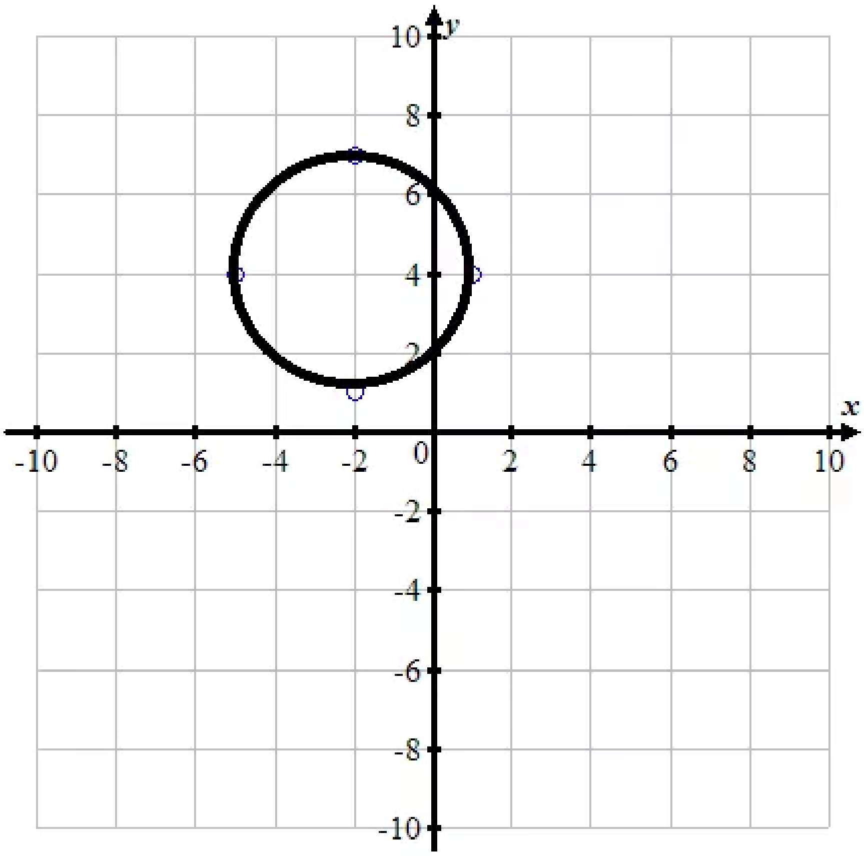


The both x-coordinate and y-coordinate are positive, so the point P is in I quadrant.

Therefore, the ordered pair is $P(25,1)$ and the point is located in the $\boxed{\text{Quadrant I}}$.

Answer 5STP.

Consider the graph:



The circle shown in the above graph passes through points $(1,4),(-2,1),(-5,4),\text{and } (-2,7)$

The center of the circle is midpoint of $(1,4)$ and $(-5,4)$

Consider,

$(1,4)$ and $(-5,4)$

The midpoint of a line segment whose endpoints are at (a,b) and (c,d) is at

$\left(\frac{a+c}{2},\frac{b+d}{2}\right)$.

Here, $(a,b)=(1,4)$ and $(c,d)=(-5,4)$

The midpoint of line segment whose endpoints are at $(1,4)$ and $(-5,4)$ is

$$\begin{aligned}\left(\frac{a+c}{2},\frac{b+d}{2}\right)&=\left(\frac{1+(-5)}{2},\frac{4+4}{2}\right)\\&=\left(\frac{-4}{2},\frac{8}{2}\right)\\&=(-2,4)\end{aligned}$$

Therefore, the center of the circle is $(-2,4)$

Since the option A is $(-2,-4)$, so A is not correct option.

Since the option C is $(-4,2)$, so C is not correct option.

Since the option D is $(4,-2)$, so D is not correct option.

Hence, the correct option is $\boxed{B}$

Answer 6PT.

Consider a parallelogram *HIJK* with vertices $H(-2,-2), I(-4,-6), J(-5,-5),$ and $K(-3,-1)$.

The object is to find the coordinates of the vertices of parallelogram after it is reflected over the *y*-axis.

To reflect the figure over the *y*-axis, multiply each *x*-coordinate by -1.

$$(x,y)\to(-x,y)$$

$$H(-2,-2)\to H'(2,-2)$$
$$I(-4,-6)\to I'(4,-6)$$
$$J(-5,-5)\to J'(5,-5)$$
$$K(-3,-1)\to K'(3,-1)$$

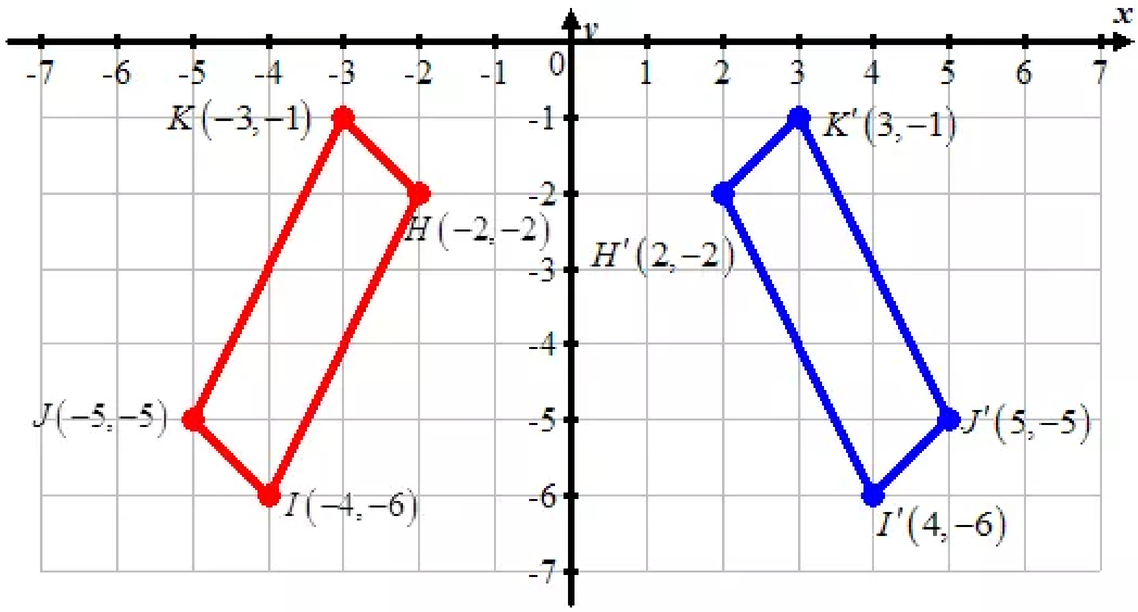
The coordinates of the vertices of the image are

$\boxed{H'(2,-2), I'(4,-6), J'(5,-5), \text{and } K'(3,-1)}$.

Now, the object is to graph the preimage and its image.

Graph each vertex of the parallelogram *HIJK*. Connect the points.

Graph each vertex of the reflected image $H'I'J'K'$. Connect the points.



Answer 6STP.

Consider the relation:

$$\{(2,5),(x,8),(7,10)\}$$

Choose $x=1$, then

$$\{(2,5),(x,8),(7,10)\}=\{(2,5),(1,8),(7,10)\}$$

Each *x*-value is assigned to only one *y*-value, so the set of ordered pairs represents a function.

Thus, the relation $\{(2,5),(x,8),(7,10)\}$ is a function for $x=1$.

Therefore, the option A is incorrect.

Choose $x = 5$, then

$$\{(2,5),(x,8),(7,10)\} = \{(2,5),(5,8),(7,10)\}$$

Each *x*-value is assigned to only one *y*-value, so the set of ordered pairs represents a function.

Thus, the relation $\{(2,5),(x,8),(7,10)\}$ is a function for $x = 5$.

Therefore, the option C is incorrect.

Choose $x = 8$, then

$$\{(2,5),(x,8),(7,10)\} = \{(2,5),(8,8),(7,10)\}$$

Each *x*-value is assigned to only one *y*-value, so the set of ordered pairs represents a function.

Thus, the relation $\{(2,5),(x,8),(7,10)\}$ is a function for $x = 8$.

Therefore, the option D is incorrect.

Choose $x = 2$, then

$$\{(2,5),(x,8),(7,10)\} = \{(2,5),(2,8),(7,10)\}$$

The ordered pairs $(2,5)$ and $(2,8)$ have the same *x*-value but different *y*-values. So, the relation $\{(2,5),(2,8),(7,10)\}$ is $\boxed{\text{not a function}}$

Hence, the correct option is $\boxed{B}$

Answer 7PT.

Consider a parallelogram *HIJK* with vertices $H(-2,-2), I(-4,-6), J(-5,-5),$ and $K(-3,-1)$.

The object is to find the coordinates of the vertices of parallelogram after it is translating 2 units up.

To translate up 2 units add 2 to *y*-coordinate.

$$(x,y) \to (x, y+2)$$

$$\begin{aligned} H(-2,-2) &\to H'(2,-2+2) \\ &\to H'(2,0) \\ I(-4,-6) &\to I'(4,-6+2) \\ &\to I'(4,-4) \\ J(-5,-5) &\to J'(5,-5+2) \\ &\to J'(5,-3) \\ K(-3,-1) &\to K'(3,-1+2) \\ &\to K'(3,1) \end{aligned}$$

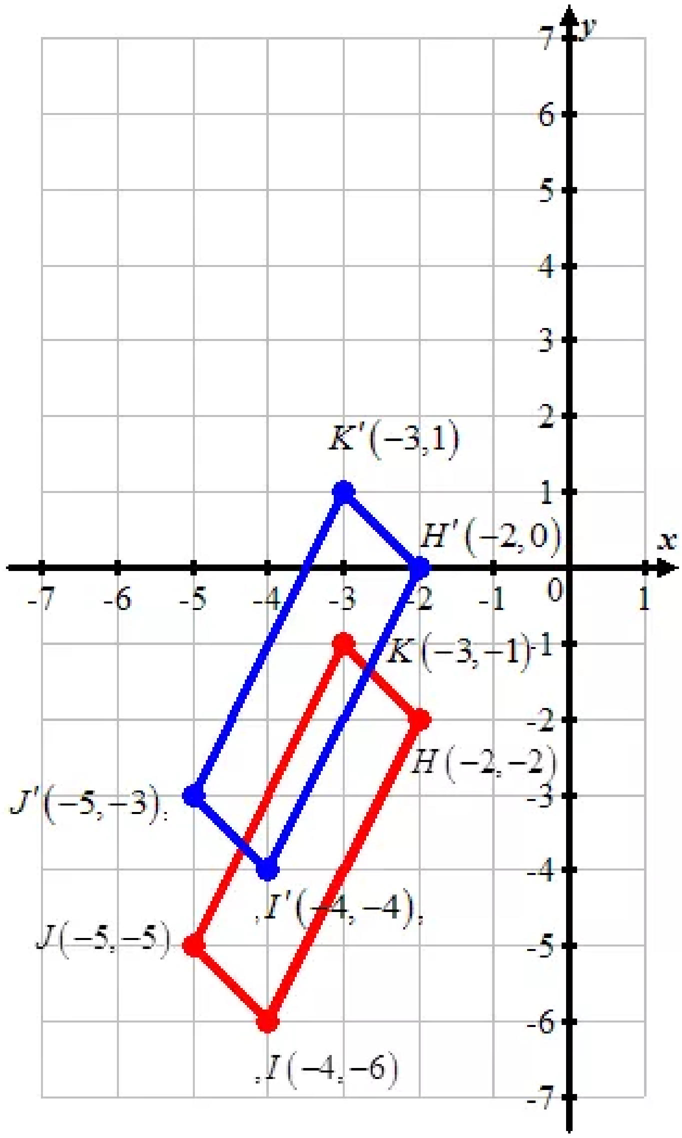
The coordinates of the vertices of the image are

$\boxed{H'(-2,0), I'(-4,-4), J'(-5,-3), \text{and } K'(-3,1)}$.

Now, the object is to graph the preimage and its image.

Graph each vertex of the parallelogram *HIJK*. Connect the points.

Graph each vertex of the reflected image $H'I'J'K'$. Connect the points.



Answer 7STP.

Consider,

$3x+4y=12;\{(-2,4),(0,-3),(1,2),(4,0)\}$

First solve the equation for *y*

$3x+4y=12$ Original equation

$-3x+3x+4y=12-3x$ Add $-3x$ each side

$4y=12-3x$ Simplify

$y=3-x$ Divide each side by 4

Make a table. Substitute ordered pair into the equation.

x	y	$y=3-x$	True or False
-2	4	$4=3-(-2)$ $4=3+2$ $4=5$	False
0	-3	$-3=3-(0)$ $-3=3$	False
1	2	$2=3-(1)$ $2=2$	True
4	0	$0=3-(4)$ $0=-1$	False

The equation $3x+4y=12$ is not satisfied by ordered pair $(-2,4)$. So the ordered pair $(-2,4)$ is not a solution of the equation.

Thus, option A is incorrect.

The equation $3x+4y=12$ is not satisfied by ordered pair $(0,-3)$. So the ordered pair $(0,-3)$ is not a solution of the equation.

Thus, option B is incorrect.

The equation $3x+4y=12$ is not satisfied by ordered pair $(4,0)$. So the ordered pair $(4,0)$ is not a solution of the equation.

Thus, option D is incorrect.

But the equation is satisfied by the ordered pair (1, 2). So option $\boxed{C}$ is correct option.

The ordered pairs $(3,12)$ and $(-1,-8)$ result in true statements

Therefore the solution set is $\boxed{(3,12),(-1,-8)}$.

Answer 8PT.

Consider the table:

x	$f(x)$
1	-1
2	4
4	5
6	10

The object is to write the above relation table as a set of ordered pairs and to write the inverse of this relation.

Relation: The set of first columns in the table are *x*-coordinates and the set of second column are *y*-coordinates.

The set of ordered pairs are $\boxed{\{(1,-1),(2,4),(4,5),(6,10)\}}$.

Inverse: Exchange *x* and *y* in each ordered pair to write the inverse relation, then the inverse relation is $\boxed{\{(1,-1),(2,4),(4,5),(6,10)\}}$.

Answer 8STP.

Consider the table

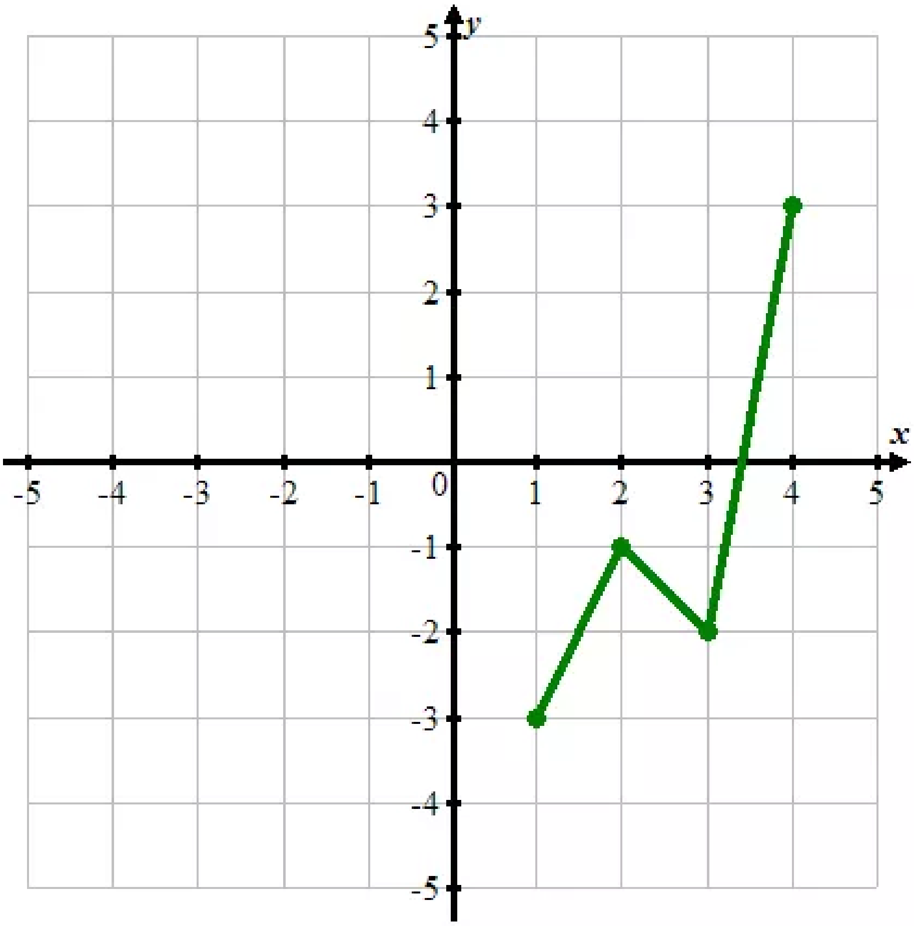
x	y
1	-3
2	-1
3	?
4	3

The object is to find the value for *y* which makes the relation a linear.

Choose $y=-2$. Then the table will be

x	y
1	-3
2	-1
3	-2
4	3

The graph of the relation represented by above table is

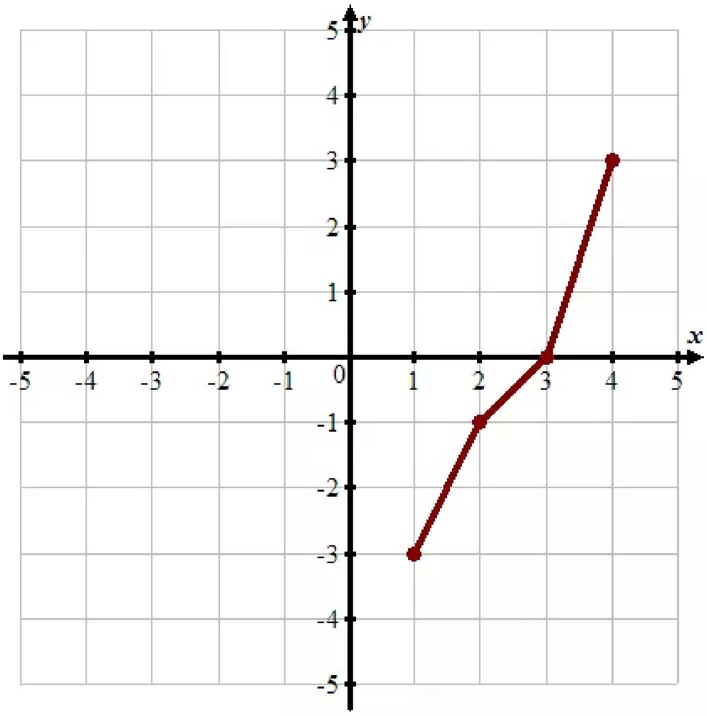


Since the graph does not represents a linear curve, so $y = -2$ does not make a linear relation. Hence, the option A is incorrect.

Choose $y = 0$. Then the table will be

x	y
1	-3
2	-1
3	0
4	3

The graph of the relation represented by above table is

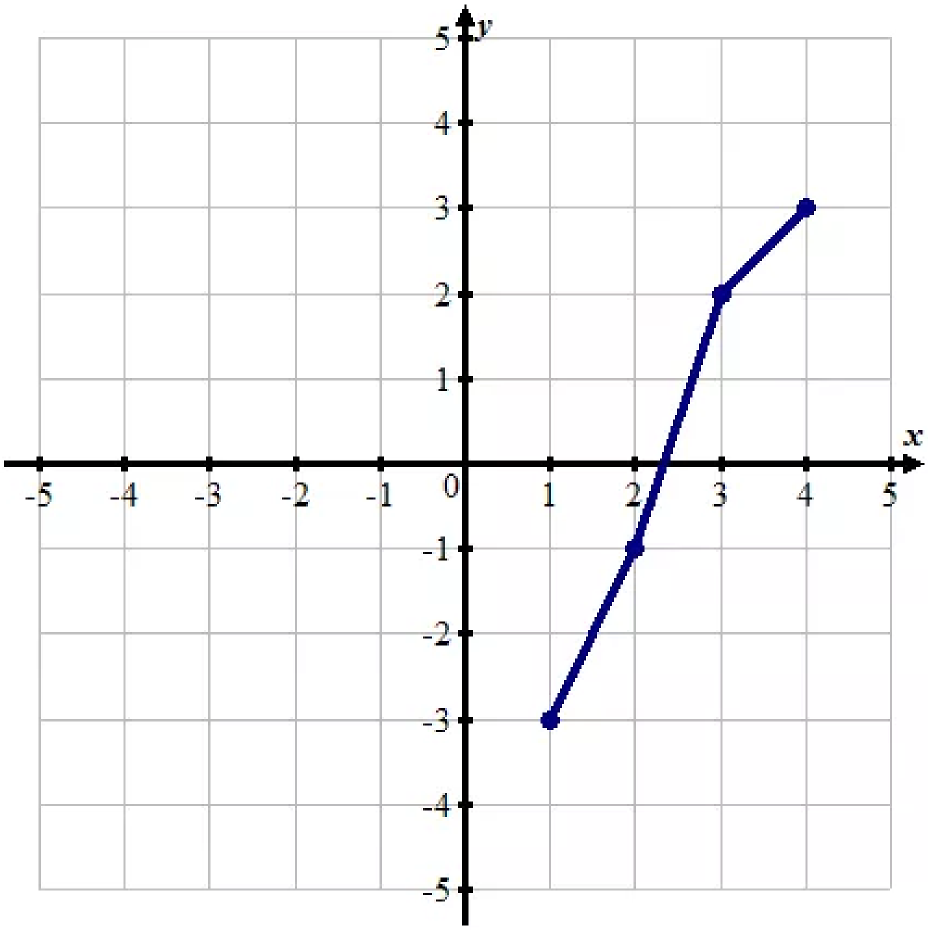


Since the graph does not represents a linear curve, so $y = 0$ does not make a linear relation. Hence, the option B is incorrect.

Choose $y = 2$. Then the table will be

x	y
1	-3
2	-1
3	2
4	3

The graph of the relation represented by above table is

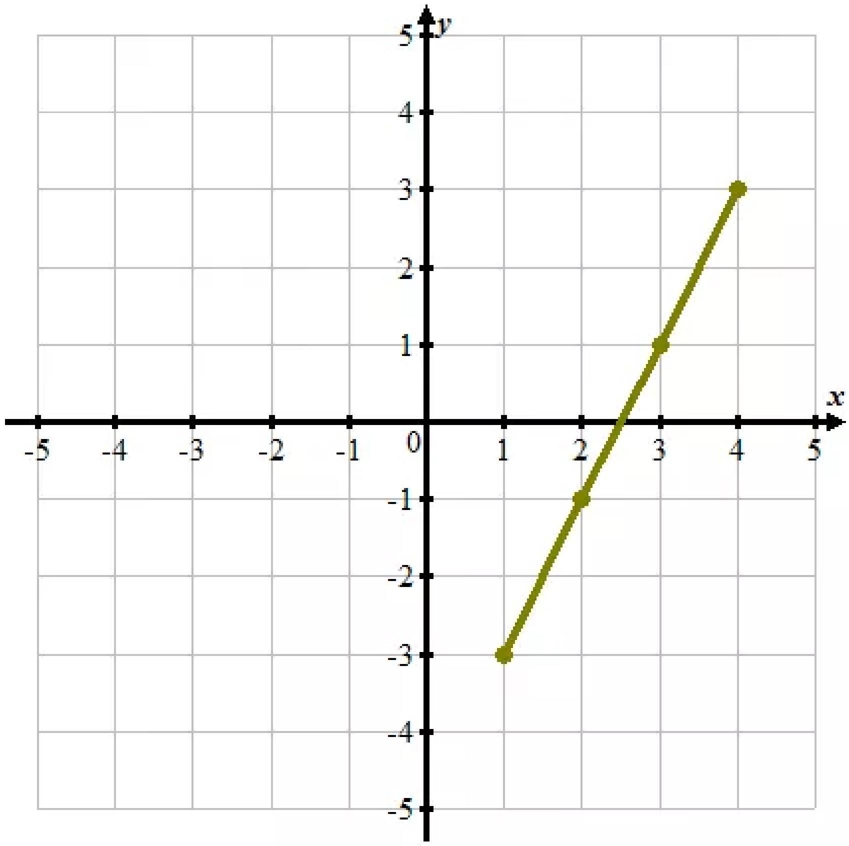


Since the graph does not represents a linear curve, so $y = 2$ does not make a linear relation. Hence, the option D is incorrect.

Choose $y=1$. Then the table will be

x	y
1	-3
2	-1
3	1
4	3

The graph of the relation represented by above table is



Since the graph represents a linear curve, so $y=1$ makes a linear relation. Hence, the option C is correct option.

Answer 9PT.

Consider the mapping

The object is to write the above mapping as a set of ordered pairs and to write the inverse of this relation.

Relation: The set of ordered pairs are $\boxed{\{(-1,2),(-2,-2),(-3,2)\}}$.

Inverse: Exchange *x* and *y* in each ordered pair to write the inverse relation, then the inverse relation is $\boxed{\{(2,-1),(-2,-2),(-2,3)\}}$.

Answer 9STP.

Consider the table

x	y
-2	5
1	2
4	-1
6	-3

Table 1

The object is to find the equation describe the data in the above table.

Consider the equation

$y=-2x+1$

Make a table for $x=-2,1,4,6$

x	$y=-2x+1$
-2	$y=-2(-2)+1$ $=5$
1	$y=-2(1)+1$ $=-1$
4	$y=-2(4)+1$ $=-7$
6	$y=-2(6)+1$ $=-11$

The y values of above table are not similar to the y values in Table 1.

Therefore, Table 1 is not related to the equation $y=-2x+1$.

Hence, option A is incorrect answer.

Consider the equation

$y = x + 1$

Make a table for $x = -2, 1, 4, 6$

x	$y = x + 1$
-2	$y = (-2) + 1$ $= -1$
1	$y = 1 + 1$ $= 2$
4	$y = 4 + 1$ $= 5$
6	$y = 6 + 1$ $= 7$

The *y* values of above table are not similar to the *y* values in Table 1.

Therefore, Table 1 is not related to the equation $y = x + 1$.

Hence, option B is incorrect answer.

Consider the equation

$y = x - 5$

Make a table for $x = -2, 1, 4, 6$

x	$y = x - 5$
-2	$y = -2 - 5$ $= -7$
1	$y = 1 - 5$ $= -4$
4	$y = 4 - 5$ $= -1$
6	$y = 6 - 5$ $= 1$

The *y* values of above table are not similar to the *y* values in Table 1.

Therefore, Table 1 is not related to the equation $y = x - 5$.

Hence, option D is incorrect answer.

Consider the equation

$y = -x + 3$

Make a table for $x = -2, 1, 4, 6$

x	$y = -x + 3$
-2	$y = -(-2) + 3$ $= 5$
1	$y = -1 + 3$ $= 2$
4	$y = -4 + 3$ $= -1$
6	$y = -6 + 3$ $= -3$

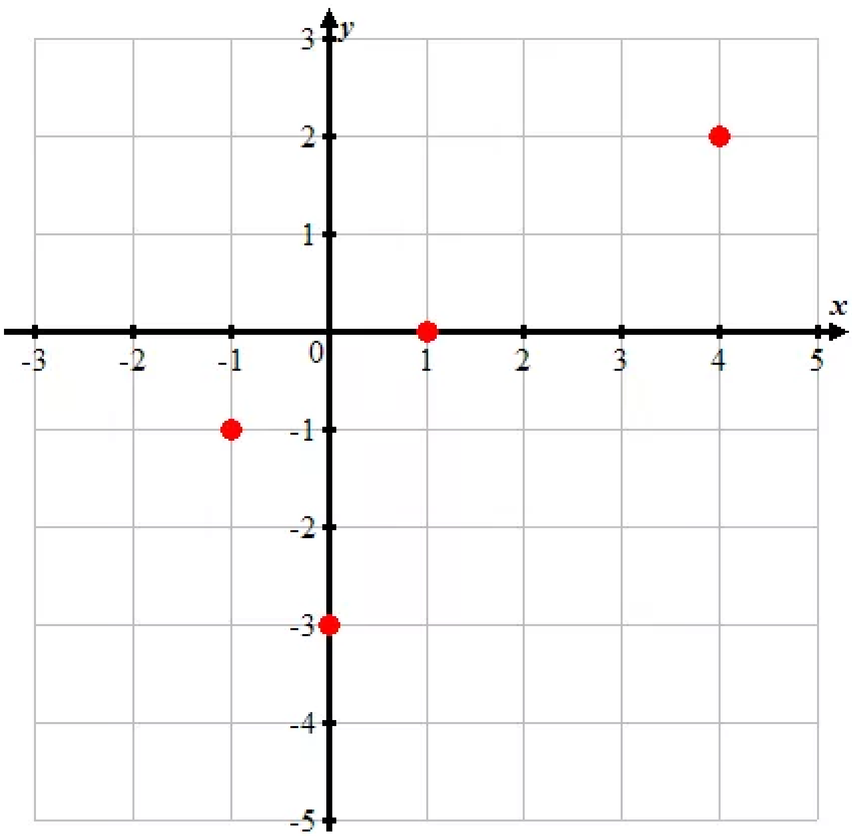
The *y* values of above table are similar to the *y* values in Table 1.

Therefore, Table 1 is related to the equation $y = -x + 3$.

Hence, option C is correct answer.

Answer 10PT.

Consider the graph:



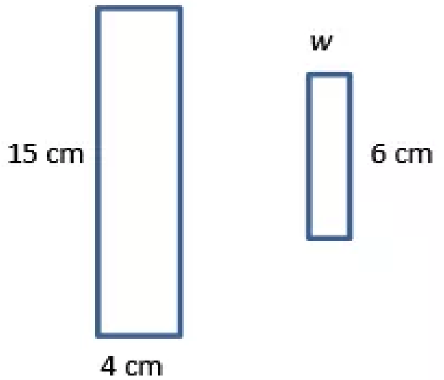
The object is to write the above graph as a set of ordered pairs and to write the inverse of this relation.

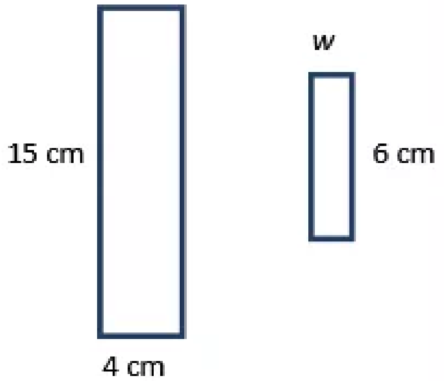
Relation: The set of ordered pairs are $\boxed{\{(1,0),(4,2),(-1,-1),(0,-3)\}}$.

Inverse: Exchange *x* and *y* in each ordered pair to write the inverse relation, then the inverse relation is $\boxed{\{(0,1),(2,4),(-1,-1),(-3,0)\}}$.

Answer 10STP.

Consider the rectangles





The lengths of sides of two rectangles are proportional

$$\frac{15}{6} = \frac{w}{4}$$

Multiplying each side by 24 and simply

$$(24)\frac{15}{6} = (24)\frac{w}{4}$$
$$4(15) = 6w$$
$$60 = 6w$$
$$10 = w$$

Therefore, the width of the second rectangle is $\boxed{10 \text{ cm}}$

Answer 11E.

Consider,

$A(4,2)$

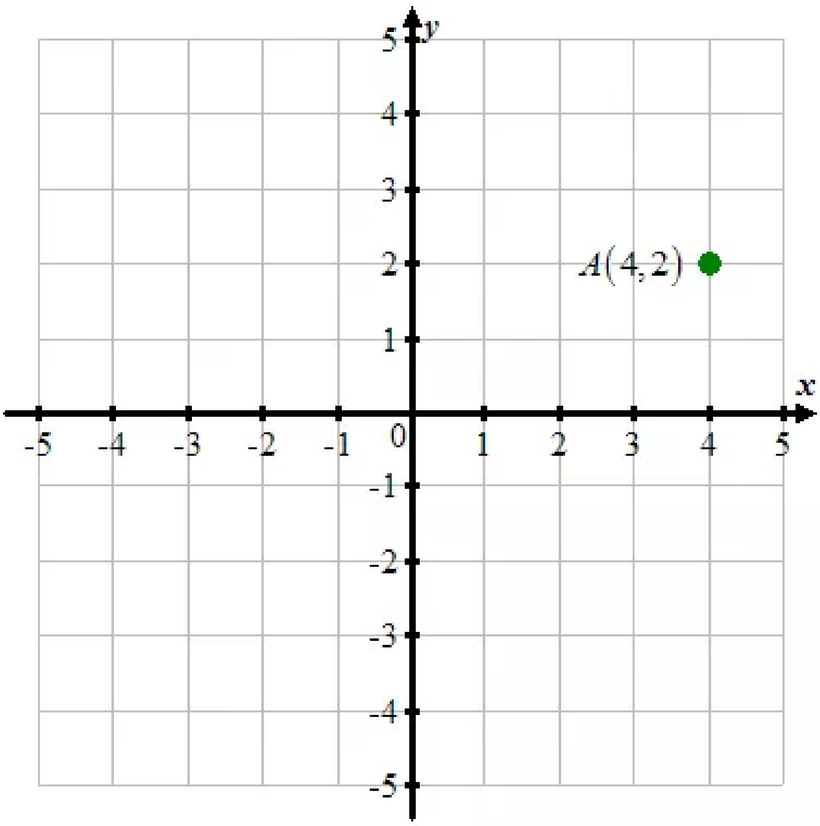
Plot the point on a coordinate plane.

Step 1: Start at the origin.

Step 2: Move right 4 units since the *x*-coordinate is 4.

Step 3: Move up 2 units since the *y*-coordinate is 2.

Step 4: Draw a dot and label it *A*.



Answer 11PT.

Consider an equation

$y = -4x + 10$

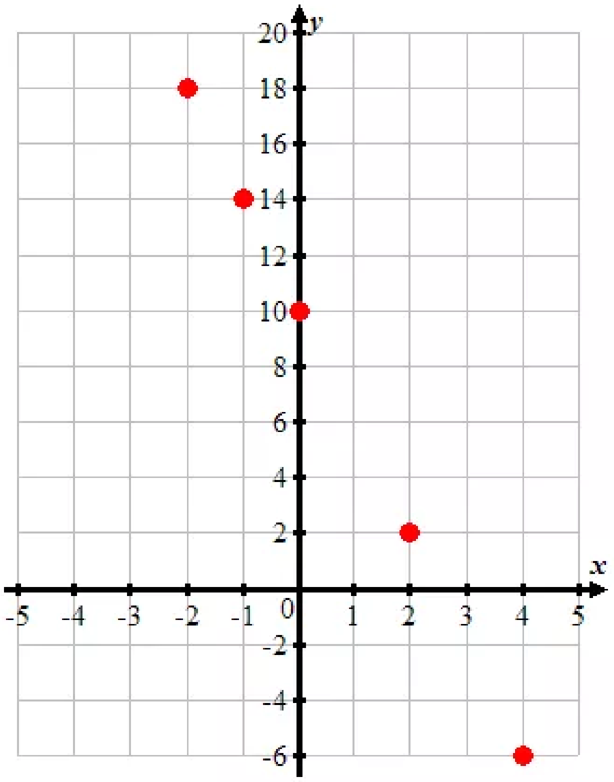
The object is to solve the equation if the domain is $\{-2, -1, 0, 2, 4\}$ and graphing the solution set.

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y = -4x + 10$	y	(x, y)
-2	$y = -4(-2) + 10$ $= 18$	18	$(-2, 18)$
-1	$y = -4(-1) + 10$ $= 14$	14	$(-1, 14)$
0	$y = -4(0) + 10$ $= 10$	10	$(0, 10)$
2	$y = -4(2) + 10$ $= 2$	2	$(2, 2)$
4	$y = -4(4) + 10$ $= -6$	-6	$(4, -6)$

Therefore the solution set is $\{(-2, 18), (-1, 14), (0, 10), (2, 2), (4, -6)\}$.

Graph the solution set $\{(-2, 18), (-1, 14), (0, 10), (2, 2), (4, -6)\}$ is



Answer 11STP.

The number of tickets sold for a television set is 2,000.

The number of tickets purchased by F's family is 25.

The probability that F's family will win the television set is equal to

$$\frac{\text{Number of tickets by F's family}}{\text{The total number of tickets sold}}$$

The required probability $=\frac{25}{2000}$ or 0.0125

The probability in percentage notation is $0.0125\times 100=\boxed{1.25\%}$

Answer 12E.

Consider,

$B(-1,3)$

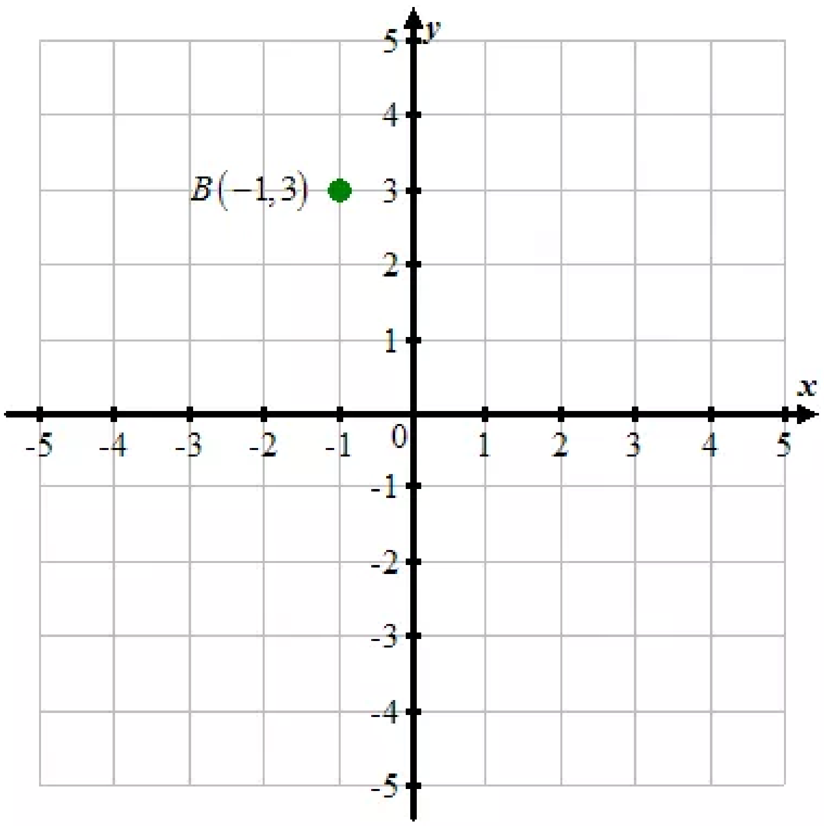
Plotting the point on a coordinate plane .

Step 1: Start at the origin.

Step 2: Move left 1 units since the *x*-coordinate is -1.

Step 3: Move up 3 units since the *y*-coordinate is 3.

Step 4: Draw a dot and label it *B*.



Answer 12PT.

Consider an equation

$3x - y = 10$

The object is to solve the equation if the domain is $\{-2,-1,0,2,4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

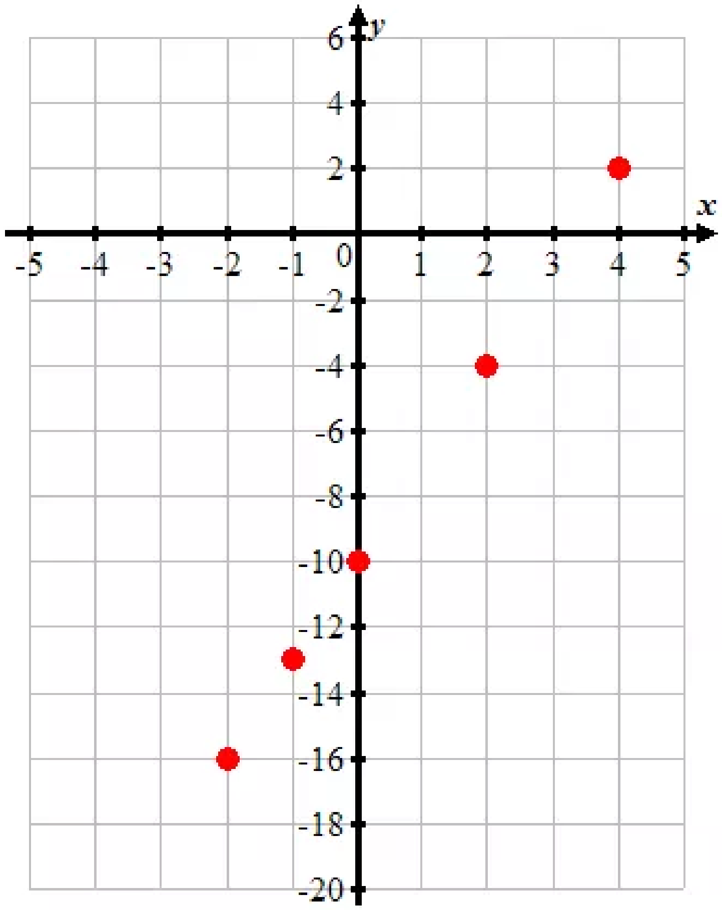
$$\begin{aligned} 3x - y &= 10 \\ -3x + 3x - y &= 10 - 3x && \text{Subtract } 3x \text{ from both sides} \\ -y &= 10 - 3x && \text{Simplify} \\ y &= 3x - 10 && \text{Multiply by } -1 \text{ each side} \end{aligned}$$

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range

x	$y = 3x - 10$	y	(x, y)
-2	$y = 3(-2) - 10$ $= -16$	-16	$(-2,-16)$
-1	$y = 3(-1) - 10$ $= -13$	-13	$(-1,-13)$
0	$y = 3(0) - 10$ $= -10$	-10	$(0,-10)$
2	$y = 3(2) - 10$ $= -4$	-4	$(2,-4)$
4	$y = 3(4) - 10$ $= 2$	2	$(4,2)$

Therefore the solution set is $\{(-2,-16),(-1,-13),(0,-10),(2,-4),(4,2)\}$.

Graph the solution set $\{(-2,-16),(-1,-13),(0,-10),(2,-4),(4,2)\}$ is



Answer 12STP.

Consider three integers $a, b,$ and c.

The sum of these three integers is 52.

$$a+b+c=52----(1)$$

The second integer is 3 more than the first.

$$b=a+3----(2)$$

The third integer is 1 more than twice the first.

$$c=2a+1----(3)$$

Substitute the values of b and c in (1).

$$a+(a+3)+(2a+1)=52$$

$$4a+4=52 \quad \text{Simplify}$$

$$4a+4-4=52-4 \quad \text{Add } -4 \text{ each side}$$

$$4a=48 \quad \text{Simplify}$$

$$a=12 \quad \text{Divide each side by 4}$$

From (2)

$b = a + 3$

$b = 12 + 3 \qquad a = 12$

$b = 15$

From (3)

$c = 2a + 1$

$c = 2(12) + 1$

$c = 25$

Therefore, $a = \boxed{12}, b = \boxed{15}, c = \boxed{25}$

Answer 13E.

Consider,

$C(0, -5)$

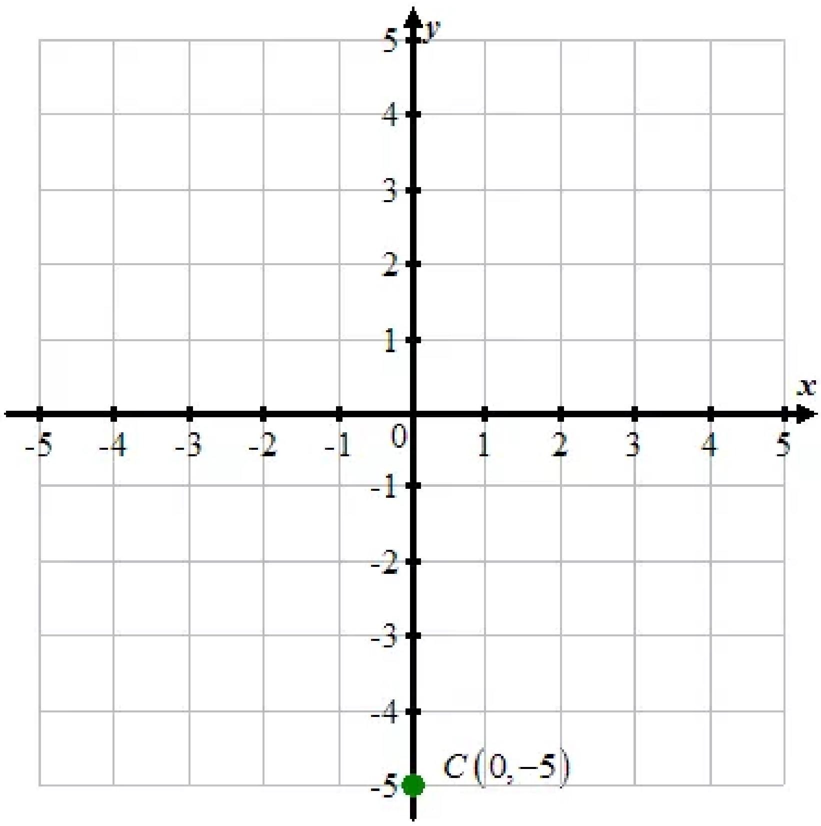
Plotting the point on a coordinate plane .

Step 1: Start at the origin.

Step 2: Since the *x*-coordinate is 0, the point will be located on the *y*-axis.

Step 3: Move down 5 unit since the *y*-coordinate is -5.

Step 4: Draw a dot and label it *C*.



Answer 13PT.

Consider an equation

$$\frac{1}{2}x-y=5$$

The object is to solve the equation if the domain is $\{-2,-1,0,2,4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

$$\frac{1}{2}x-y=5$$

$$-\frac{1}{2}x+\frac{1}{2}x-y=-\frac{1}{2}x+5 \qquad \text{Subtract } \frac{1}{2}x \text{ from both sides}$$

$$-y=-\frac{1}{2}x+5 \qquad \text{Simplify}$$

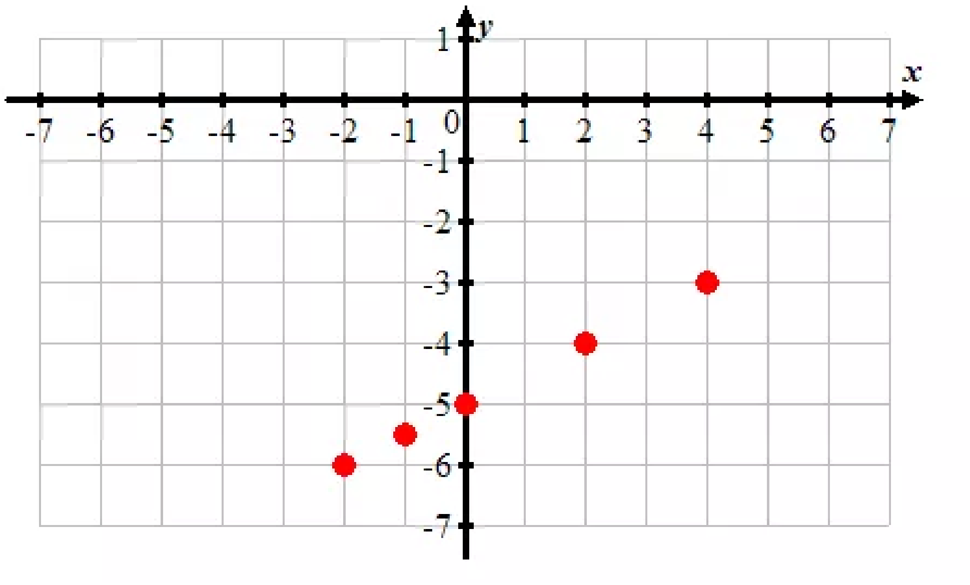
$$y=\frac{1}{2}x-5 \qquad \text{Multiply by } -1 \text{ each side}$$

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range

x	$y=\frac{1}{2}x-5$	y	(x,y)
-2	$y=\frac{1}{2}(-2)-5$ $=-6$	-6	$(-2,-6)$
-1	$y=\frac{1}{2}(-1)-5$ $=-5.5$	-5.5	$(-1,-5.5)$
0	$y=\frac{1}{2}(0)-5$ $=-5$	-5	$(0,-5)$
2	$y=\frac{1}{2}(2)-5$ $=-4$	-4	$(2,-4)$
4	$y=\frac{1}{2}(4)-5$ $=-3$	-3	$(4,-3)$

Therefore the solution set is $\{(-2,-6),(-1,-5.5),(0,-5),(2,-4),(4,-3)\}$.

Graph the solution set $\{(-2,-6),(-1,-5.5),(0,-5),(2,-4),(4,-3)\}$ is



Answer 13STP.

Consider three integers $a, b,$ and c.

The sum of these three integers is 52.

$$a+b+c=52----(1)$$

The second integer is 3 more than the first.

$$b=a+3----(2)$$

The third integer is 1 more than twice the first.

$$c=2a+1----(3)$$

Substitute the values of b and c in (1).

$$\begin{aligned} a+(a+3)+(2a+1)&=52 \\ 4a+4&=52 && \text{Simplify} \\ 4a+4-4&=52-4 && \text{Add } -4 \text{ each side} \\ 4a&=48 && \text{Simplify} \\ a&=12 && \text{Divide each side by 4} \end{aligned}$$

From (2)

$$\begin{aligned} b&=a+3 \\ b&=12+3 && a=12 \\ b&=15 \end{aligned}$$

From (3)

$$\begin{aligned} c&=2a+1 \\ c&=2(12)+1 \\ c&=25 \end{aligned}$$

Therefore, $a=\boxed{12}, b=\boxed{15}, c=\boxed{25}$

Answer 14E.

Consider,

$$D(-3,-2)$$

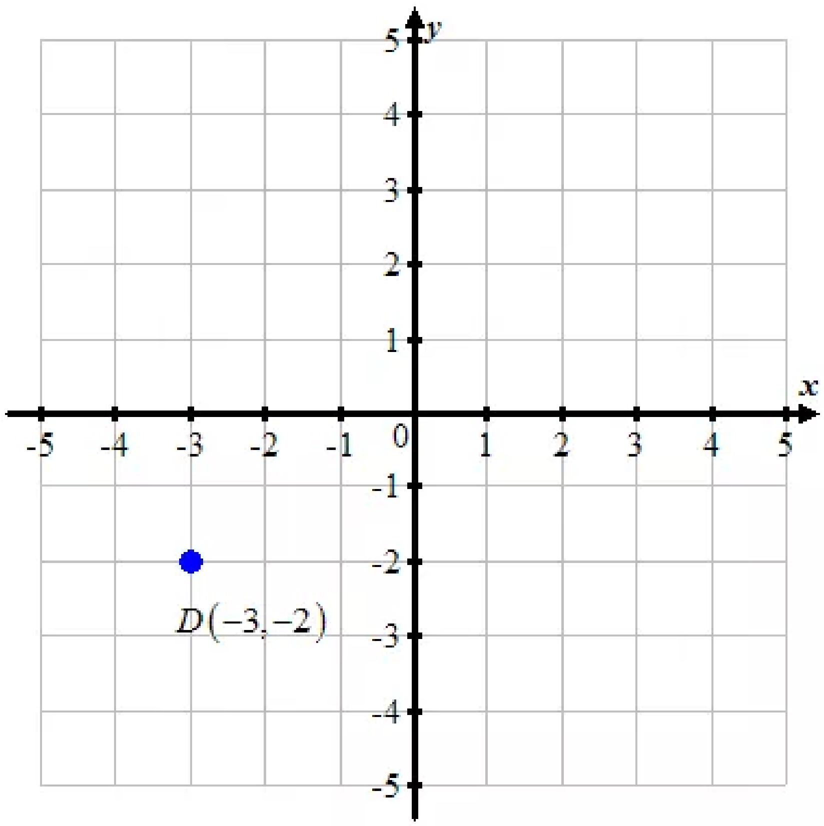
Plot the point on a coordinate plane.

Step 1: Start at the origin.

Step 2: Move left 3 units since the *x*-coordinate is -3.

Step 3: Move down 2 units since the *y*-coordinate is -2.

Step 4: Draw a dot and label it *D*.



Answer 14PT.

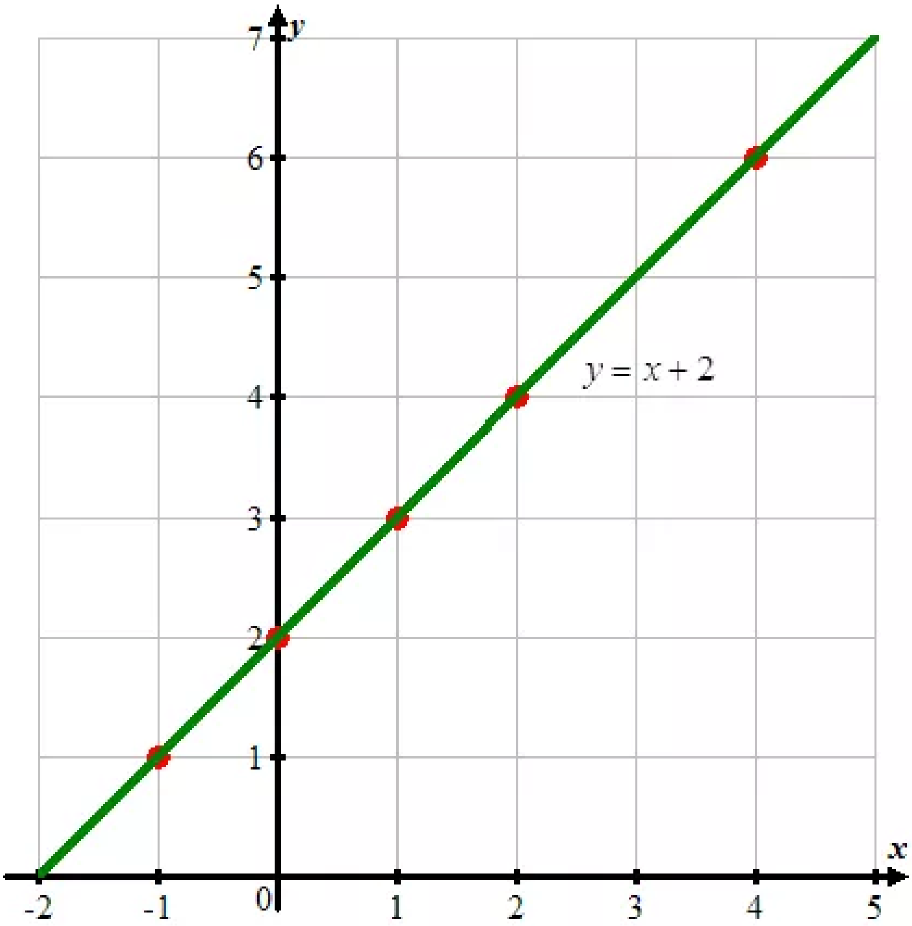
Consider the following equation:

$$y = x + 2$$

Find ordered pairs from the equation by randomly choosing a value for *x*, replacing this value for *x* in the equation, and solving for *y* as shown in the table.

x	y	(x, y)
-1	1	$(-1,1)$
0	2	$(0,2)$
1	3	$(1,3)$
2	4	$(2,4)$
4	6	$(4,6)$

Graph the ordered pairs $(-1,1),(0,2),(1,3),(2,4),(4,6)$ and draw a line through the points. Then the graph appears as shown below



Answer 14STP.

The original cost of CD player is \$160.

The present cost price of CD player is \$120.

The difference cost price is

$$\$160-\$120=\$40$$

Let 40 be n% of original cost 160.

Translate the words of the problem as follows:

$$\underbrace{40}_{\downarrow}\ \underbrace{\text{is}}_{\downarrow}\ \underbrace{n\%}_{\downarrow}\ \underbrace{\text{of}}_{\downarrow}\ \underbrace{160}_{\downarrow}$$

$$40 = \frac{n}{100} \times 160$$

Solve the equation $40=160\left(\frac{n}{100}\right)$ for n.

$$40=160\left(\frac{n}{100}\right) \quad \text{Multiply each by 100}$$

$$4000=160n \quad \text{Divide each by 160}$$

$$\frac{4000}{160}=n \quad \text{Simplify}$$

$$25=n$$

Therefore, the cost of CD player is decreased by $\boxed{25\%}$

Answer 15E.

Consider,

$E(-4,0)$

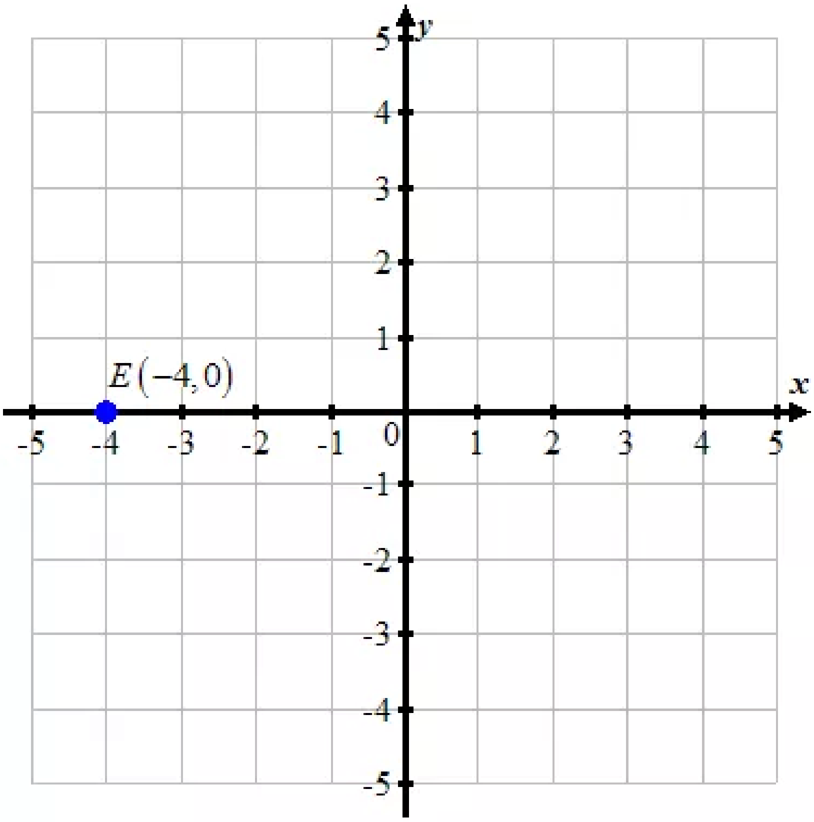
Plot the point on a coordinate plane.

Step 1: Start at the origin.

Step 2: Since the *y*-coordinate is 0, the point will be located on the *x*-axis.

Step 3: Move down 4 units since the *x*-coordinate is -4.

Step 4: Draw a dot and label it *E*.



Answer 15PT.

Consider the equation:

$x+2y=-1$

To find x-intercept, substitute $y=0$ in $x+2y=-1$.

$x+2(0)=-1$ Simplify

$x=-1$

So, the x-intercept is $(-1,0)$.

To find y-intercept, substitute $x=0$ in $x+2y=-1$

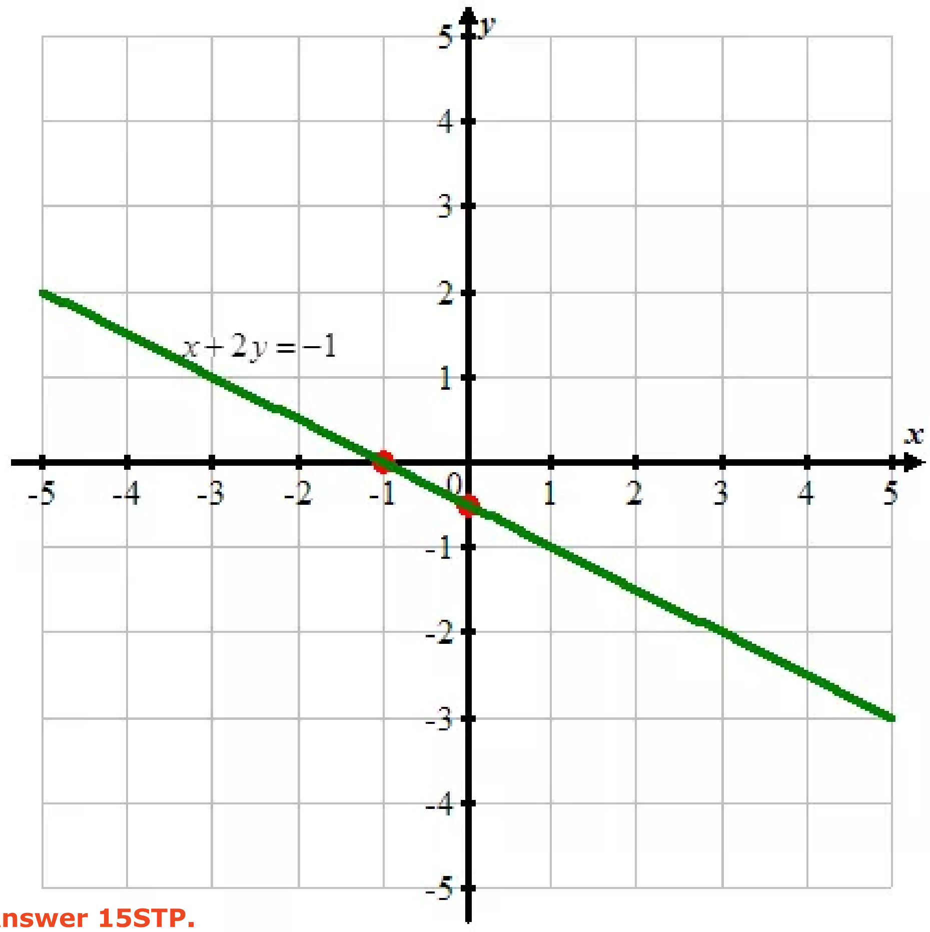
$0+2y=-1$ Simplify

$2y=-1$ Divide both sides of the equation by 2.

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

So, the y-intercept is $\left(0,-\frac{1}{2}\right)$.

Graph the ordered pairs $(-1,0),\left(0,-\frac{1}{2}\right)$ and draw a line through the points. Then the graph appears as shown below



Answer 15STP.

Consider a swimming pool of *l* feet long, w feet wide and h feet deep. Then the volume of the pool is

$$V=lwh$$

Substitute $V=1800, l=20, \text{and } h=6$ in $V=lwh$, then

$$V=lwh$$
$$1800=(20)w(6)$$
$$1800=120w$$

Dividing each side by 120

$$\frac{1800}{120}=\frac{120w}{120}$$

Simplifying the equation, we get

$$w=15$$

Hence, the wide of the pool is $\boxed{15 \text{ feet}}$

Answer 16E.

Consider,

$F(2,-1)$

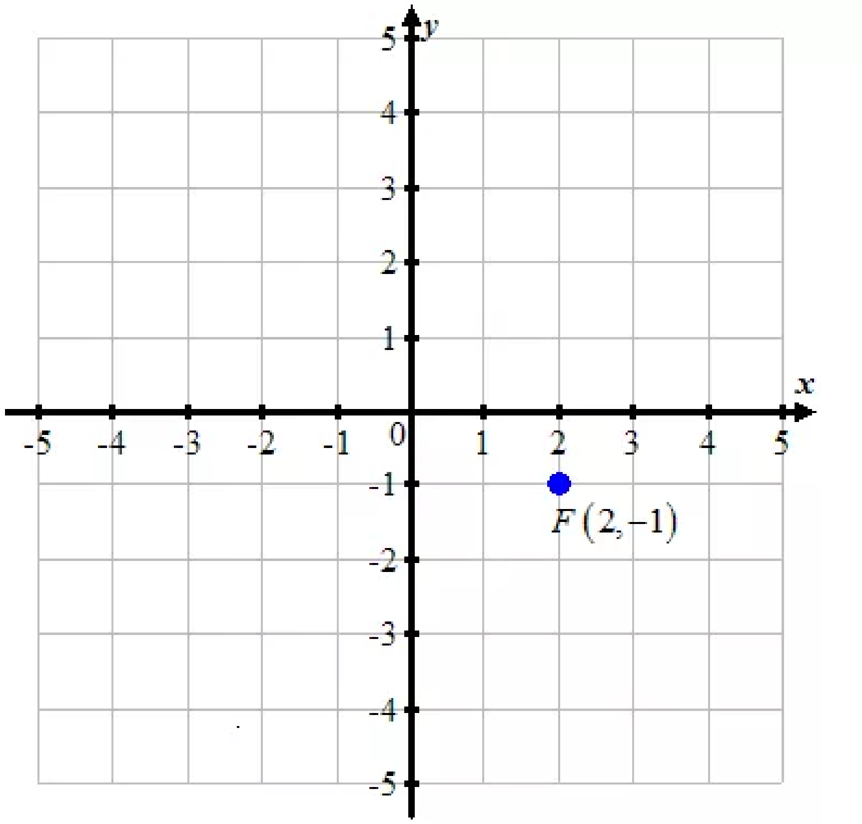
Plot the point on a coordinate plane.

Step 1: Start at the origin.

Step 2: Move right 2 units since the *x*-coordinate is 2.

Step 3: Move down 1 units since the *y*-coordinate is -1.

Step 4: Draw a dot and label it *F*.



Answer 16STP.

Consider,

The ordered pair that describes a point 7 units up from and 3 units to the left of the origin.

Step 1: Start at the origin.

Step 2: Move up 7 units from origin, then the *y*-coordinate is 7.

Step 3: Move left 3 units from origin, and then the *x*-coordinate is -3.

Step 4: The ordered pair is $(-3,7)$.

Therefore the ordered pair is $\boxed{(-3,7)}$.

Answer 17E.

Consider a triangle *ABC* with vertices $A(3,3), B(5,4)$ and $C(4,-3)$.

The object is to find the coordinates of the vertices of triangle after it is reflected over the *x*-axis.

To reflect the figure over the *x*-axis, multiply each *y*-coordinate by -1.

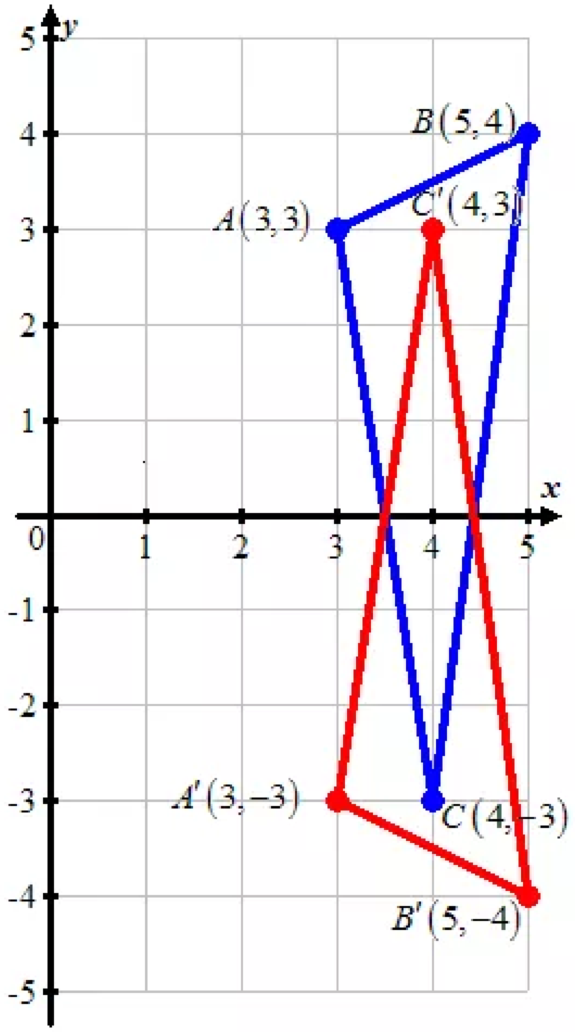
$$(x,y)\to(x,-y)$$
$$A(3,3)\to A'(3,-3)$$
$$B(5,4)\to B'(5,-4)$$
$$C(4,-3)\to C'(4,3)$$

The coordinates of the vertices of the image are $\boxed{A'(3,-3), B'(5,-4), \text{ and } C'(4,3)}$.

Now, the object is to graph the preimage and its image.

Graph each vertex of the triangle *ABC*. Connect the points.

Graph each vertex of the reflected image $A'B'C'$. Connect the points.



Answer 17PT.

A function is a relation in which each first component (element of domain) in the ordered pairs corresponds to exactly one second component (element of range).

Consider the relation:

$$\{(2,4),(3,2),(4,6),(5,4)\}$$

Although the ordered pairs $(2,4)$ and $(5,4)$ have the same *y*-value, each *x*-value is assigned to only one *y*-value, so the set of ordered pairs $\{(2,4),(3,2),(4,6),(5,4)\}$ is $\boxed{\text{a function}}$.

Answer 17STP.

Consider a triangle *DEF* with $D(1,3), E(7,2)$ and $F(-3,4)$ reflected over the *x*-axis .

To reflect the figure over the *x*-axis, multiply each *y*-coordinate by -1.

$$\begin{aligned}(x,y)&\rightarrow(x,-y)\\ D(1,3)&\rightarrow D'(1,-3)\\ E(7,2)&\rightarrow E'(7,-2)\\ F(-3,4)&\rightarrow F'(-3,-4)\end{aligned}$$

The coordinates of the vertices of the image are $\boxed{D'(1,-3), E'(7,-2) \text{ and } F'(-3,-4)}$.

Answer 18E.

Consider a quadrilateral *PQRS* with vertices $P(-2,4), Q(0,6), R(3,3)$ and $S(-1,-4)$.

The object is to find the coordinates of the vertices of quadrilateral after it is translated 3 units down.

To translate 3 units down, add -3 to the *y*-coordinate of each vertex.

$$(x,y)\rightarrow(x,y-3)$$

$$\begin{aligned}P(-2,4)&\rightarrow P'(-2,4-3)\\ &\rightarrow P'(-2,1)\\ Q(0,6)&\rightarrow Q'(0,6-3)\\ &\rightarrow Q'(0,3)\end{aligned}$$

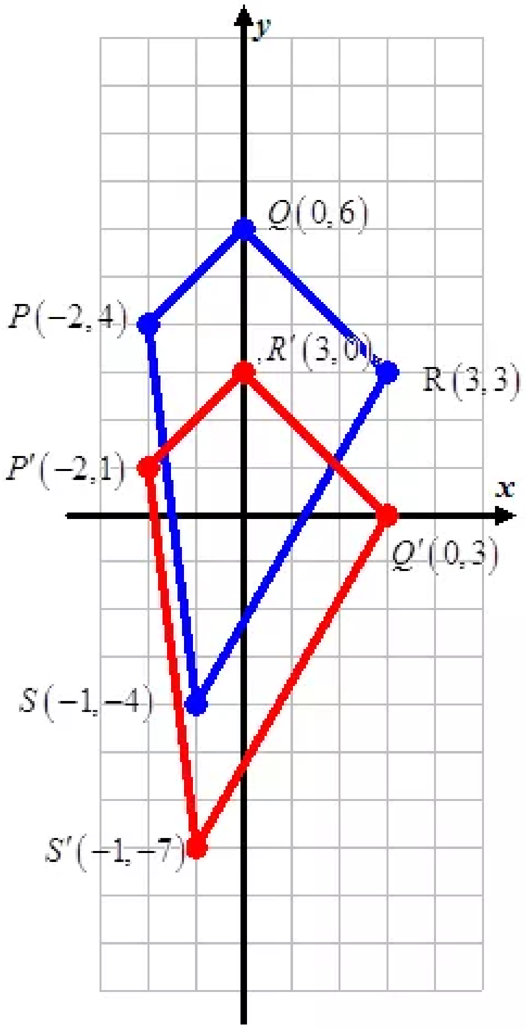
$$\begin{aligned}R(3,3)&\rightarrow R'(3,3-3)\\ &\rightarrow R'(3,0)\\ S(-1,-4)&\rightarrow S'(-1,-4-3)\\ &\rightarrow S'(-1,-7)\end{aligned}$$

The coordinates of the vertices of the image are $\boxed{P'(-2,1), Q'(0,3), R'(3,0), \text{and } S'(-1,-7)}$.

Now, the object is to graph the preimage and its image.

Graph each vertex of quadrilateral *PQRS*. Connect the points.

Graph each vertex of the reflected image $P'Q'R'S'$. Connect the points.



Answer 18PT.

A function is a relation in which each first component (element of domain) in the ordered pairs corresponds to exactly one second component (element of range).

Consider the relation:

$$\{(3,1),(2,5),(4,0),(3,-2)\}$$

The ordered pairs $(3,1)$ and $(3,-2)$ have the same *x*-value but different *y*-values. So, the relation $\{(3,1),(2,5),(4,0),(3,-2)\}$ is $\boxed{\text{not a function}}$

Answer 18STP.

Consider,

$2x + y = -5$

The range of the above is $\{1, -13, -5, -7\}$

The object is to find the domain for $2x + y = -5$

First solve the equation in terms of *x*.

$$
\begin{aligned}
2x + y &= -5 \\
2x + y - y &= -5 - y && \text{Subtract } y \text{ from both sides} \\
2x &= -5 - y && \text{Add} \\
x &= -\frac{5}{2} - \frac{y}{2} && \text{Divide each side by 2}
\end{aligned}
$$

Make a table. Substitute each value of *y* into the equation to determine the corresponding values of *x* in the domain.

y	$x = -\frac{5}{2} - \frac{y}{2}$	x
1	$x = -\frac{5}{2} - \frac{1}{2}$ $= -\frac{6}{2}$ $= -3$	-3
-13	$x = -\frac{5}{2} - \frac{(-13)}{2}$ $= -\frac{5}{2} + \frac{13}{2}$ $= \frac{13-5}{2}$ $= 4$	4
-5	$x = -\frac{5}{2} - \frac{(-5)}{2}$ $= -\frac{5}{2} + \frac{5}{2}$ $= 0$	0
-7	$x = -\frac{5}{2} - \frac{(-7)}{2}$ $= -\frac{5}{2} + \frac{7}{2}$ $= \frac{2}{2}$ $= 1$	1

Therefore the domain is $\boxed{\{-3, 4, 0, 1\}}$.

Answer 19E.

Consider a parallelogram *GHIJ* with vertices $G(2,2), H(6,0), I(6,2)$ and $J(2,4)$.

The object is to find the coordinates of the vertices of parallelogram after it is dilated by a scale factor of $\frac{1}{2}$.

To dilate the figure multiply the coordinates of each vertex by $\frac{1}{2}$

$$(x,y) \to \left(\frac{1}{2}x, \frac{1}{2}y\right)$$

$$\begin{aligned} G(2,2) &\to G'\left[\frac{1}{2}(2), \frac{1}{2}(2)\right] \\ &\to G'(1,1) \end{aligned}$$

$$\begin{aligned} H(6,0) &\to H'\left[\frac{1}{2}(6), \frac{1}{2}(0)\right] \\ &\to H'(3,0) \end{aligned}$$

$$\begin{aligned} I(6,2) &\to I'\left[\frac{1}{2}(6), \frac{1}{2}(2)\right] \\ &\to I'(3,1) \end{aligned}$$

$$\begin{aligned} J(2,4) &\to J'\left[\frac{1}{2}(2), \frac{1}{2}(4)\right] \\ &\to J'(1,2) \end{aligned}$$

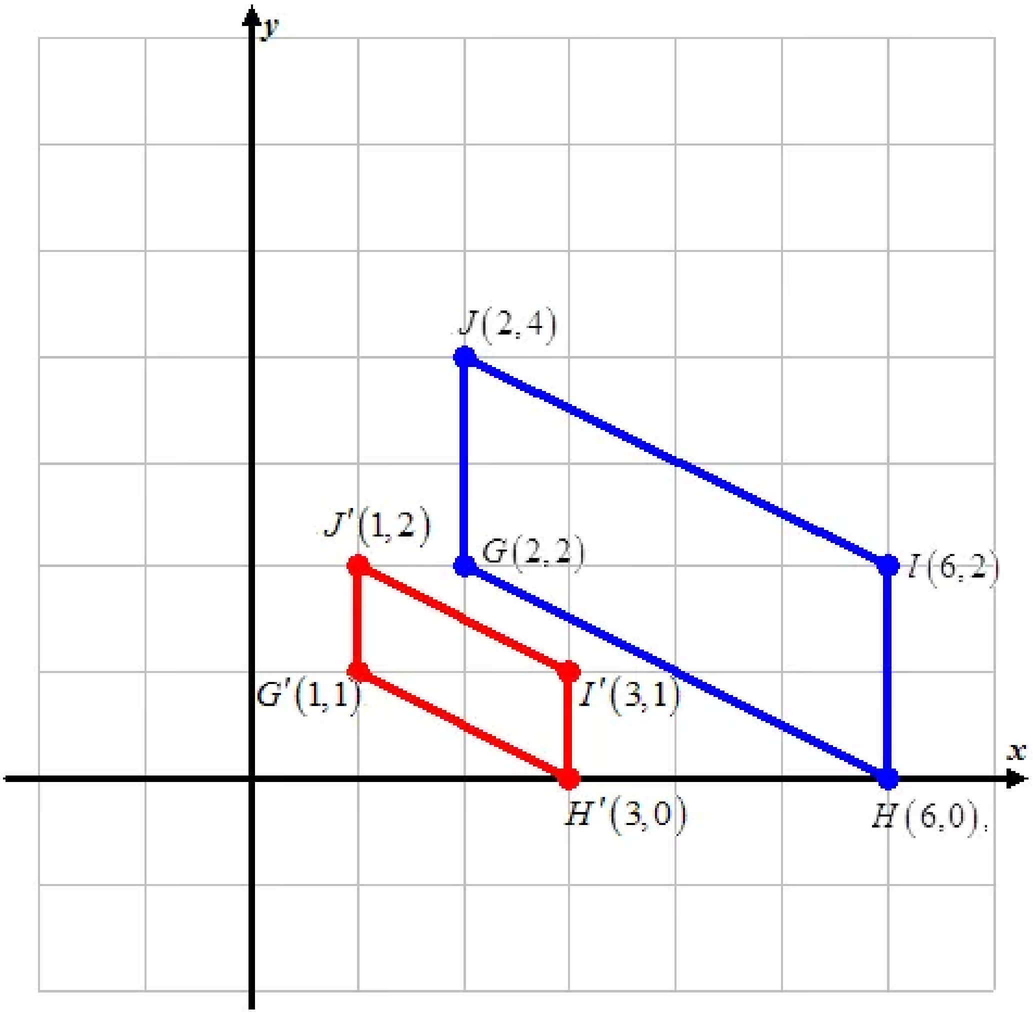
The coordinates of the vertices of image are

$$\boxed{G'(1,1), H'(3,0), I'(3,1) \text{ and } J'(1,2)}.$$

Now, the object is to graph the preimage and its image.

Graph each vertex of parallelogram *GHIJ*. Connect the points.

Graph each vertex of the reflected image $G'H'I'J'$. Connect the points.



Answer 19PT.

A function is a relation in which each element of domain corresponds to exactly one element of range.

Consider the relation

$$8y = 7 + 3x$$

First solve the equation in terms of *y*.

$$8y = 7 + 3x$$

$$y = \frac{7}{8} - \frac{3}{8}x \qquad \text{Multiply by 8 each side}$$

Form a table of x and y values

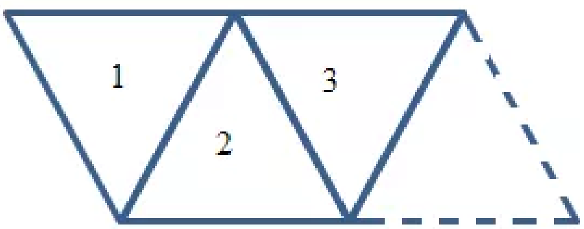
x	y
2	$\frac{1}{8}$
4	$-\frac{5}{8}$
0	$\frac{7}{8}$
8	$-\frac{17}{8}$

All the x-values of the table are assigned to unique y-values of the table, so the given relation is

$\boxed{\text{a function}}$

Answer 19STP.

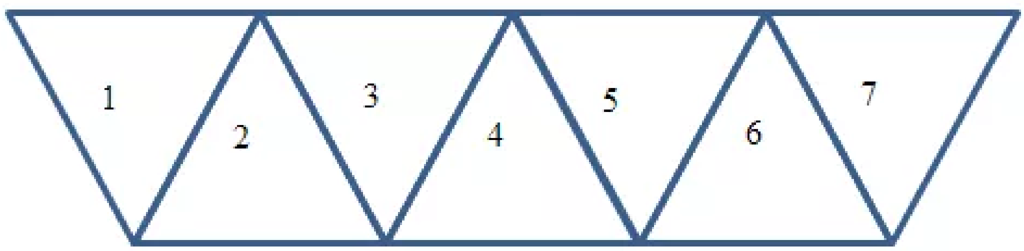
Consider the following pattern of triangles formed by G using toothpicks.



To form first triangle G used 3 toothpicks. The second triangle is formed by joining 2 toothpicks to the first triangle. Also the third triangle is formed by using 2 more toothpicks to the second triangle.

Therefore, to continue the pattern of triangles G has to add 2 toothpicks to the preceding triangles.

The pattern of 7 triangles will be as below.



The total number of toothpicks that G will use to form the above pattern of 7 triangles is

$3+2+2+2+2+2+2=\boxed{15}$

Answer 20E.

Consider a trapezoid *MNOP* with vertices $M(2,0), N(4,3), O(6,3)$ and $P(8,0)$.

The object is to find the coordinates of the vertices of trapezoid rotated 90° counterclockwise about the origin.

To find the coordinates of the vertices after a 900 rotation, switch the coordinates of each point and then multiply the new first coordinate by -1.

$$(x,y)\to(-y,x)$$

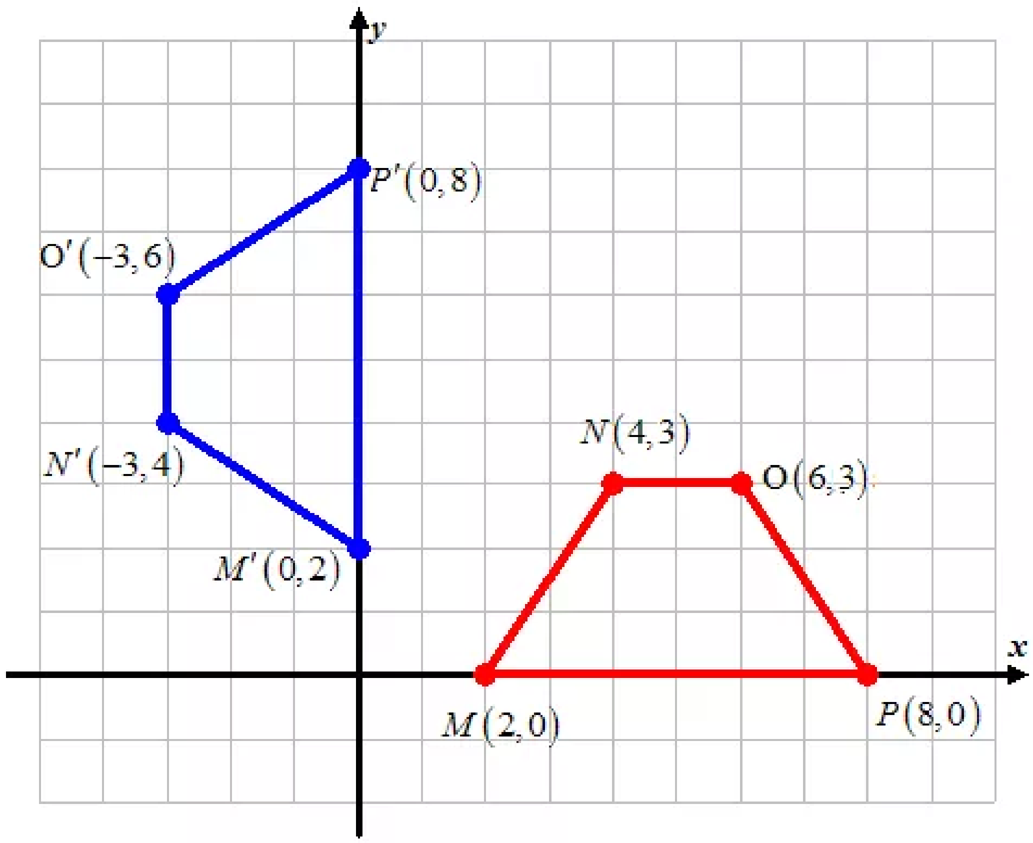
$$M(2,0)\to M'(0,2)$$
$$N(4,3)\to N'(-3,4)$$
$$O(6,3)\to O'(-3,6)$$
$$P(8,0)\to P'(0,8)$$

The coordinates of the vertices of the image are $\boxed{M'(0,2), N'(-3,4), O'(-3,6) \text{ and } P'(0,8)}$.

Now, the object is to graph the preimage and its image.

Graph each vertex of trapezoid *MNOP*. Connect the points.

Graph each vertex of the reflected image $M'N'O'P'$. Connect the points.



Answer 20PT.

A function is a relation in which each element of domain corresponds to exactly one element of range.

Consider the relation

$$8y = 7 + 3x$$

First solve the equation in terms of *y*.

$$8y = 7 + 3x$$

$$y = \frac{7}{8} - \frac{3}{8}x \qquad \text{Multiply by 8 each side}$$

Form a table of *x* and *y* values

x	y
2	$\frac{1}{8}$
4	$-\frac{5}{8}$
0	$\frac{7}{8}$
8	$-\frac{17}{8}$

All the *x*-values of the table are assigned to unique *y*-values of the table, so the given relation is $\boxed{\text{a function}}$

Answer 21E.

Consider a relation

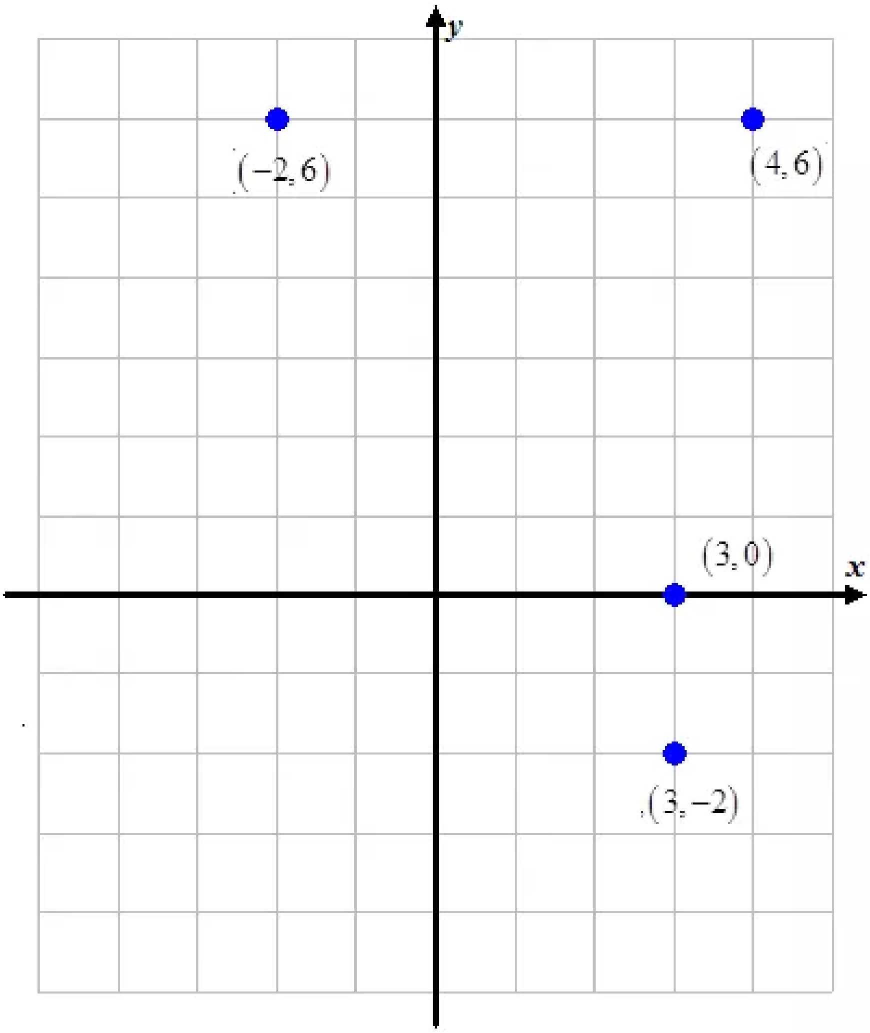
$$\{(-2,6),(3,-2),(3,0),(4,6)\}$$

The object is to table the above relation, graphing the relation, and drawing a mapping of the relation.

First, form a table of the given relation by listing the set of *x*-coordinates in the first column of the table and *y*-coordinates in the second column of the table.

x	*y*
-2	6
3	-2
3	0
4	6

Graphing each ordered pair in coordinate plane



Map the relation $\{(-2,6),(3,-2),(3,0),(4,6)\}$ by listing *x* and *y* values and connecting them by arrows.

The domain of the relation is $\{-2,3,3,4\}$ and the range is $\{-2,0,6\}$.

Answer 21PT.

Consider the function

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

The objective is to find the value of $f(-2)$

$$\begin{aligned} f(-2) &= 3(-2)+7 && \text{Replace } x \text{ with } -2 \\ &= -6+7 && \text{Simplify} \\ &= 1 && \text{Add} \end{aligned}$$

Therefore,

$f(3) = \boxed{16}$

Answer 21STP.

A function is a relation in which each element of domain corresponds to exactly one element of range.

Consider the table of values of stopping distances of a car at different speeds.

Suppose *x* represents the speed and *y* represents stopping distance.

Speed(ft/s) x	Minimum stopping distance y
10	2
20	8
40	31
60	70
100	194

All the *x*-values of the table are assigned to unique *y*-values of the table, so the given relation is

$\boxed{\text{a function}}$

Answer 22E.

Consider a relation

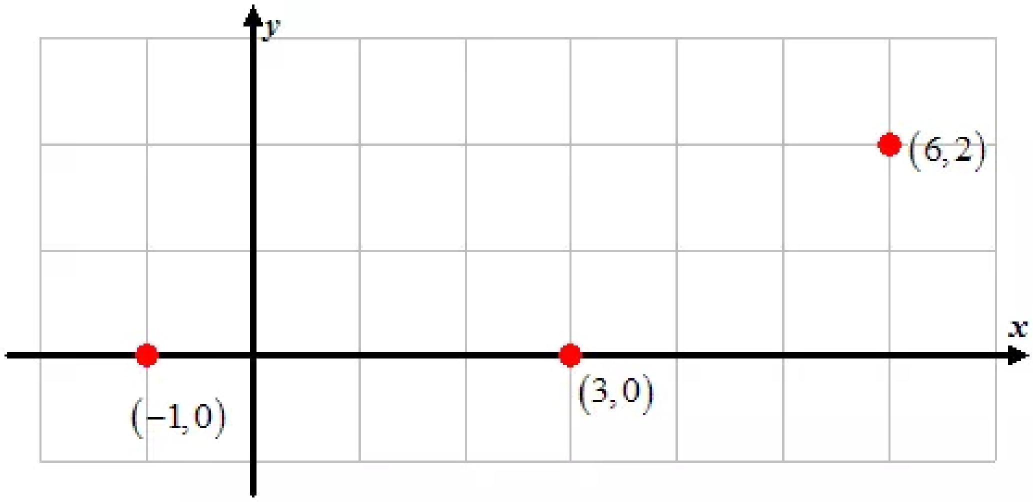
$\{(-1,0),(3,0),(6,2)\}$

The object is to table the above relation, graphing the relation, and drawing a mapping of the relation.

First, form a table of the given relation by listing the set of *x*-coordinates in the first column of the table and *y*-coordinates in the second column of the table.

x	*y*
-1	0
3	0
6	2

Graphing each ordered pair in coordinate plane



Map the relation $\{(-1,0),(3,0),(6,2)\}$ by listing *x* and *y* values and connecting them by arrows.

The domain of the relation is $\{-1,3,6\}$ and the range is $\{0,2\}$.

Answer 22PT.

Consider the function

$$g(x)=x^2-4x+1$$

The objective is to find the value of $g(3a)+1$

First find the value of $g(3a)$

$$\begin{aligned} g(3a) &= (3a)^2-4(3a)+1 && \text{Replace } x \text{ with } 3a \\ &= 9a^2-12a+1 && \text{Simplify} \end{aligned}$$

Adding 1 both sides

$$g(3a)+1=9a^2-12a+1+1$$
$$g(3a)+1=9a^2-12a+2$$

Therefore,

$$g(3a)=\boxed{9a^2-12a+2}$$

Answer 23E.

Consider a relation

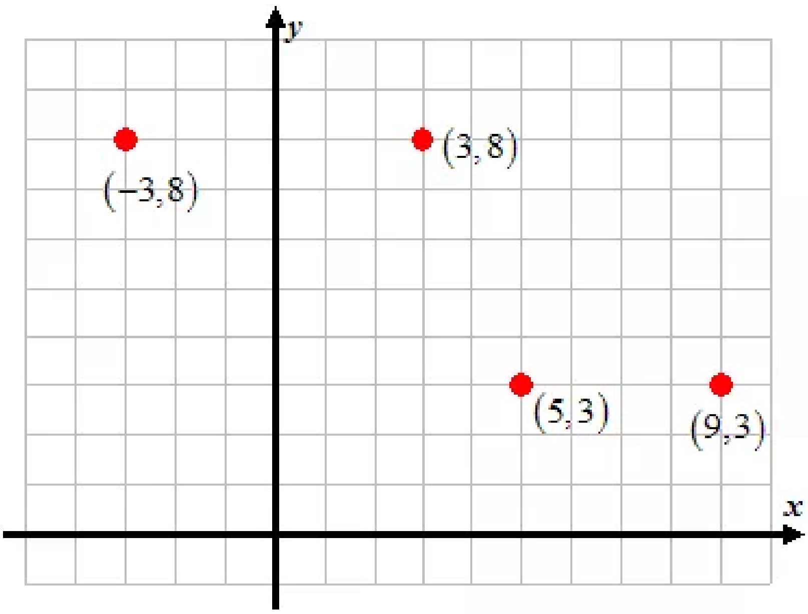
$\{(3,8),(9,3),(-3,8),(5,3)\}$

The object is to table the above relation, graphing the relation, and drawing a mapping of the relation.

First, form a table of the given relation by listing the set of *x*-coordinates in the first column of the table and *y*-coordinates in the second column of the table.

x	*y*
3	8
9	3
-3	8
5	3

Graphing each ordered pair in coordinate plane



Map the relation $\{(3,8),(9,3),(-3,8),(5,3)\}$ by listing *x* and *y* values and connecting them by arrows.

The domain of the relation is $\{3,9,-3,5\}$ and the range is $\{8,3\}$.

Answer 23PT.

Consider the function

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

The objective is to find the value of $f(x+2)$

$$\begin{aligned} f(x+2) &= -2(x+2)+5 && \text{Replace } x \text{ with } x+2 \\ &= -2x-4+5 && \text{Distributive Property} \\ &= -2x+1 && \text{Add} \end{aligned}$$

Therefore,

$$f(x+2) = \boxed{-2x+1}$$

Answer 24E.

Consider a relation

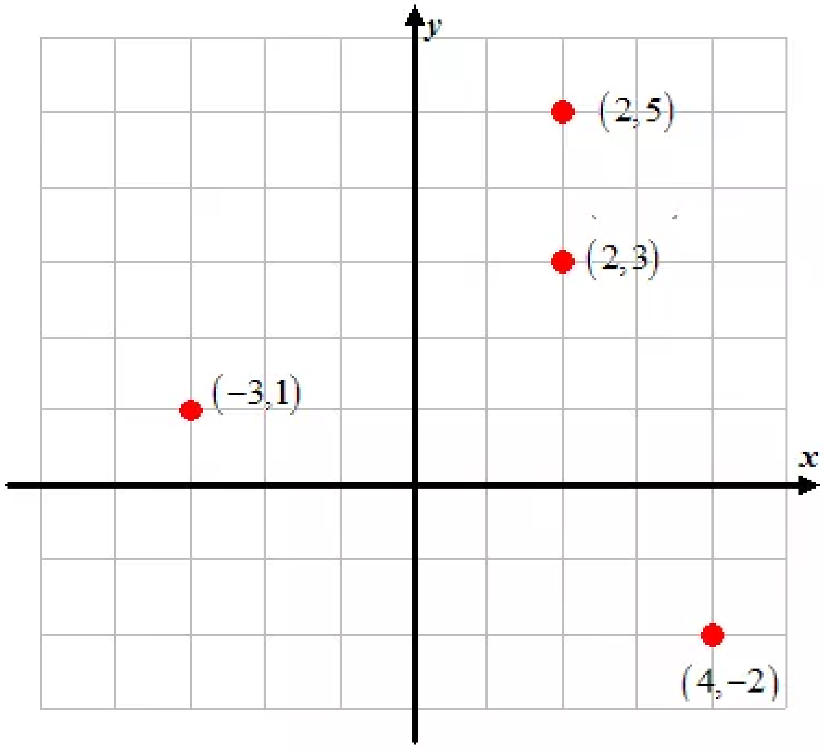
$$\{(2,5),(-3,1),(4,-2),(2,3)\}$$

The object is to table the above relation, graphing the relation, and drawing a mapping of the relation.

First, form a table of the given relation by listing the set of *x*-coordinates in the first column of the table and *y*-coordinates in the second column of the table.

x	*y*
3	8
9	3
-3	8
5	3

Graphing each ordered pair in coordinate plane



Map the relation $\{(2,5),(-3,1),(4,-2),(2,3)\}$ by listing *x* and *y* values and connecting them by arrows.

The domain of the relation is $\{2,-3,4,2\}$ and the range is $\{5,1,-2,3\}$

Answer 24PT.

A sequence $a_1, a_2, a_3, \ldots, a_n$ is said to be an arithmetic sequence if the successive terms differ by the same number, say *d*. That is each difference $a_2 - a_1, a_3 - a_2, \ldots, a_n - a_{n-1}$ is equal to a same number *d*.

This constant number is called common difference of the arithmetic sequence.

Consider a sequence

$16, 24, 32, 40, \ldots$

The differences between two consecutive numbers in the sequence

$$24 - 16 = 8$$
$$32 - 24 = 8$$
$$40 - 32 = 8$$

It can be observed that the differences are constant and equal to 8.

Therefore, the sequence $16, 24, 32, 40, \ldots$ is $\boxed{\text{an arithmetic sequence}}$ and the common difference is $\boxed{8}$

Answer 25E.

Consider an equation

$y = x - 9$

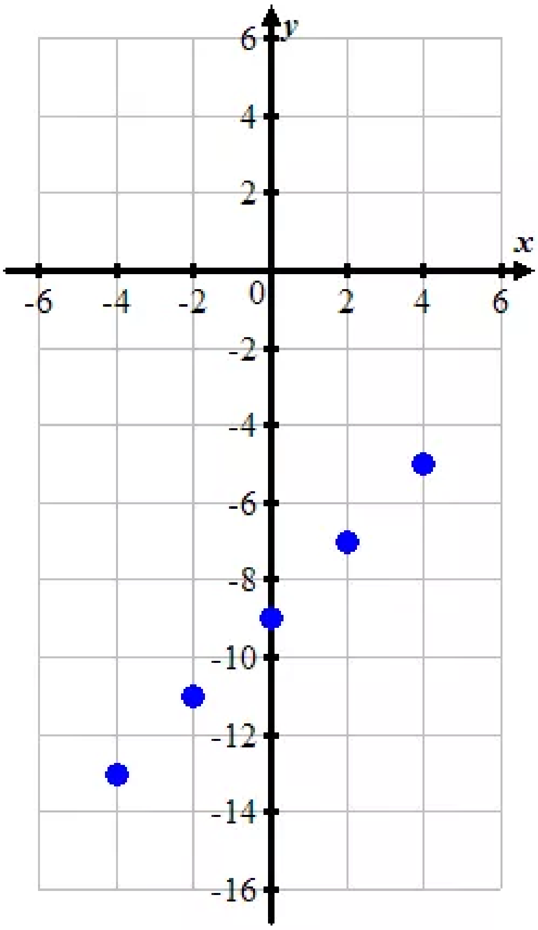
The object is to solve the equation if the domain is $\{-4, -2, 0, 2, 4\}$ and graphing the solution set.

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y = x - 9$	y	(x, y)
-4	$y = -4 - 9$ $= -13$	-13	$(-4, -13)$
-2	$y = -2 - 9$ $= -11$	-11	$(-2, -11)$
0	$y = 0 - 9$ $= -9$	-9	$(0, -9)$
2	$y = 2 - 9$ $= -7$	-7	$(2, -7)$
4	$y = 4 - 9$ $= -5$	-5	$(4, -5)$

Therefore the solution set is $\{(-4, -13), (-2, -11), (0, -9), (2, -7), (4, -5)\}$.

Graph the solution set $\{(-4,-13),(-2,-11),(0,-9),(2,-7),(4,-5)\}$ is



Answer 25PT.

A sequence $a_1, a_2, a_3, \ldots, a_n$ is said to be an arithmetic sequence if the successive terms differ by the same number, say *d*. That is each difference $a_2 - a_1, a_3 - a_2, \ldots, a_n - a_{n-1}$ is equal to a same number *d*.

This constant number is called common difference of the arithmetic sequence.

Consider a sequence

$99, 87, 76, 65, \ldots$

The differences between two consecutive numbers in the sequence

$87 - 99 = -12$

$76 - 87 = -11$

$65 - 76 = -11$

It can be observed that the difference between the terms is not constant.

Therefore, the sequence $99, 87, 76, 65, \ldots$ is $\boxed{\text{not an arithmetic sequence}}$.

Answer 26E.

Consider an equation

$y = 4 - 2x$

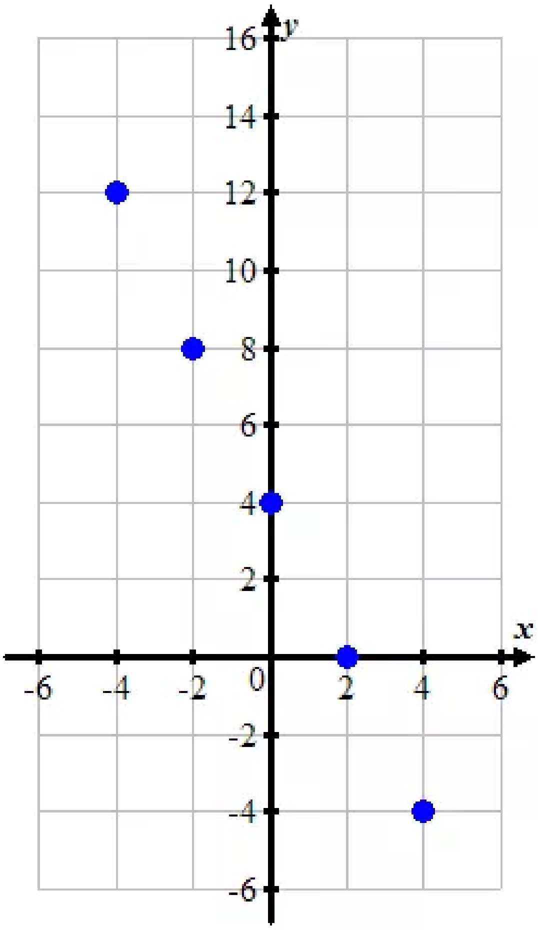
The object is to solve the equation if the domain is $\{-4, -2, 0, 2, 4\}$ and graphing the solution set.

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y = 4 - 2x$	y	(x, y)
-4	$y = 4 - 2(-4)$ $= 4 + 8$ $= 12$	12	$(-4, 12)$
-2	$y = 4 - 2(-2)$ $= 4 + 4$ $= 8$	8	$(-2, 8)$
0	$y = 4 - 2(0)$ $= 4 - 0$ $= 4$	4	$(0, 4)$
2	$y = 4 - 2(2)$ $= 4 - 4$ $= 0$	0	$(2, 0)$
4	$y = 4 - 2(4)$ $= 4 - 8$ $= -4$	-4	$(4, -4)$

Therefore the solution set is $\{(-4, 12), (-2, 8), (0, 4), (2, 0), (4, -4)\}$.

Graph the solution set $\{(-4,12),(-2,8),(0,4),(2,0),(4,-4)\}$ is



Answer 26PT.

A sequence $a_1, a_2, a_3, \ldots, a_n$ is said to be an arithmetic sequence if the successive terms differ by the same number, say *d*. That is each difference $a_2 - a_1, a_3 - a_2, \ldots, a_n - a_{n-1}$ is equal to a same number *d*.

This constant number is called common difference of the arithmetic sequence.

Consider a sequence

$5, 17, 29, 41, \ldots$

The differences between two consecutive numbers in the sequence

$$17 - 5 = 12$$
$$29 - 17 = 12$$
$$41 - 29 = 12$$

It can be observed that the differences are constant and equal to 12.

Therefore, the sequence $5, 17, 29, 41, \ldots$ is $\boxed{\text{an arithmetic sequence}}$ and the common difference is $\boxed{12}$

Answer 27E.

Consider an equation

$4x - y = -5$

The object is to solve the equation if the domain is $\{-4,-2,0,2,4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

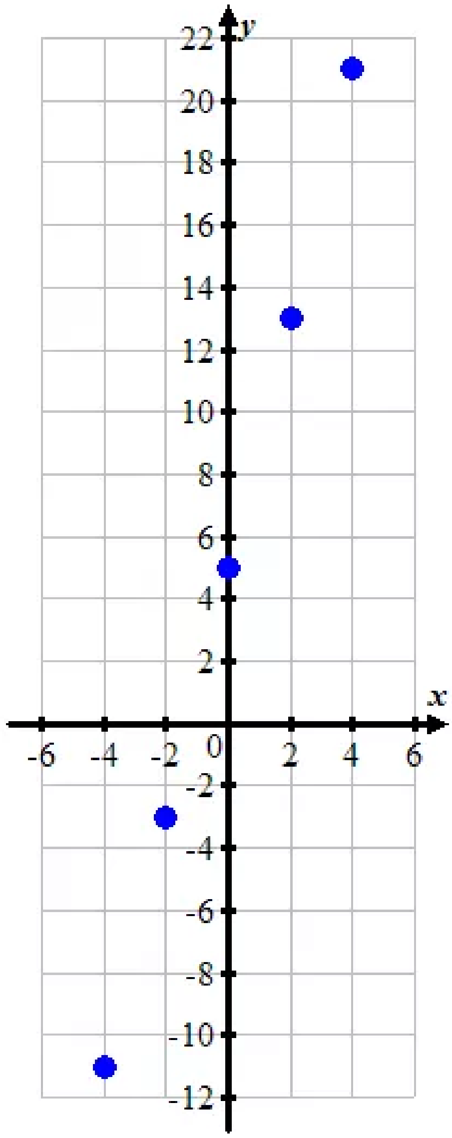
$$\begin{aligned} 4x - y &= -5 && \\ 4x - 4x - y &= -5 - 4x && \text{Subtract } 4x \text{ from both sides} \\ -y &= -5 - 4x && \text{Simplify} \\ y &= 4x + 5 && \text{Multiply both sides with } -1 \end{aligned}$$

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y = 4x + 5$	y	(x, y)
-4	$y = 4(-4) + 5$ $= -16 + 5$ $= -11$	-11	$(-4, -11)$
-2	$y = 4(-2) + 5$ $= -8 + 5$ $= -3$	-3	$(-2, -3)$
0	$y = 4(0) + 5$ $= 0 + 5$ $= 5$	5	$(0, 5)$
2	$y = 4(2) + 5$ $= 8 + 5$ $= 13$	13	$(2, 13)$
4	$y = 4(4) + 5$ $= 16 + 5$ $= 21$	21	$(4, 21)$

Therefore the solution set is $\{(-4,-11),(-2,-3),(0,5),(2,13),(4,21)\}$.

Graph the solution set $\{(-4,-11),(-2,-3),(0,5),(2,13),(4,21)\}$ is



Answer 27PT.

Consider an arithmetic sequence

$$5,-10,15,-20,25,\ldots$$

The object is to find the next three terms of the sequence.

Make an arithmetic sequence with first, third, fifth terms and so on

$$5,15,25,\ldots$$

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$15-5=10$$
$$25-15=10$$

It can be observed that the difference between the terms is constant and equal to 10.

Therefore, the common difference is 10.

The next three term of the sequence $5, 15, 25, \ldots$ can be obtained by adding the common difference 10 to the last term 25 and continue adding 10 until the next terms are found.

$$25 + 10 = 35$$
$$35 + 10 = 45$$
$$45 + 10 = 55$$

Hence, the next three terms of the sequence $5, 15, 25, \ldots$ are $35, 45, 55$ ------ (1)

Again make an arithmetic sequence with second, fourth terms and so on from

$$5, -10, 15, -20, 25, \ldots$$

The sequence is

$$-10, -20, \ldots$$

The common difference is

$$-20 - (-10) = -10$$

It can be observed that the difference between the terms is constant and equal to -10.

Therefore, the common difference is -10.

The next three term of the sequence $-10, -20, \ldots$ can be obtained by adding the common difference -10 to the last term -20 and continue adding -10 until the next terms are found.

$$-20 + (-10) = -30$$
$$-30 + (-10) = -40$$
$$-40 + (-10) = -50$$

Hence, the next three terms of the sequence $-10, -20, \ldots$ are $-30, -40, -50$ ------- (2)

From (1) and (2) the next terms of the sequence $5, -10, 15, -20, 25, \ldots$ are
$-30, 35, -40, 45 - 50, 55$

Hence, the next three terms of the sequence $5, -10, 15, -20, 25, \ldots$ are $\boxed{-30, 35, -40}$

Answer 28E.

Consider an equation

$$2x + y = 8$$

The object is to solve the equation if the domain is $\{-4, -2, 0, 2, 4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

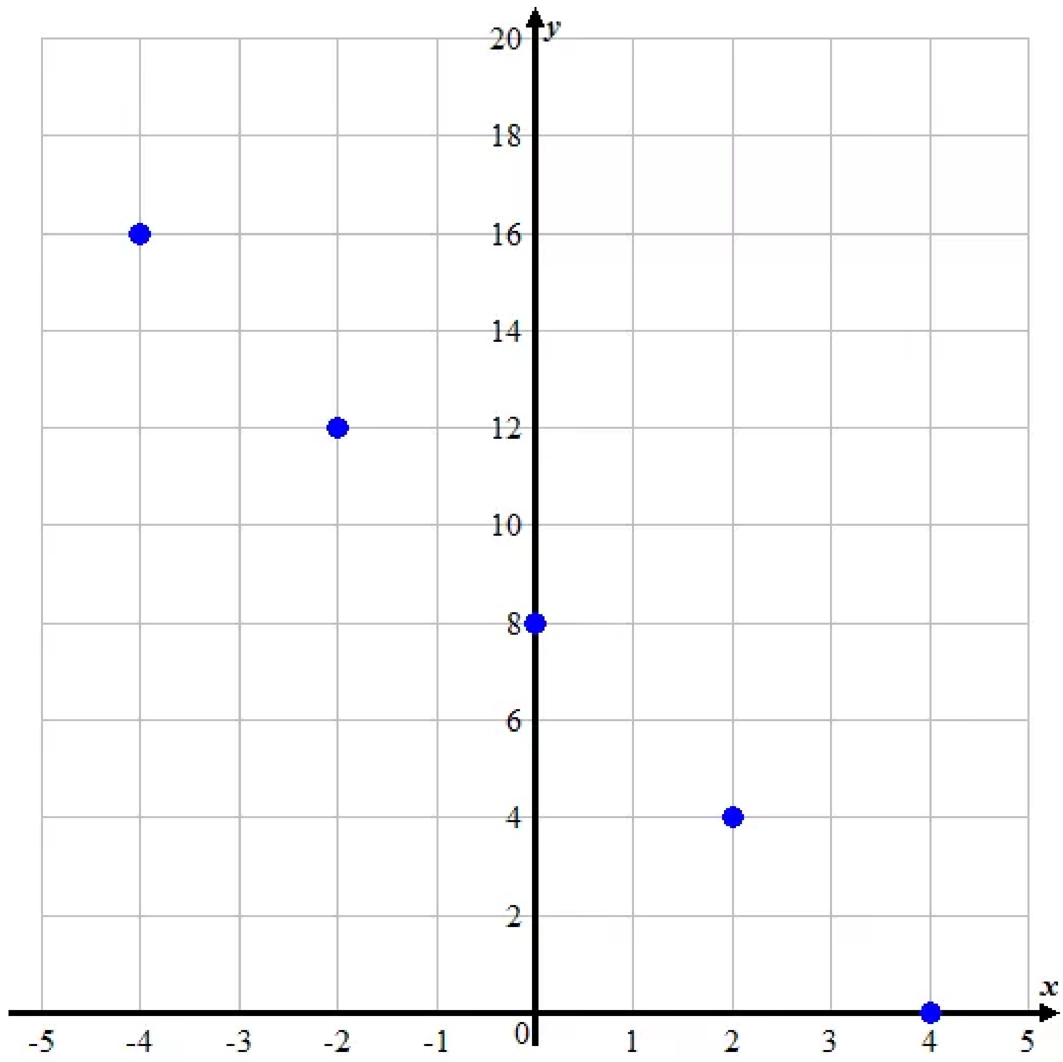
$$\begin{aligned} 2x + y &= 8 \\ 2x - 2x + y &= 8 - 2x && \text{Subtract } 2x \text{ from both sides} \\ y &= 8 - 2x && \text{Simplify} \end{aligned}$$

Make a table. The values of x come from the domain. Substitute each value of x into the equation to determine the corresponding values of y in the range.

x	$y=8-2x$	y	(x,y)
-4	$y=8-2(-4)$ $=8+8$ $=16$	16	$(-4,16)$
-2	$y=8-2(-2)$ $=8+4$ $=12$	12	$(-2,12)$
0	$y=8-2(0)$ $=8-0$ $=8$	8	$(0,8)$
2	$y=8-2(2)$ $=8-4$ $=4$	4	$(2,4)$
4	$y=8-2(4)$ $=8-8$ $=0$	0	$(4,0)$

Therefore the solution set is $\{(-4,16),(-2,12),(0,8),(2,4),(4,0)\}$.

Graph the solution set $\{(-4,16),(-2,12),(0,8),(2,4),(4,0)\}$ is



Answer 28PT.

Consider the sequence

$5,5,6,8,11,15,\ldots$

The object is to find the next three terms of the sequence.

The differences between two consecutive terms of the sequence are

$$5-5=0$$
$$6-5=1$$
$$8-6=2$$
$$11-8=3$$
$$15-11=4$$

It can be observed that the difference between each term is increased by 1 in each successive term.

Thus to find the next three terms in the sequence $5,5,6,8,11,15,\ldots$, continue adding 1 to each successive difference. That is adding 5, 6, and 7.

Hence, the next three terms of the sequence are $\boxed{20, 26, \text{and } 33}$.

Answer 29E.

Consider an equation

$3x+2y=9$

The object is to solve the equation if the domain is $\{-4,-2,0,2,4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

$$\begin{aligned} 3x+2y&=9 \\ -3x+3x+2y&=9-3x && \text{Subtract } 3x \text{ from both sides} \\ 2y&=9-3x && \text{Simplify} \\ y&=\frac{9-3x}{2} && \text{Divide each side by 2} \end{aligned}$$

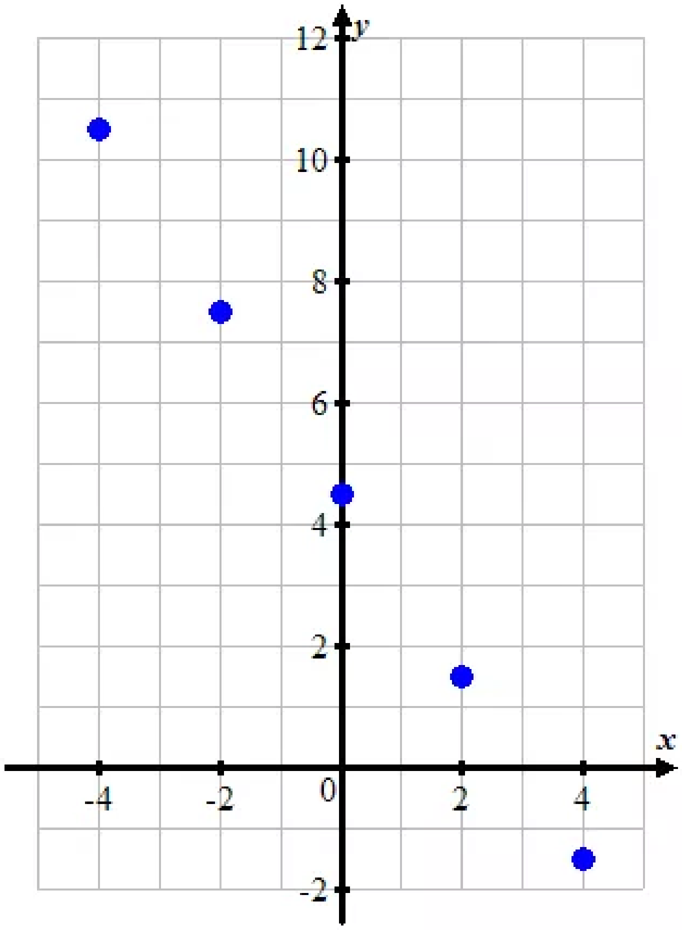
Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y=\frac{9-3x}{2}$	y	(x,y)
-4	$y=\frac{9-3(-4)}{2}$ $=\frac{9+12}{2}$ $=\frac{21}{2}$ $=10.5$	10.5	$(-4,10.5)$
-2	$y=\frac{9-3(-2)}{2}$ $=\frac{9+6}{2}$ $=\frac{15}{2}$ $=7.5$	7.5	$(-2,7.5)$
0	$y=\frac{9-3(0)}{2}$ $=\frac{9-0}{2}$ $=\frac{9}{2}$ $=4.5$	4.5	$(0,4.5)$
2	$y=\frac{9-3(2)}{2}$ $=\frac{9-6}{2}$ $=\frac{3}{2}$ $=1.5$	1.5	$(2,1.5)$

4	$y=\frac{9-3(4)}{2}$ $=\frac{9-12}{2}$ $=-\frac{3}{2}$ $=-1.5$	-1.5	$(4,-1.5)$

Therefore the solution set is $\{(-4,10.5),(-2,7.5),(0,4.5),(2,1.5),(4,-1.5)\}$

Graph the solution set $\{(-4,10.5),(-2,7.5),(0,4.5),(2,1.5),(4,-1.5)\}$ is



Answer 29PT.

Consider the equation:

$K=C+273.$

The objective is to solve the equation for C

Use the properties of equality and inverse operations to solve the equation.

$K-273=C+273-273$ Add -273 to both sides of the equation

$K-273=C$ Perform the operation for like terms

Therefore,

$C=\boxed{K-273}$

In the equation $C = K - 273$ the dependent variable is $\boxed{C}$ and independent variable is $\boxed{K}$.

Make a table. Choose some random values of *K* and substitute each value of *K* into the equation $C = K - 273$ to determine the corresponding values of *C*.

K	$C = K - 273$	C
-3	$C = -3 - 273$ $= -276$	-276
-1	$C = -1 - 273$ $= -274$	-274
0	$C = 0 - 273$ $= -273$	-273
2	$C = 2 - 273$ $= -271$	-271
4	$C = 4 - 273$ $= -269$	-269

Answer 30E.

Consider an equation

$$4x - 3y = 0$$

The object is to solve the equation if the domain is $\{-4, -2, 0, 2, 4\}$ and graphing the solution set.

First solve the equation in terms of *y*.

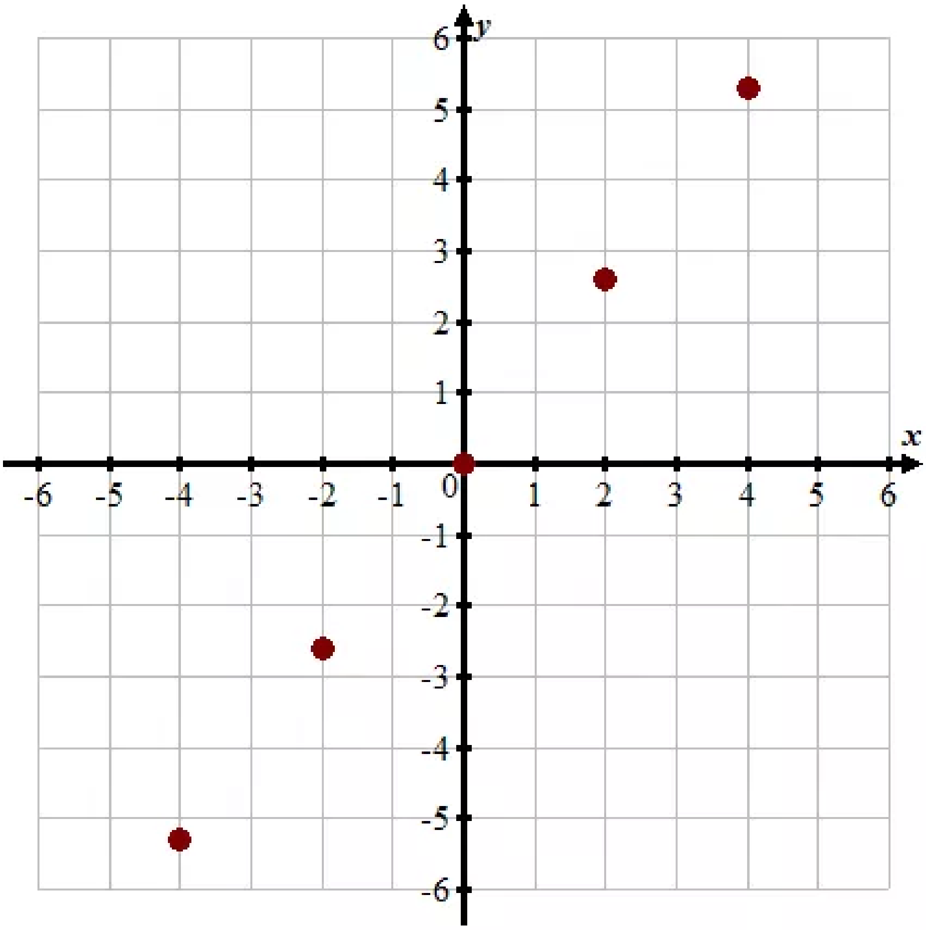
$$\begin{aligned} 4x - 3y &= 0 \\ -4x + 4x - 3y &= -4x && \text{Subtract } 4x \text{ from both sides} \\ -3y &= -4x && \text{Simplify} \\ y &= \frac{4x}{3} && \text{Divide each side by 2} \end{aligned}$$

Make a table. The values of *x* come from the domain. Substitute each value of *x* into the equation to determine the corresponding values of *y* in the range.

x	$y=\frac{4x}{3}$	y	(x,y)
-4	$y=\frac{4(-4)}{3}$ $=-\frac{16}{3}$ $=-5.3$	-5.3	$(-4,-5.3)$
-2	$y=\frac{4(-2)}{3}$ $=-\frac{8}{3}$ $=-2.6$	-2.6	$(-2,-2.6)$
0	$y=\frac{4(0)}{3}$ $=0$	0	$(0,0)$
2	$y=\frac{4(2)}{3}$ $=\frac{8}{3}$ $=2.6$	2.6	$(2,2.6)$
4	$y=\frac{4(4)}{3}$ $=\frac{16}{3}$ $=5.3$	5.3	$(4,5.3)$

Therefore the solution set is $\{(-4,-5.3),(-2,-2.6),(0,0),(2,2.6),(4,5.3)\}$.

Graph the solution set $\{(-4,-5.3),(-2,-2.6),(0,0),(2,2.6),(4,5.3)\}$ is



Answer 30PT.

Consider the function

$$f(x) = 3x - 2$$

The objective is to find the value of $f(8) - f(-5)$

First find the value of $f(8)$

$$\begin{aligned} f(8) &= 3(8) - 2 && \text{Replace } x \text{ with } 8 \\ &= 24 - 2 && \text{Simplify} \\ &= 22 && \text{Subtract} \end{aligned}$$

Therefore,

$f(8) = 22$ ------ (1)

Now, find the value of First find the value of $f(-5)$

$$\begin{aligned} f(-5) &= 3(-5) - 2 && \text{Replace } x \text{ with } -5 \\ &= -15 - 2 && \text{Simplify} \\ &= -17 && \text{Subtract} \end{aligned}$$

Therefore,

$f(-5) = -17$ ------ (2)

From (1) and (2)

$$f(8)-f(-5)=22-(-17)$$
$$=22+17$$
$$=39$$

Hence, $f(8)-f(-5)=39$

Therefore the correct option is $\boxed{D}$

Answer 31E.

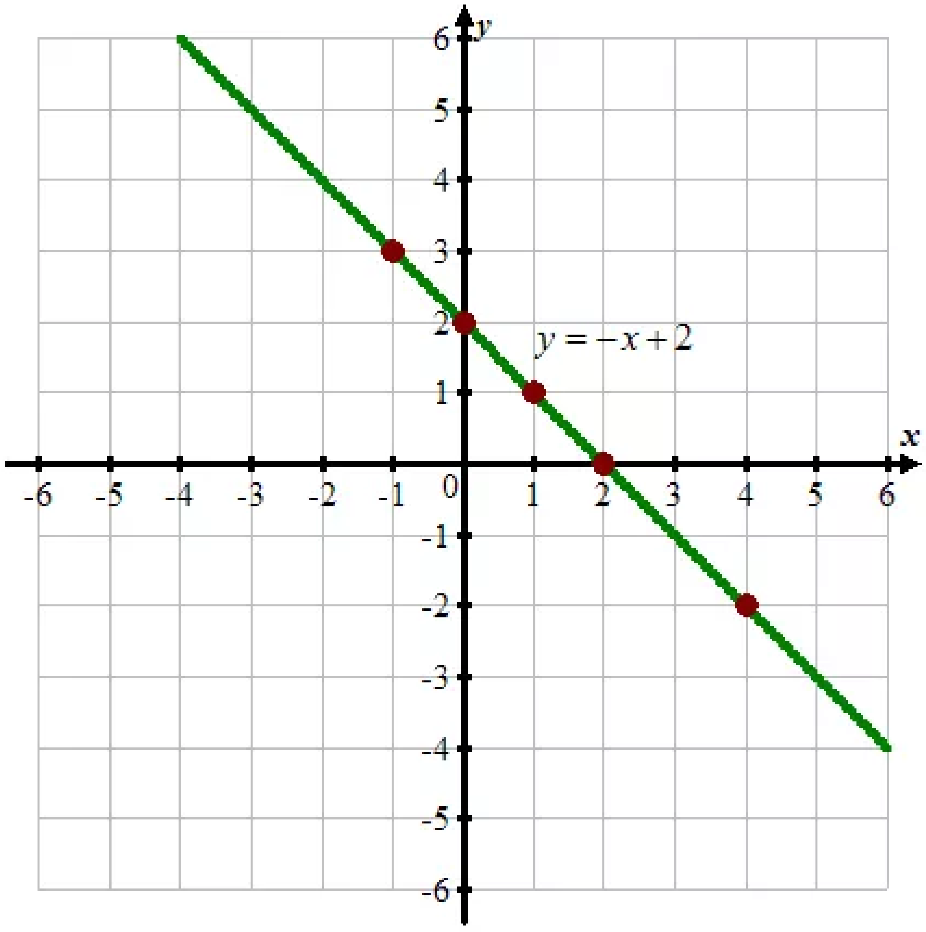
Consider the following equation:

$$y=-x+2$$

Find ordered pairs from the equation by randomly choosing a value for *x*, replacing this value for *x* in the equation, and solving for *y* as shown in the table.

x	y	(x,y)
-1	3	$(-1,3)$
0	2	$(0,2)$
1	1	$(1,1)$
2	0	$(2,0)$
4	-2	$(4,-2)$

Graph the ordered pairs $(-1,3),(0,2),(1,1),(2,0),(4,-2)$ and draw a line through the points. Then the graph appears as shown below



Answer 32E.

Consider the equation:

$x+5y=4$

To find x-intercept, substitute $y=0$ in $x+5y=4$.

$x+5(0)=4$ Simplify

$x=4$

So, the x-intercept is $(4,0)$.

To find y-intercept, substitute $x=0$ in $3x+2y=6$

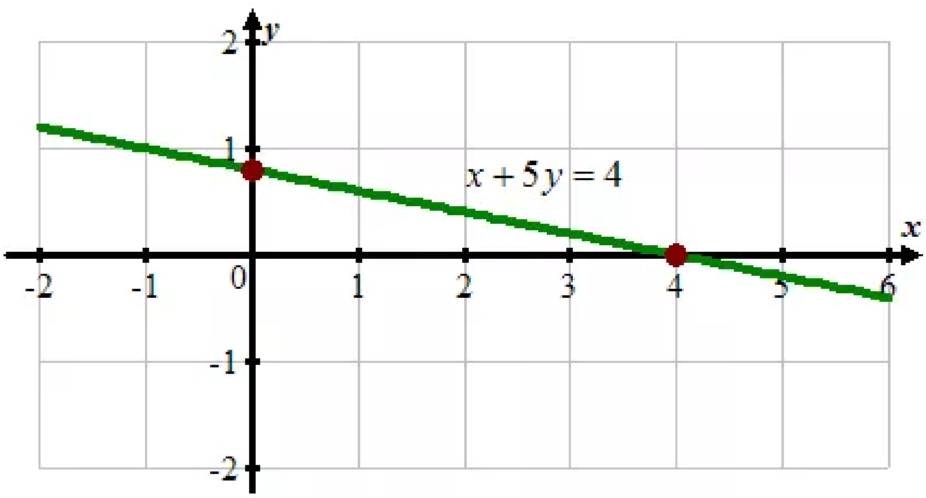
$0+5y=4$ Simplify

$5y=4$ Divide both sides of the equation by 5.

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

So, the y-intercept is $\left(0,\frac{4}{5}\right)$.

Graph the ordered pairs $(4,0),\left(0,\frac{4}{5}\right)$ and draw a line through the points. Then the graph appears as shown below



Answer 33E.

Consider the equation:

$2x-3y=6$

To find x-intercept, substitute $y=0$ in $2x-3y=6$.

$2x-3(0)=6$ Simplify

$2x=6$ Divide both sides of the equation by 2

$x=3$

So, the x-intercept is $(3,0)$.

To find y-intercept, substitute $x=0$ in $2x-3y=6$

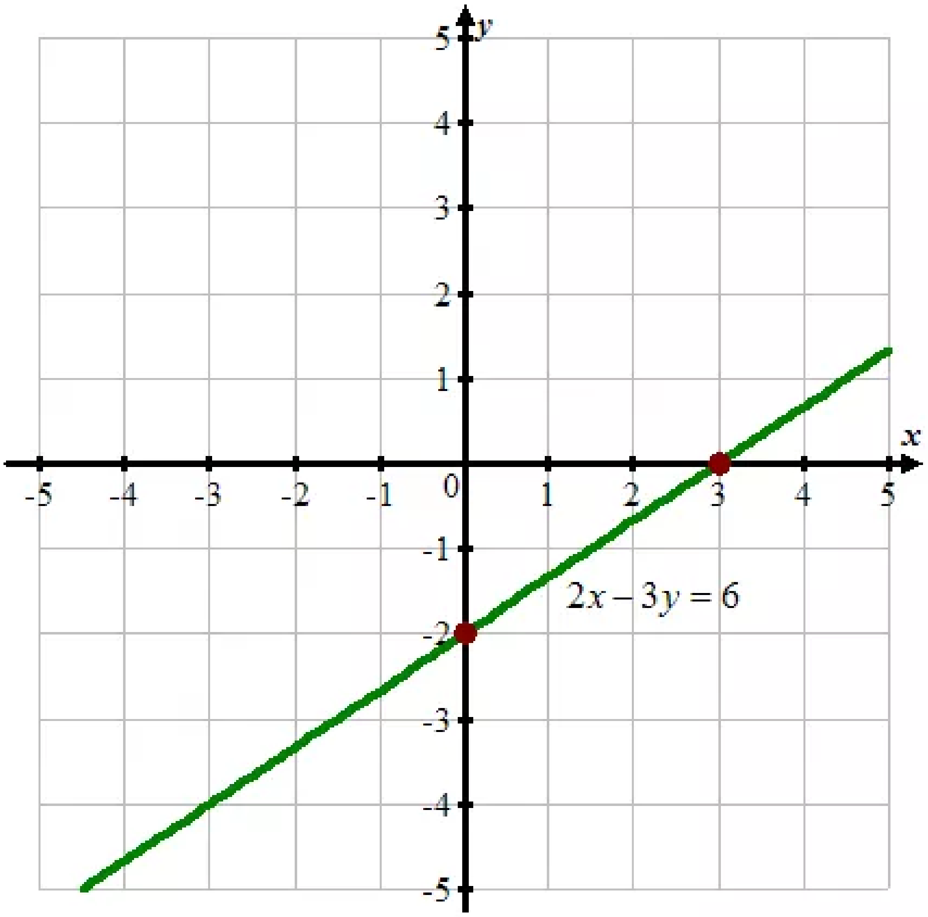
$2(0)-3y=6$ Simplify

$-3y=6$ Divide both sides of the equation by -3.

$y=-2$

So, the y-intercept is $(0,-2)$.

Graph the ordered pairs $(3,0),(0,-2)$ and draw a line through the points. Then the graph appears as shown below



Answer 34E.

Consider the equation:

$5x+2y=10$

To find x-intercept, substitute $y=0$ in $5x+2y=10$.

$5x+2(0)=10$ Simplify

$5x=10$ Divide both sides of the equation by 5

$x=2$

So, the x-intercept is $(2,0)$.

To find y-intercept, substitute $x=0$ in $5x+2y=10$

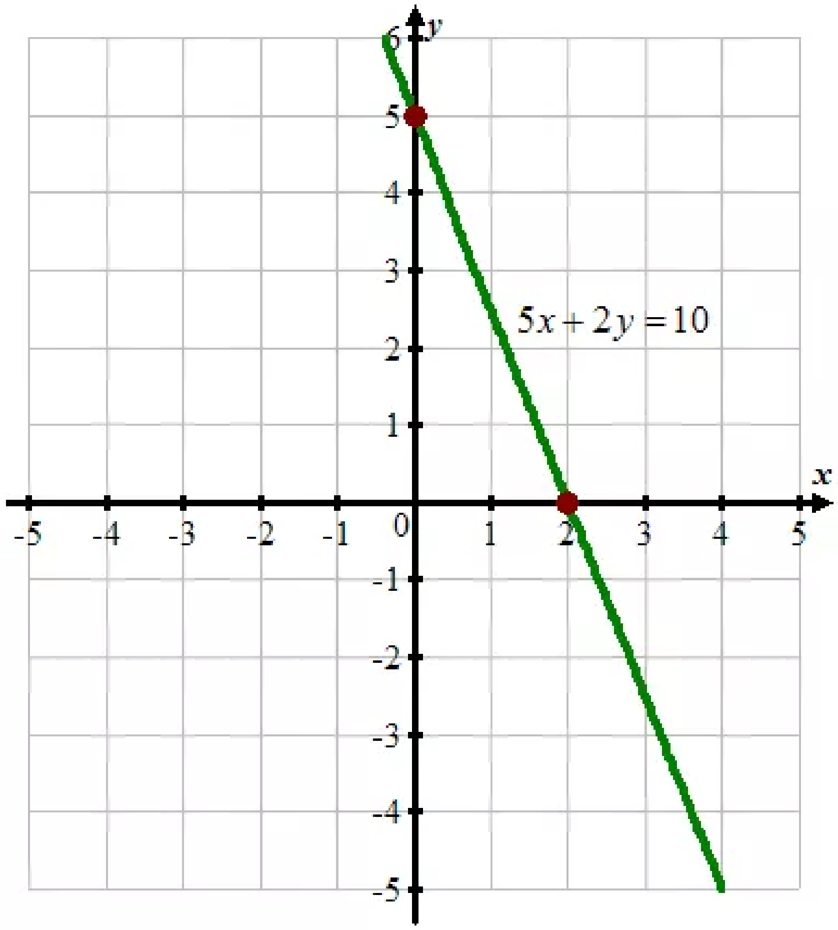
$5(0)+2y=10$ Simplify

$2y=10$ Divide both sides of the equation by 2.

$y=5$

So, the y-intercept is $(0,5)$.

Graph the ordered pairs $(2,0),(0,5)$ and draw a line through the points. Then the graph appears as shown below



Answer 35E.

Consider the equation:

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

To find x-intercept, substitute $y=0$ in $\frac{1}{2}x+\frac{1}{3}y=3$.

$\frac{1}{2}x+\frac{1}{3}(0)=3$ Simplify

$\frac{1}{2}x=3$ Multiply both sides of the equation by 2

$x=6$

So, the x-intercept is $(6,0)$.

To find y-intercept, substitute $x=0$ in $\frac{1}{2}x+\frac{1}{3}y=3$

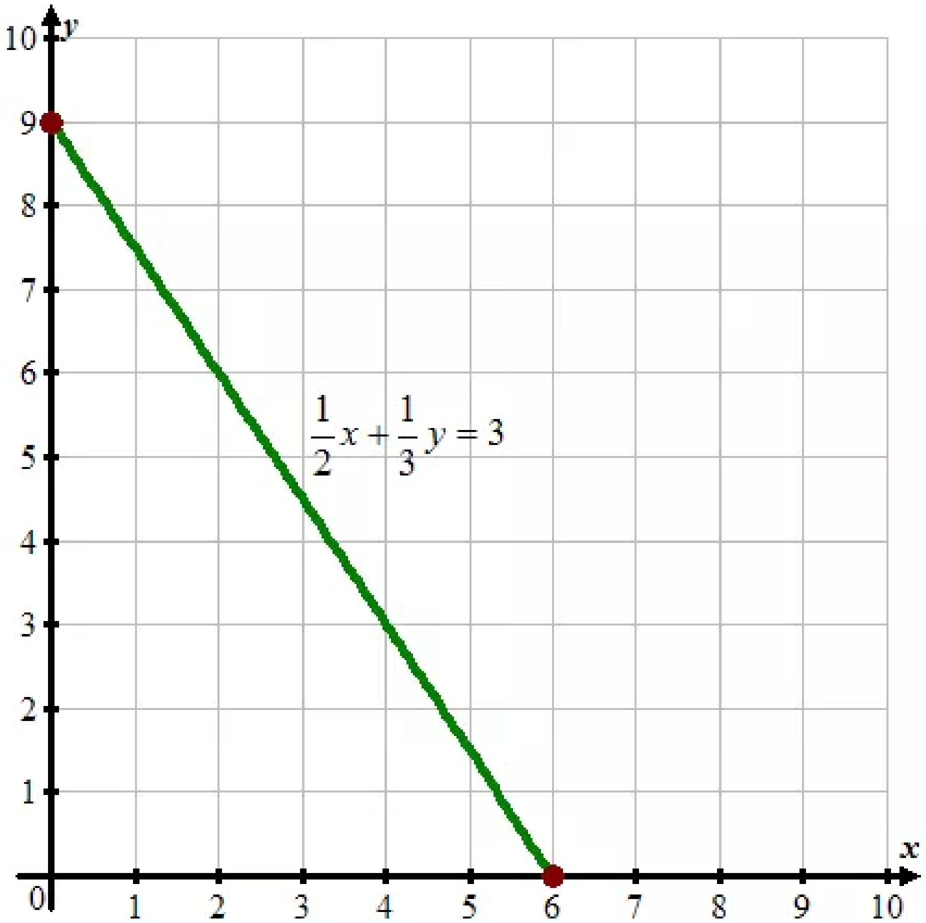
$\frac{1}{2}(0)+\frac{1}{3}y=3$ Simplify

$\frac{1}{3}y=3$ Multiply both sides of the equation by 3.

$y=9$

So, the y-intercept is $(0,9)$.

Graph the ordered pairs $(6,0),(0,9)$ and draw a line through the points. Then the graph appears as shown below



Answer 36E.

Consider the equation:

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

To find x-intercept, substitute $y=0$ in $\frac{1}{2}x+\frac{1}{3}y=3$.

$\frac{1}{2}x+\frac{1}{3}(0)=3$ Simplify

$\frac{1}{2}x=3$ Multiply both sides of the equation by 2

$x=6$

So, the x-intercept is $(6,0)$.

To find y-intercept, substitute $x=0$ in $\frac{1}{2}x+\frac{1}{3}y=3$

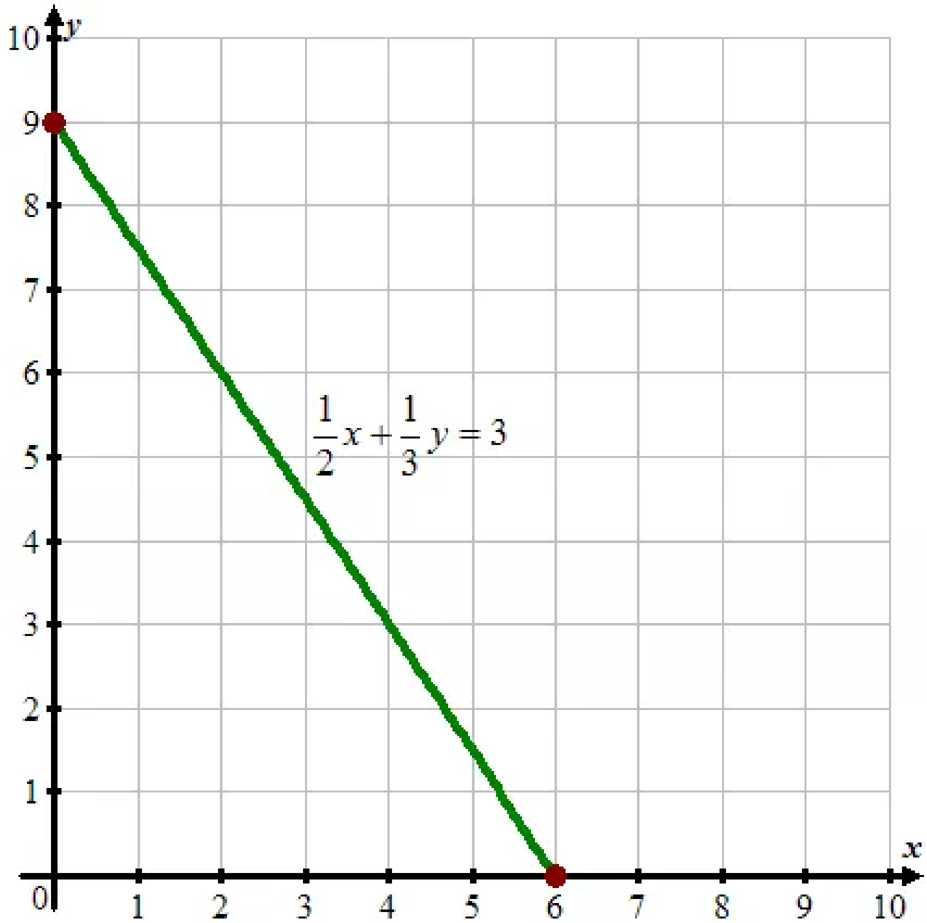
$\frac{1}{2}(0)+\frac{1}{3}y=3$ Simplify

$\frac{1}{3}y=3$ Multiply both sides of the equation by 3.

$y=9$

So, the y-intercept is $(0,9)$.

Graph the ordered pairs $(6,0),(0,9)$ and draw a line through the points. Then the graph appears as shown below



Answer 37E.

A function is a relation in which each element of domain corresponds to exactly one element of range.

Consider the relation:

Although the ordered pairs $(-5,0),(-2,0)$ have the same *y*-value, each *x*-value is assigned to only one *y*-value. Therefore, each element of the domain assigned to unique element of range, so the given relation is $\boxed{\text{a function}}$

Answer 38E.

A function is a relation in which each element of domain corresponds to exactly one element of range.

Consider the relation:

x	y
5	3
1	4
−6	5
1	6
−2	7

All the *x*-values of the table are assigned to unique *y*-values of the table, so the given relation is $\boxed{\text{a function}}$

Answer 39E.

A function is a relation in which each first component (element of domain) in the ordered pairs corresponds to exactly one second component (element of range).

Consider the relation:

$$\{(2,3),(-3,-4),(-1,3)\}$$

Although the ordered pairs $(2,3)\text{and}(-1,3)$ have the same *y*-value, each *x*-value is assigned to only one *y*-value, so the set of ordered pairs $\{(2,3),(-3,-4),(-1,3)\}$ is $\boxed{\text{a function}}$.

Answer 40E.

A function is a relation in which each first component (element of domain) in the ordered pairs
Consider the function

$$g(x)=x^2-x+1$$

The objective is to find the value of $g(2)$

$$\begin{aligned} g(2) &= (2)^2-(2)+1 && \text{Replace } x \text{ with } 2 \\ &= 4-2+1 && \text{Simplify} \\ &= 3 && \text{Add} \end{aligned}$$

Therefore,

$$g(2)=\boxed{3}$$

Answer 41E.

Consider the function

$$g(x)=x^2-x+1$$

The objective is to find the value of $g(-1)$

$$\begin{aligned} g(-1) &= (-1)^2-(-1)+1 && \text{Replace } x \text{ with } -1 \\ &= 1+1+1 && \text{Simplify} \\ &= 3 && \text{Add} \end{aligned}$$

Therefore,

$$g(-1)=\boxed{3}$$

Answer 42E.

A function is a relation in which each first component (element of domain) in the ordered pairs

Consider the function

$$g(x) = x^2 - x + 1$$

The objective is to find the value of $g\left(\frac{1}{2}\right)$

$$\begin{aligned} g\left(\frac{1}{2}\right) &= \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right) + 1 && \text{Replace } x \text{ with } \frac{1}{2} \\ &= \frac{1}{4} - \frac{1}{2} + 1 && \text{Simplify} \\ &= \frac{3}{4} && \text{Add} \end{aligned}$$

Therefore,

$$g\left(\frac{1}{2}\right) = \boxed{\frac{3}{4}}$$

Answer 43E.

A function is a relation in which each first component (element of domain) in the ordered pairs

Consider the function

$$g(x) = x^2 - x + 1$$

The objective is to find the value of $g(5) - 3$

First find $g(5)$

$$\begin{aligned} g(5) &= (5)^2 - 5 + 1 && \text{Replace } x \text{ with } 5 \\ &= 25 - 5 + 1 && \text{Simplify} \\ &= 21 && \text{Add} \end{aligned}$$

Now, to find $g(5) - 3$

$$\begin{aligned} g(5) &= 21 \\ g(5) - 3 &= 21 - 3 && \text{Add } -3 \text{ each side} \\ &= 18 && \text{Add} \end{aligned}$$

Therefore,

$$g(5) - 3 = \boxed{18}$$

Answer 44E.

A function is a relation in which each first component (element of domain) in the ordered pairs
Consider the function

$$g(x) = x^2 - x + 1$$

The objective is to find the value of $g(a)$

$$\begin{aligned} g(a) &= (a)^2 - a + 1 && \text{Replace } x \text{ with } a \\ &= a^2 - a + 1 && \text{Simplify} \end{aligned}$$

Therefore,

$$g(a) = \boxed{a^2 - a + 1}$$

Answer 45.

A function is a relation in which each first component (element of domain) in the ordered pairs
Consider the function

$$g(x) = x^2 - x + 1$$

The objective is to find the value of $g(-2a)$

$$\begin{aligned} g(-2a) &= (-2a)^2 - (-2a) + 1 && \text{Replace } x \text{ with } -2a \\ &= 4a^2 + 2a + 1 && \text{Simplify} \end{aligned}$$

Therefore,

$$g(-2a) = \boxed{4a^2 + 2a + 1}$$

Answer 46E.

Consider an arithmetic sequence

$$9, 18, 27, 36, \ldots$$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$18 - 9 = 9$$
$$27 - 18 = 9$$
$$36 - 27 = 9$$

It can be observed that the difference between the terms is constant and equal to 9.

Therefore, the common difference is 9.

The next three term of the sequence $9, 18, 27, 36, \ldots$ can be obtained by adding the common difference 9 to the last term 36 and continue adding 9 until the next terms are found.

$$36 + 9 = 45$$
$$45 + 9 = 54$$
$$54 + 9 = 63$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{45, 54, 63}$.

Answer 47E.

Consider an arithmetic sequence

$6, 11, 16, 21, \ldots$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$11 - 6 = 5$$
$$16 - 11 = 5$$
$$21 - 16 = 5$$

It can be observed that the difference between the terms is constant and equal to 5.

Therefore, the common difference is 5.

The next three term of the sequence $6, 11, 16, 21, \ldots$ can be obtained by adding the common difference 5 to the last term 21 and continue adding 5 until the next terms are found.

$$21 + 5 = 26$$
$$26 + 5 = 31$$
$$31 + 5 = 36$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{26, 31, 36}$.

Answer 48E.

Consider an arithmetic sequence

$10, 21, 32, 43, \ldots$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$21 - 10 = 11$$
$$32 - 21 = 11$$
$$43 - 32 = 11$$

It can be observed that the difference between the terms is constant and equal to 11.

Therefore, the common difference is 11.

The next three term of the sequence $10, 21, 32, 43, \ldots$ can be obtained by adding the common difference 11 to the last term 43 and continue adding 11 until the next terms are found.

$$43 + 11 = 54$$
$$54 + 11 = 65$$
$$65 + 11 = 76$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{56, 65, 76}$.

Answer 49E.

Consider an arithmetic sequence

$14, 12, 10, 8, \ldots$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$12 - 14 = -2$$
$$10 - 12 = -2$$
$$8 - 10 = -2$$

It can be observed that the difference between the terms is constant and equal to -2.

Therefore, the common difference is -2.

The next three term of the sequence $14, 12, 10, 8, \ldots$ can be obtained by adding the common difference -2 to the last term 8 and continue adding -2 until the next terms are found.

$$8 + (-2) = 6$$
$$6 + (-2) = 4$$
$$4 + (-2) = 2$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{6, 4, 2}$.

Answer 50E.

Consider an arithmetic sequence

$-3, -11, -19, -27, \ldots$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$-11 - (-3) = -8$$
$$-19 - (-11) = -8$$
$$-27 - (-19) = -8$$

It can be observed that the difference between the terms is constant and equal to -8.

Therefore, the common difference is -8.

The next three term of the sequence $-3,-11,-19,-27,\ldots$ can be obtained by adding the common difference -8 to the last term -27 and continue adding -8 until the next terms are found.

$$-27+(-8)=-35$$
$$-35+(-8)=-43$$
$$-43+(-8)=-51$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{-35,-43,-51}$.

Answer 51E.

Consider an arithmetic sequence

$$-35,-29,-23,-17,\ldots$$

The object is to find the next three terms of the sequence.

First find the common difference of the sequence.

The differences between two consecutive numbers in the sequence

$$-29-(-35)=6$$
$$-23-(-29)=6$$
$$-17-(-23)=6$$

It can be observed that the difference between the terms is constant and equal to 6.

Therefore, the common difference is 6.

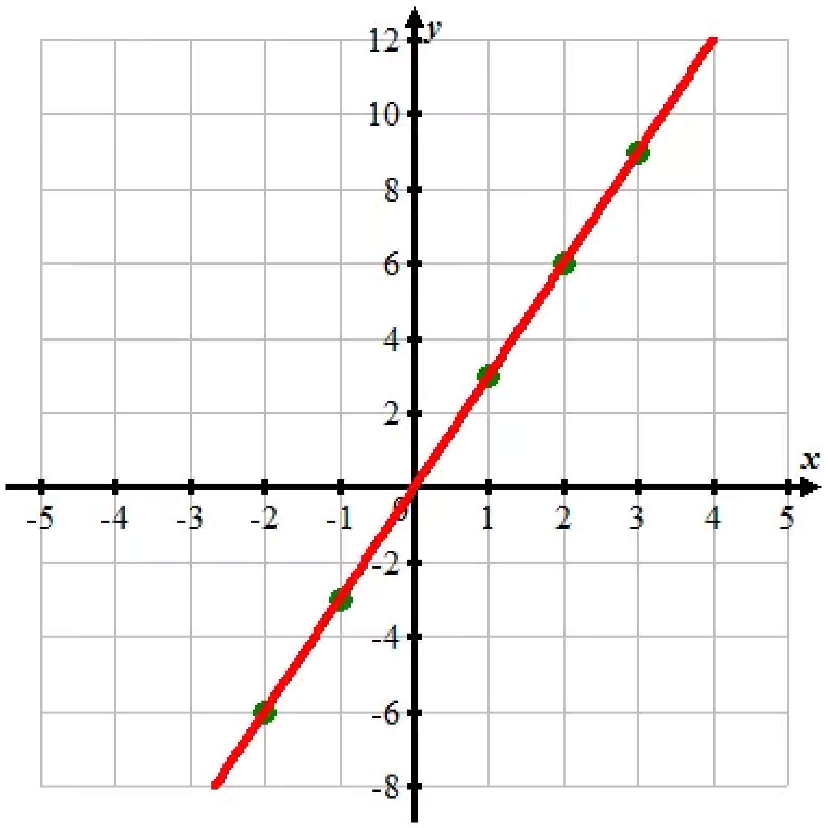
The next three term of the sequence $-35,-29,-23,-17,\ldots$ can be obtained by adding the common difference 6 to the last term -17 and continue adding 6 until the next terms are found.

$$-17+6=-11$$
$$-11+6=-5$$
$$-5+6=1$$

Hence, the next three terms of the given arithmetic sequence are $\boxed{-11,-5,1}$.

Answer 52E.

Consider the graph of the function



Construct a table of ordered pairs which lies on the above graph.

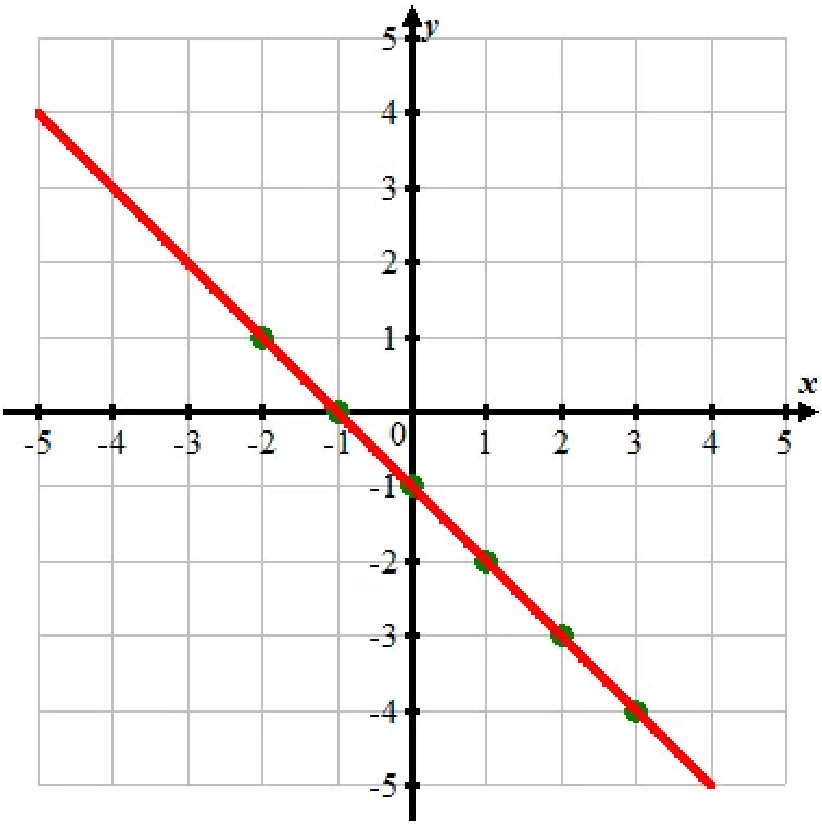
x	y
-1	-3
-2	-6
1	3
2	6
3	9

From the above table it can be observed that the values of y are 3 times the values of x. So, the required equation in function notation is

$\boxed{y=3x}$ or $\boxed{f(x)=3x}$

Answer 53E.

Consider the graph of the function



Construct a table of ordered pairs which lies on the above graph.

x	y
-2	1
-1	0
0	-1
1	-2
2	-3
3	-4

The difference between any two consecutive values of x is 1.

The difference between any two consecutive values of y is -1.

Thus, the difference in y values is equal to negative difference of x values.

Therefore, the suitable equation might be $y = -x$.

Before concluding the results first check this equation.

Check: If $x = 2,$ then $y = -2$. But the y value for $x = 2,$ is -3 .

This is an increment of -1 . Try some other values in the domain to see if the same increment occurs.

x	$-x$	y
-2	2	1
-1	1	0
0	0	-1
1	-1	-2
2	-2	-3
3	-3	-4

From above table it can be observed that y is always -1 more than $-x$.

This pattern suggests that -1 should be added to one side of the equation in order to correctly describe the relation.

Check $y = -x - 1$.

If $x = 0$, then $y = 0 - 1$ or -1 ✓

If $x = 2$, then $y = -2 - 1$ or -3 ✓

Hence, an equation in function notation for the given relation is $\boxed{y = -x - 1}$