Chapter 3 Systems of Linear Equations and Inequalities

Ex 3.5

Answer 1e.

The dimensions of a matrix with m rows and n columns are $m \times n$. In the given statement m is 3 and n is 4.

Therefore, the statement can be completed as
"The **dimensions** of a matrix with 3 rows and 4 columns are 3×4.

To graph $y < 6$, we begin by graphing the boundary line $y = 6$. Since the inequality contains an $<$ symbol, the boundary is a dashed line. Because the coordinates of the test point $(0,0)$ satisfy $y < 6$, we shade the side of the boundary that contains $(0,0)$.

Graph the boundary: $y = 6$

x	y	(x,y)
0	6	$(0,6)$
3	6	$(3,6)$

Shading: Check the test point $(0,0)$

$y < 6$

$0 < 6$

$(0,0)$ is a solution of $y < 6$

We superimpose the graph of $x + y > -2$ on the graph of $y < 6$ so that we can determine the points that the graphs have in common.

To graph $x+y>-2$, we graph the boundary line $x+y=-2$. Since the test point $(0,0)$ satisfy $2x-y\geq 1$, we shade the half plane that contains $(0,0)$.

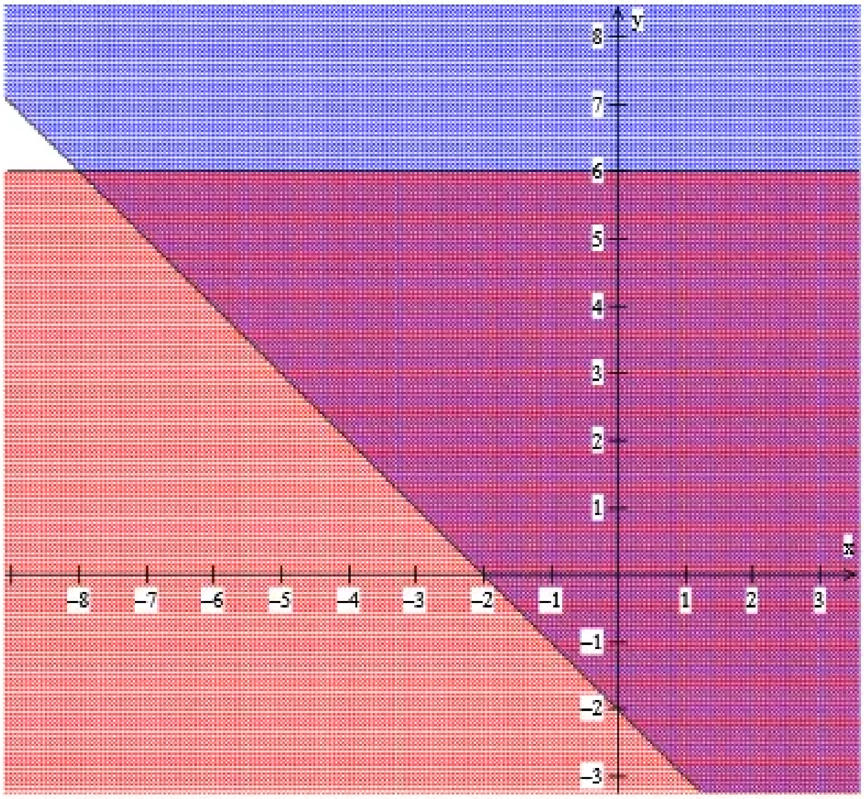
Graph the boundary: $x+y=-2$

x	y	(x,y)
0	−2	$(0,-2)$
−2	0	$(-2,0)$

Shading: Check the test point $(0,0)$

$$x+y>-2$$
$$0+0>-2$$
$$0>-2$$

$(0,0)$ is a solution of $2x-y\geq 1$



In the above figure, the area that is shaded twice represents the solutions of the given system. Any point in the doubly shaded region in purple has coordinates that satisfy both inequalities.

Answer 1gp.

In order to add two matrices, add the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are added.

$$\begin{bmatrix} -2 & 5 & 11 \\ 4 & -6 & 8 \end{bmatrix} + \begin{bmatrix} -3 & 1 & -5 \\ -2 & -8 & 4 \end{bmatrix} = \begin{bmatrix} -2+(-3) & 5+1 & 11+(-5) \\ 4+(-2) & -6+(-8) & 8+4 \end{bmatrix}$$

Simplify.

$$\begin{bmatrix} -2+(-3) & 5+1 & 11+(-5) \\ 4+(-2) & -6+(-8) & 8+4 \end{bmatrix} = \begin{bmatrix} -2-3 & 5+1 & 11-5 \\ 4-2 & -6-8 & 8+4 \end{bmatrix}$$

$$= \begin{bmatrix} -5 & 6 & 7 \\ 2 & -14 & 12 \end{bmatrix}$$

Therefore, $\begin{bmatrix} -2 & 5 & 11 \\ 4 & -6 & 8 \end{bmatrix} + \begin{bmatrix} -3 & 1 & -5 \\ -2 & -8 & 4 \end{bmatrix} = \begin{bmatrix} -5 & 6 & 7 \\ 2 & -14 & 12 \end{bmatrix}$.

Answer 2e.

Two matrices are equal if their dimensions are the same and the elements in corresponding positions are equal.

That is, the matrices A and B are equal when $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $B = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

To graph $x \geq -1$, we begin by graphing the boundary line $x = -1$. Since the inequality contains an $\geq$ symbol, the boundary is a solid line. Because the coordinates of the test point $(0,0)$ satisfy $x \geq -1$, we shade the side of the boundary that contains $(0,0)$.

Graph the boundary: $x = -1$

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

Shading: Check the test point $(0,0)$

$$x \geq -1$$
$$0 \geq -1$$

$(0,0)$ is a solution of $x \geq -1$

We superimpose the graph of $-2x + y \leq 5$ on the graph of $x \geq -1$ so that we can determine the points that the graphs have in common.

To graph $-2x+y\le 5$, we graph the boundary line $-2x+y=5$. Since the test point $(0,0)$ satisfy $-2x+y\le 5$, we shade the half plane that contains $(0,0)$.

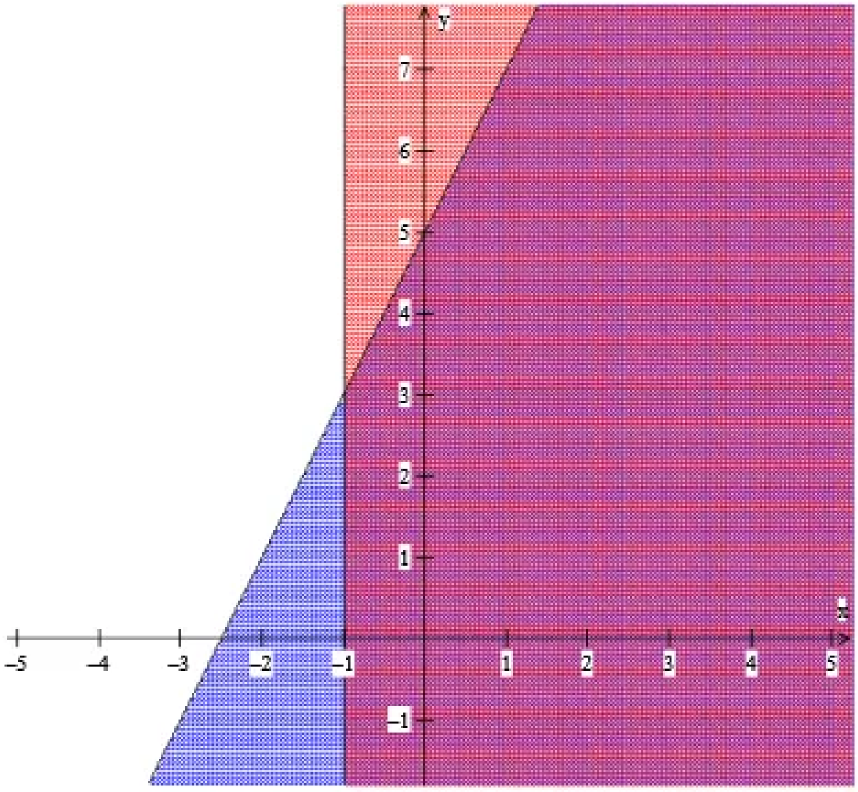
Graph the boundary: $-2x+y=5$

x	y	(x,y)
0	5	$(0,5)$
−2	1	$(-2,1)$

Shading: Check the test point $(0,0)$

$$-2x+y\le 5$$
$$-2(0)+0\le 5$$
$$0\le 5$$

$(0,0)$ is a solution of $-2x+y\le 5$



In the above figure, the area that is shaded twice represents the solutions of the given system. Any point in the doubly shaded region in purple has coordinates that satisfy both inequalities.

Answer 2gp.

To subtract two matrices, simply subtract the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.

$$\begin{pmatrix} -4 & 0 \\ 7 & -2 \\ -3 & 1 \end{pmatrix} - \begin{pmatrix} 2 & 2 \\ -3 & 0 \\ 5 & -14 \end{pmatrix}$$

$$= \begin{pmatrix} -4-2 & 0-2 \\ 7-(-3) & -2-0 \\ -3-5 & 1-(-14) \end{pmatrix}$$

$$= \begin{pmatrix} -6 & -2 \\ 10 & -2 \\ -8 & 15 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} -6 & -2 \\ 10 & -2 \\ -8 & 15 \end{pmatrix}}$.

Answer 3e.

The error in the given problem is that instead of adding the corresponding elements, the two matrices are combined to form a single matrix.

In order to add two matrices, add the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are added.

$$\begin{bmatrix} 9 \\ -5 \end{bmatrix} + \begin{bmatrix} 4.1 \\ 3.8 \end{bmatrix} = \begin{bmatrix} 9+4.1 \\ -5+3.8 \end{bmatrix}$$

Add.

$$\begin{bmatrix} 9+4.1 \\ -5+3.8 \end{bmatrix} = \begin{bmatrix} 13.1 \\ -1.2 \end{bmatrix}$$

Therefore, $\begin{bmatrix} 9 \\ -5 \end{bmatrix} + \begin{bmatrix} 4.1 \\ 3.8 \end{bmatrix} = \begin{bmatrix} 13.1 \\ -1.2 \end{bmatrix}$.

Answer 3ep.

To graph $x+3y>3$, we begin by graphing the boundary line $x+3y=3$. Since the inequality contains an > symbol, the boundary is a dashed line. Because the coordinates of the test point $(0,0)$ does not satisfy $x+3y>3$, we shade the side of the boundary that does not contain $(0,0)$.

Graph the boundary: $x+3y=3$

x	y	(x,y)
0	1	$(0,1)$
3	0	$(3,0)$

Shading: Check the test point $(0,0)$

$$x+3y>3$$
$$0+3(0)>3$$
$$0>3$$

$(0,0)$ is not a solution of $x+3y>3$

We superimpose the graph of $x+3y<-9$ on the graph of $x+3y>3$ so that we can determine the points that the graphs have in common.

To graph $x+3y<-9$, we graph the boundary line $x+3y=-9$. Since the test point $(0,0)$ does not satisfy $x+3y<-9$, we shade the half plane that does not contain $(0,0)$.

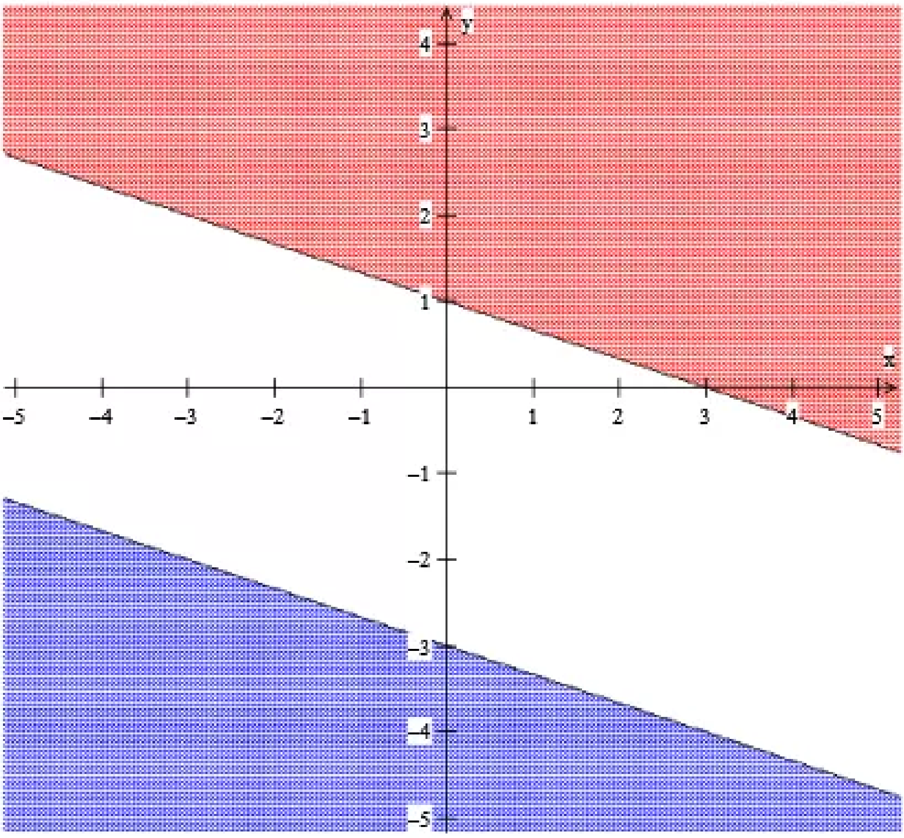
Graph the boundary: $x+3y=-9$

x	y	(x,y)
0	5	$(0,5)$
-2	1	$(-2,1)$

Shading: Check the test point $(0,0)$

$$x+3y<-9$$
$$0+3(0)<-9$$
$$0<-9$$

$(0,0)$ is not a solution of $x+3y<-9$



In the above figure, none of the area is shaded twice. There is no common area.

Answer 3gp.

We multiply each element in the matrix by the scalar to multiply a matrix by a scalar.
Multiply each element in the matrix by −4.

$$-4\begin{bmatrix} 2 & -1 & -3 \\ -7 & 6 & 1 \\ -2 & 0 & -5 \end{bmatrix} = \begin{bmatrix} -4(2) & -4(-1) & -4(-3) \\ -4(-7) & -4(6) & -4(1) \\ -4(-2) & -4(0) & -4(-5) \end{bmatrix}$$

Simplify.

$$\begin{bmatrix} -4(2) & -4(-1) & -4(-3) \\ -4(-7) & -4(6) & -4(1) \\ -4(-2) & -4(0) & -4(-5) \end{bmatrix} = \begin{bmatrix} -8 & 4 & 12 \\ 28 & -24 & -4 \\ 8 & 0 & 20 \end{bmatrix}$$

Therefore,

$$-4\begin{bmatrix} 2 & -1 & -3 \\ -7 & 6 & 1 \\ -2 & 0 & -5 \end{bmatrix} = \begin{bmatrix} -8 & 4 & 12 \\ 28 & -24 & -4 \\ 8 & 0 & 20 \end{bmatrix}.$$

Answer 4e.

To add two matrices, simply add the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.

$$\begin{pmatrix} 5 & 2 \\ -1 & 8 \end{pmatrix} + \begin{pmatrix} -8 & 10 \\ -6 & 3 \end{pmatrix}$$
$$= \begin{pmatrix} 5+(-8) & 2+10 \\ -1+(-6) & 8+3 \end{pmatrix}$$
$$= \begin{pmatrix} -3 & 12 \\ -7 & 11 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} -3 & 12 \\ -7 & 11 \end{pmatrix}}$.

To graph $x - y \geq 4$, we begin by graphing the boundary line $x - y = 4$. Since the inequality contains an $\geq$ symbol, the boundary is a solid line. Because the coordinates of the test point $(0,0)$ does not satisfy $x - y \geq 4$, we shade the side of the boundary that does not contain $(0,0)$.

Graph the boundary: $x - y = 4$

x	y	(x, y)
0	–4	$(0, -4)$
4	0	$(4, 0)$

Shading: Check the test point $(0,0)$

$$x - y \geq 4$$
$$0 - 0 \geq 4$$
$$0 \geq 4$$

$(0,0)$ is not a solution of $x - y \geq 4$

We superimpose the graph of $2x + 4y \geq -10$ on the graph of $x - y \geq 4$ so that we can determine the points that the graphs have in common.

To graph $2x+4y\geq -10$, we graph the boundary line $2x+4y=-10$. Since the test point $(0,0)$ satisfy $2x+4y\geq -10$, we shade the half plane that contains $(0,0)$.

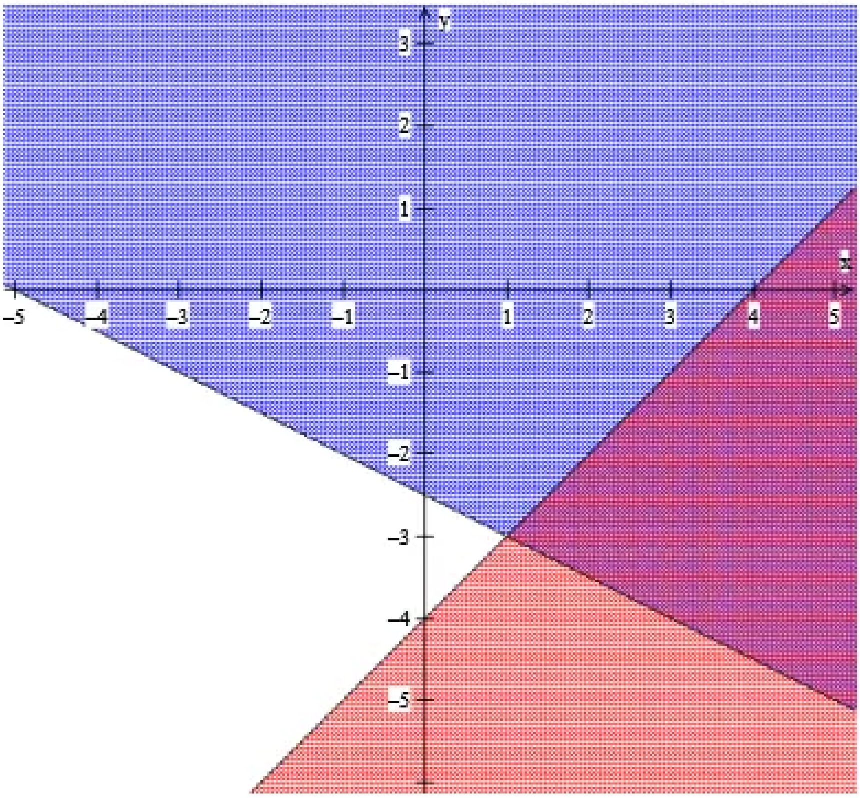
Graph the boundary: $2x+4y=-10$

x	y	(x,y)
1	–3	(1,–3)
–1	–2	(–1,–2)

Shading: Check the test point $(0,0)$

$$2x+4y\geq -10$$
$$2(0)+4(0)\geq -10$$
$$0\geq -10$$

$(0,0)$ is a solution of $2x+4y\geq -10$



In the above figure, the area that is shaded twice represents the solutions of the given system. Any point in the doubly shaded region in purple has coordinates that satisfy both inequalities.

Answer 4gp.

To add two matrices, simply add the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.
But perform scalar multiplication before matrix addition.

$$3\begin{pmatrix} 4 & -1 \\ -3 & -5 \end{pmatrix} + \begin{pmatrix} -2 & -2 \\ 0 & 6 \end{pmatrix}$$

$$= \begin{pmatrix} 3(4) & 3(-1) \\ 3(-3) & 3(-5) \end{pmatrix} + \begin{pmatrix} -2 & -2 \\ 0 & 6 \end{pmatrix}$$

$$= \begin{pmatrix} 12 & -3 \\ -9 & -15 \end{pmatrix} + \begin{pmatrix} -2 & -2 \\ 0 & 6 \end{pmatrix}$$

$$= \begin{pmatrix} 12+(-2) & -3+(-2) \\ -9+0 & -15+6 \end{pmatrix}$$

$$= \begin{pmatrix} 10 & -5 \\ -9 & -9 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} 10 & -5 \\ -9 & -9 \end{pmatrix}}$.

Answer 5e.

In order to subtract two matrices, subtract the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are subtracted.

$$\begin{bmatrix} 7 & -3 \\ 12 & 5 \\ -4 & 11 \end{bmatrix} - \begin{bmatrix} 9 & 2 \\ -2 & 6 \\ 6 & 5 \end{bmatrix} = \begin{bmatrix} 7-9 & -3-2 \\ 12-(-2) & 5-6 \\ (-4)-6 & 11-5 \end{bmatrix}$$

Subtract.

$$\begin{bmatrix} 10-12 & -8-(-3) \\ 5-3 & -3-(-4) \end{bmatrix} = \begin{bmatrix} 10-12 & -8+3 \\ 5-3 & -3+4 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & -5 \\ 2 & 1 \end{bmatrix}$$

Therefore, $\begin{bmatrix} 10 & -8 \\ 5 & -3 \end{bmatrix} - \begin{bmatrix} 12 & -3 \\ 3 & -4 \end{bmatrix} = \begin{bmatrix} -2 & -5 \\ 2 & 1 \end{bmatrix}$.

Answer 5ep.

To graph $x+2y\leq 10$, we begin by graphing the boundary line $x+2y=10$. Since the inequality contains an $\leq$ symbol, the boundary is a solid line. Because the coordinates of the test point $(0,0)$ satisfy $x+2y\leq 10$, we shade the side of the boundary that contains $(0,0)$.

Graph the boundary: $x+2y=10$

x	y	(x,y)
0	5	$(0,5)$
10	0	$(10,0)$

Shading: Check the test point $(0,0)$

$$x+2y\leq 10$$
$$0+2(0)\leq 10$$
$$0\leq 10$$

$(0,0)$ is a solution of $x+2y\leq 10$

We superimpose the graph of $y\geq|x+2|$ on the graph of $x+2y\leq 10$ so that we can determine the points that the graphs have in common.

To graph $y \geq |x+2|$, we graph the boundary line $y = |x+2|$. Since the test point $(0,0)$ does not satisfy $y \geq |x+2|$, we shade the half plane that does not contain $(0,0)$.

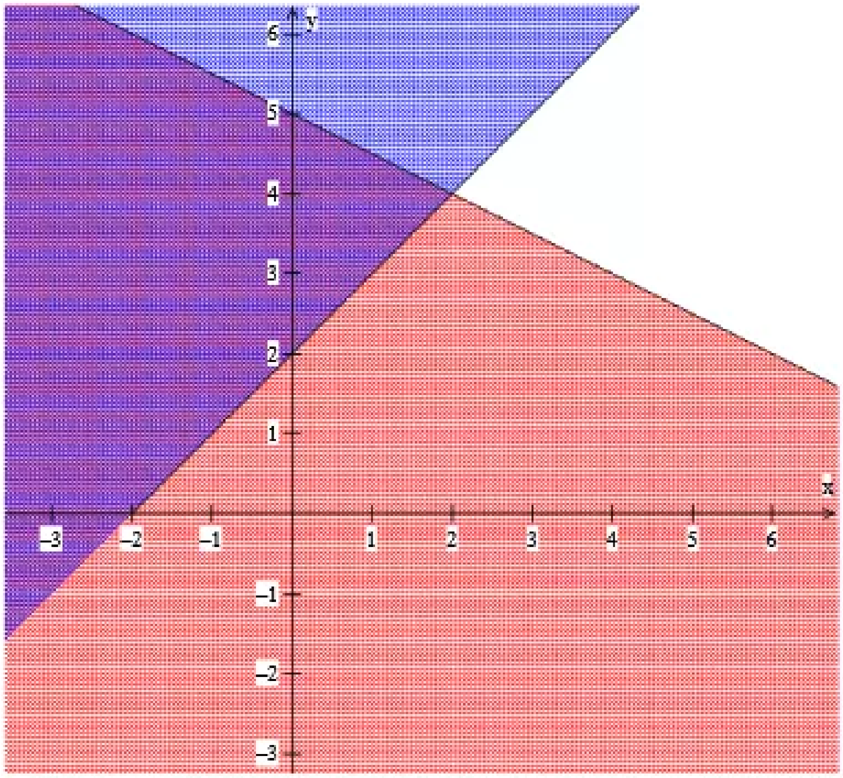
Graph the boundary: $y = |x+2|$

x	y	(x, y)
1	3	$(1,3)$
-3	1	$(-3,1)$

Shading: Check the test point $(0,0)$

$$y \geq |x+2|$$
$$0 \geq |0+2|$$
$$0 \geq 2$$

$(0,0)$ is not a solution of $y \geq |x+2|$



In the above figure, the area that is shaded twice represents the solutions of the given system. Any point in the doubly shaded region in purple has coordinates that satisfy both inequalities.

Answer 5gp.

Substitute the matrices for B and A.

$$B - A = \begin{bmatrix} 95 & 114 \\ 316 & 215 \\ 205 & 300 \end{bmatrix} - \begin{bmatrix} 125 & 114 \\ 316 & 251 \\ 225 & 270 \end{bmatrix}$$

In order to subtract two matrices, subtract the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are subtracted.

$$\begin{bmatrix} 95 & 114 \\ 316 & 215 \\ 205 & 300 \end{bmatrix} - \begin{bmatrix} 125 & 100 \\ 278 & 251 \\ 225 & 270 \end{bmatrix} = \begin{bmatrix} 95-125 & 114-100 \\ 316-278 & 215-251 \\ 205-225 & 300-270 \end{bmatrix}$$

Subtract.

$$\begin{bmatrix} 95-125 & 114-100 \\ 316-278 & 215-251 \\ 205-225 & 300-270 \end{bmatrix} = \begin{bmatrix} -35 & 14 \\ 38 & -36 \\ -20 & 30 \end{bmatrix}$$

Therefore, $B - A = \begin{bmatrix} -35 & 14 \\ 38 & -36 \\ -20 & 30 \end{bmatrix}$.

The matrix $B-A$ represents the increase or decrease in the production of small and large walnut, pine and cherry.

Answer 6e.

To subtract two matrices, simply subtract the elements in the corresponding positions. But the dimensions of the two matrices are not equal; hence we cannot perform the indicated operation.

Answer 6ep.

To graph $-y<x$, we begin by graphing the boundary line $-y=x$. Since the inequality contains an < symbol, the boundary is a dashed line. Because the coordinates of the test point $(1,1)$ satisfy $-y<x$, we shade the side of the boundary that contains $(1,1)$.

Graph the boundary: $-y=x$

x	y	(x,y)
0	0	$(0,0)$
–1	1	$(-1,1)$

Shading: Check the test point $(1,1)$

$$-y<x$$
$$-1<1$$

$(1,1)$ is a solution of $-y<x$

We superimpose the graph of $2y<5x+9$ on the graph of $-y<x$ so that we can determine the points that the graphs have in common.

To graph $2y<5x+9$, we graph the boundary line $2y=5x+9$. Since the test point $(0,0)$ satisfy $2y<5x+9$, we shade the half plane that contains $(0,0)$.

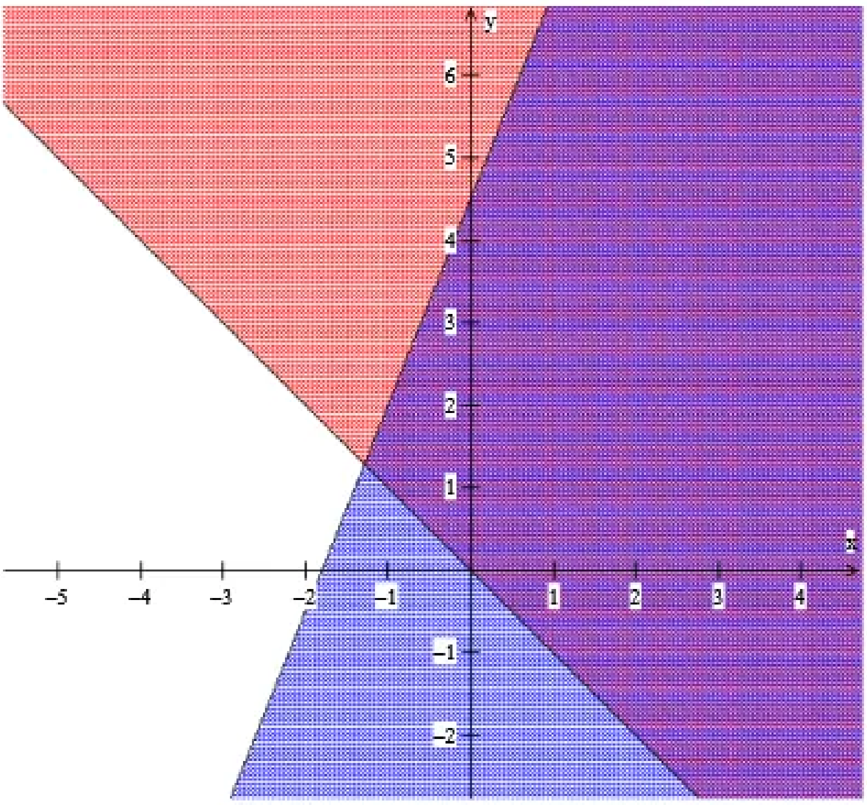
Graph the boundary: $2y = 5x + 9$

x	y	(x, y)
1	7	$(1, 7)$
-1	2	$(-1, 2)$

Shading: Check the test point $(0,0)$

$$2y < 5x + 9$$
$$2(0) < 5(0) + 9$$
$$0 < 9$$

$(0,0)$ is a solution of $2y < 5x + 9$



In the above figure, the area that is shaded twice represents the solutions of the given system. Any point in the doubly shaded region in purple has coordinates that satisfy both inequalities.

Answer 6gp.

The given equation is

$$-2\left(\begin{pmatrix} -3x & -1 \\ 4 & y \end{pmatrix} + \begin{pmatrix} 9 & -4 \\ -5 & 3 \end{pmatrix}\right) = \begin{pmatrix} 12 & 10 \\ 2 & -18 \end{pmatrix}$$

Let us simplify the left side of the equation

$$-2\begin{pmatrix} -3x+9 & -1+(-4) \\ 4+(-5) & y+3 \end{pmatrix} = \begin{pmatrix} 12 & 10 \\ 2 & -18 \end{pmatrix}$$

$$-2\begin{pmatrix} -3x+9 & -5 \\ -1 & y+3 \end{pmatrix} = \begin{pmatrix} 12 & 10 \\ 2 & -18 \end{pmatrix}$$

$$\begin{pmatrix} 6x-18 & 10 \\ 2 & -2y-6 \end{pmatrix} = \begin{pmatrix} 12 & 10 \\ 2 & -18 \end{pmatrix}$$

Now equate the corresponding elements to obtain equations involving x and y

$$6x-18=12$$
$$-2y-6=-18$$

Now solve the two resulting equations

$$6x-18=12 \qquad\qquad -2y-6=-18$$
$$6x=30 \qquad\qquad -2y=-12$$
$$x=5 \qquad\qquad y=6$$

Therefore, the solution is $\boxed{x=5, y=6}$.

Answer 7e.

In order to add two matrices, add the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are added.

$$\begin{bmatrix} 1.2 & 5.3 \\ 0.1 & 4.4 \\ 6.2 & 0.7 \end{bmatrix} + \begin{bmatrix} 2.4 & -0.6 \\ 6.1 & 3.1 \\ 8.1 & -1.9 \end{bmatrix} = \begin{bmatrix} 1.2+2.4 & 5.3+(-0.6) \\ 0.1+6.1 & 4.4+3.1 \\ 6.2+8.1 & 0.7+(-1.9) \end{bmatrix}$$

Add.

$$\begin{bmatrix} 1.2+2.4 & 5.3+(-0.6) \\ 0.1+6.1 & 4.4+3.1 \\ 6.2+8.1 & 0.7+(-1.9) \end{bmatrix} = \begin{bmatrix} 3.6 & 4.7 \\ 6.2 & 7.5 \\ 14.3 & -1.2 \end{bmatrix}$$

Therefore, $\begin{bmatrix} 1.2 & 5.3 \\ 0.1 & 4.4 \\ 6.2 & 0.7 \end{bmatrix} + \begin{bmatrix} 2.4 & -0.6 \\ 6.1 & 3.1 \\ 8.1 & -1.9 \end{bmatrix} = \begin{bmatrix} 3.6 & 4.7 \\ 6.2 & 7.5 \\ 14.3 & -1.2 \end{bmatrix}$.

Answer 7ep.

The equations of the given system are written in the standard $Ax+By+Cz=D$ form.

$2x-y-3z=5$ ......(1)
$x+2y-5z=-11$ ......(2)
$-x-3y=10$ ......(3)

Equation (3) does not have a z-term, hence we will find another equation that does not contain a z-term.

If each side of equation (1) is multiplied by 5 and equation (2) is multiplied by –3, and the resulting equation is added, z is eliminated.

$$\begin{aligned} 10x-5y-15z&=25 \\ -3x-6y+15z&=33 \\ \hline 7x-11y&=58 \end{aligned}$$ ......(4)

Equations (3) and (4) form a system of two equations in x and y.

$-x-3y=10$ ......(3)
$7x-11y=58$ ......(4)

To solve this system multiply equations (3) by 7 so that the variable x gets eliminated when added.

$$\begin{aligned} -7x-21y&=70 \\ 7x-11y&=58 \\ \hline -32y&=128 \\ y&=-4 \end{aligned}$$

To find x, we substitute –4 for y in any equation containing x and y (such as equation 3) and solve for x:

and solve for x:

$$\begin{aligned} -x-3y&=10 \\ -x-3(-4)&=10 \\ -x+12&=10 \\ x&=2 \end{aligned}$$

To find z, we substitute 2 for x and -4 for y in any equation containing x, y and z (such as equation 1) and solve for y:

$$\begin{aligned} 2x-y-3z&=5 \\ 2(2)-(-4)-3z&=5 \\ 4+4-3z&=5 \\ -3z&=-3 \\ z&=1 \end{aligned}$$

The solution set is $\boxed{\{(2,-4,1)\}}$.

Answer 8e.

To add two matrices, simply add the elements in the corresponding positions.
But the dimensions of the two matrices are not equal; hence we cannot perform the indicated operation.

Answer 8ep.

The equations of the given system are written in the standard $Ax+By+Cz=D$ form.

$$x+y+z=-3 \quad \ldots\ldots(1)$$
$$2x-3y+z=9 \quad \ldots\ldots(2)$$
$$4x-5y+2z=16 \quad \ldots\ldots(3)$$

If we pick equations (1) and (2) and multiply equation (1) by −1 before adding them, the variable z gets eliminated.

$$\begin{aligned} -x-y-z&=3 \\ \underline{2x-3y+z}&\underline{=9} \\ x-4y&=12 \quad \ldots\ldots(4) \end{aligned}$$

We now pick a different pair of equations (equations 2 and 3) and multiply equation (2) by −2 before adding them, the variable x and z gets eliminated.

$$\begin{aligned} -4x+6y-2z&=-18 \\ \underline{4x-5y+2z}&\underline{=16} \\ y&=-2 \end{aligned}$$

Substituting $y=-2$ in equation (4)

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

To find z, we substitute 4 for x and −2 for y in any equation containing x, y and z (such as equation 1) and solve for z:

$$\begin{aligned} x+y+z&=-3 \\ 4-2+z&=-3 \\ 2+z&=-3 \\ z&=-5 \end{aligned}$$

The solution set is $\boxed{\{(4,-2,-5)\}}$.

Answer 9e.

In order to subtract two matrices, subtract the elements in corresponding positions. The resultant matrix will have the same dimensions as the matrices that are subtracted.

$$\begin{bmatrix} 7 & -3 \\ 12 & 5 \\ -4 & 11 \end{bmatrix} - \begin{bmatrix} 9 & 2 \\ -2 & 6 \\ 6 & 5 \end{bmatrix} = \begin{bmatrix} 7-9 & -3-2 \\ 12-(-2) & 5-6 \\ -4-6 & 11-5 \end{bmatrix}$$

Subtract.

$$\begin{bmatrix} 7-9 & -3-2 \\ 12-(-2) & 5-6 \\ -4-6 & 11-5 \end{bmatrix} = \begin{bmatrix} 7-9 & -3-2 \\ 12+2 & 5-6 \\ -4-6 & 11-5 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & -5 \\ 14 & -1 \\ -10 & 6 \end{bmatrix}$$

Therefore, $\begin{bmatrix} 7 & -3 \\ 12 & 5 \\ -4 & 11 \end{bmatrix} - \begin{bmatrix} 9 & 2 \\ -2 & 6 \\ 6 & 5 \end{bmatrix} = \begin{bmatrix} -2 & -5 \\ 14 & -1 \\ -10 & 6 \end{bmatrix}$.

Answer 9ep.

The equations of the given system are written in the standard $Ax+By+Cz=D$ form.

$$2x-4y+3z=1 \qquad \text{......(1)}$$
$$6x+2y+10z=19 \qquad \text{......(2)}$$
$$-2x+5y-2z=2 \qquad \text{......(3)}$$

If we pick equations (1) and (2) and add them, the variable x gets eliminated.

$$\begin{array}{r} 2x-4y+3z=1 \\ -2x+5y-2z=2 \\ \hline y+z=3 \end{array} \qquad \text{......(4)}$$

We now pick a different pair of equations (equations 2 and 3) and multiply equation (3) by 3 before adding them, the variable x gets eliminated.

$$\begin{array}{r} 6x+2y+10z=19 \\ -6x+15y-6z=6 \\ \hline 17y+4z=25 \end{array} \qquad \text{.......(5)}$$

Equations (4) and (5) form a system of two equations in y and z.

$$y+z=3 \qquad \text{......(4)}$$
$$17y+4z=25 \qquad \text{......(5)}$$

To solve this system multiply equations (4) by -4 so that the variable z gets eliminated when added.

$$\begin{array}{r} -4y-4z=-12 \\ 17y+4z=25 \\ \hline 13y=13 \\ y=1 \end{array}$$

To find z, we substitute 1 for y in any equation containing y and z (such as equation 4) and solve for z:

$$\begin{aligned} y+z&=3\\ 1+z&=3\\ z&=2 \end{aligned}$$

To find x, we substitute 2 for z and 1 for y in any equation containing x, y and z (such as equation 1) and solve for y:

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

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

Answer 10e.

To multiply a matrix by a scalar, you multiply each element in the matrix by the scalar. This process is called scalar multiplication.

$$\begin{aligned} 2\begin{pmatrix} -1 & 4 \\ 3 & -6 \end{pmatrix} &= \begin{pmatrix} 2(-1) & 2(4) \\ 2(3) & 2(-6) \end{pmatrix} \\ &= \begin{pmatrix} -2 & 8 \\ 6 & -12 \end{pmatrix} \end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} -2 & 8 \\ 6 & -12 \end{pmatrix}}$.

Answer 10ep.

We have given $A = \begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} -4 & 3 \\ 8 & 10 \end{pmatrix}$

We need to find $A + B$

To add two matrices, simply add the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.

$$\begin{aligned} A+B &= \begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix} + \begin{pmatrix} -4 & 3 \\ 8 & 10 \end{pmatrix} \\ &= \begin{pmatrix} 2+(-4) & -5+3 \\ 3+8 & -1+10 \end{pmatrix} \\ &= \begin{pmatrix} -2 & -2 \\ 11 & 9 \end{pmatrix} \end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} -2 & -2 \\ 11 & 9 \end{pmatrix}}$.

Answer 11e.

We multiply each element in the matrix by the scalar to multiply a matrix by a scalar.
Multiply each element in the matrix by -3.

$$-3\begin{bmatrix} 2 & 0 & -5 \\ 4 & 7 & -3 \end{bmatrix} = \begin{bmatrix} -3(2) & -3(0) & -3(-5) \\ -3(4) & -3(7) & -3(-3) \end{bmatrix}$$

Simplify.

$$\begin{bmatrix} -3(2) & -3(0) & -3(-5) \\ -3(4) & -3(7) & -3(-3) \end{bmatrix} = \begin{bmatrix} -6 & 0 & 15 \\ -12 & -21 & 9 \end{bmatrix}$$

Therefore,

$$-3\begin{bmatrix} 2 & 0 & -5 \\ 4 & 7 & -3 \end{bmatrix} = \begin{bmatrix} -6 & 0 & 15 \\ -12 & -21 & 9 \end{bmatrix}.$$

Answer 11ep.

We have given $A=\begin{pmatrix}2 & -5\\ 3 & -1\end{pmatrix}$ and $B=\begin{pmatrix}-4 & 3\\ 8 & 10\end{pmatrix}$

We need to find $B-2A$

To subtract two matrices, simply subtract the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.
But perform scalar multiplication before matrix subtraction.

$$\begin{aligned}B-2A&=\begin{pmatrix}-4 & 3\\ 8 & 10\end{pmatrix}-2\begin{pmatrix}2 & -5\\ 3 & -1\end{pmatrix}\\ &=\begin{pmatrix}-4 & 3\\ 8 & 10\end{pmatrix}-\begin{pmatrix}4 & -10\\ 6 & -2\end{pmatrix}\\ &=\begin{pmatrix}-4-4 & 3-(-10)\\ 8-6 & 10-(-2)\end{pmatrix}\\ &=\begin{pmatrix}-8 & 13\\ 2 & 12\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix}-8 & 13\\ 2 & 12\end{pmatrix}}$.

Answer 12e.

To multiply a matrix by a scalar, you multiply each element in the matrix by the scalar.
This process is called scalar multiplication.

$$\begin{aligned}-4\begin{pmatrix}2 & -3 & -2\\ -\frac{5}{8} & \frac{11}{2} & \frac{7}{4}\end{pmatrix}&=\begin{pmatrix}-4(2) & -4(-3) & -4(-2)\\ -4\left(-\frac{5}{8}\right) & -4\left(\frac{11}{2}\right) & -4\left(\frac{7}{4}\right)\end{pmatrix}\\ &=\begin{pmatrix}-8 & 12 & 8\\ \frac{5}{2} & -22 & -7\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix}-8 & 12 & 8\\ \frac{5}{2} & -22 & -7\end{pmatrix}}$.

Answer 12ep.

We have given $A=\begin{pmatrix}2 & -5\\ 3 & -1\end{pmatrix}$ and $C=\begin{pmatrix}-6 & -2 & 9\\ 1 & -4 & -1\end{pmatrix}$

We need to find $3A+C$

To add two matrices, simply add the elements in the corresponding positions.
But the dimensions of the two matrices are not equal; hence we cannot perform the indicated operation.

Answer 13e.

We multiply each element in the matrix by the scalar to multiply a matrix by a scalar.
Multiply each element in the matrix by 1.5.

$$1.5\begin{bmatrix}-2 & 3.4 & 1.6\\ 5.4 & 0 & -3\end{bmatrix}=\begin{bmatrix}1.5(-2) & 1.5(3.4) & 1.5(1.6)\\ 1.5(5.4) & 1.5(0) & 1.5(-3)\end{bmatrix}$$

Simplify.

$$\begin{bmatrix}1.5(-2) & 1.5(3.4) & 1.5(1.6)\\ 1.5(5.4) & 1.5(0) & 1.5(-3)\end{bmatrix}=\begin{bmatrix}-3 & 5.1 & 2.4\\ 8.1 & 0 & -4.5\end{bmatrix}$$

Therefore,

$$1.5\begin{bmatrix}-2 & 3.4 & 1.6\\ 5.4 & 0 & -3\end{bmatrix}=\begin{bmatrix}-3 & 5.1 & 2.4\\ 8.1 & 0 & -4.5\end{bmatrix}.$$

Answer 13ep.

We have given $C=\begin{pmatrix}-6 & -2 & 9\\ 1 & -4 & -1\end{pmatrix}$

We need to find $\frac{2}{3}C$

To multiply a matrix by a scalar, you multiply each element in the matrix by the scalar. This process is called scalar multiplication.

$$\begin{aligned}\frac{2}{3}C &= \frac{2}{3}\begin{pmatrix}-6 & -2 & 9\\ 1 & -4 & -1\end{pmatrix}\\ &= \begin{pmatrix}-6\left(\frac{2}{3}\right) & -2\left(\frac{2}{3}\right) & 9\left(\frac{2}{3}\right)\\ 1\left(\frac{2}{3}\right) & -4\left(\frac{2}{3}\right) & -1\left(\frac{2}{3}\right)\end{pmatrix}\\ &= \begin{pmatrix}-4 & -\frac{4}{3} & 6\\ \frac{2}{3} & -\frac{8}{3} & -\frac{2}{3}\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix}-4 & -\frac{4}{3} & 6\\ \frac{2}{3} & -\frac{8}{3} & -\frac{2}{3}\end{pmatrix}}$.

Answer 14e.

To multiply a matrix by a scalar, you multiply each element in the matrix by the scalar. This process is called scalar multiplication.

$$\frac{1}{2}\begin{pmatrix} -2 & 8 & 12 \\ 20 & -1 & 0 \\ -8 & 10 & 2 \end{pmatrix} = \begin{pmatrix} \frac{1}{2}(-2) & \frac{1}{2}(8) & \frac{1}{2}(12) \\ \frac{1}{2}(20) & \frac{1}{2}(-1) & \frac{1}{2}(0) \\ \frac{1}{2}(-8) & \frac{1}{2}(10) & \frac{1}{2}(2) \end{pmatrix}$$

$$= \begin{pmatrix} -1 & 4 & 6 \\ 10 & \frac{-1}{2} & 0 \\ -4 & 5 & 1 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} -1 & 4 & 6 \\ 10 & \frac{-1}{2} & 0 \\ -4 & 5 & 1 \end{pmatrix}}$.

Answer 14ep.

Let $x =$ weight of Empire apples
$y =$ weight of Red Delicious apples
$z =$ weight of Golden Delicious apples

According to the given data, the total weight is 21 pounds, that is

$$x + y + z = 21 \qquad \ldots\ldots(1)$$

Since the cost of each apple is given and the total cost is \$25, we have

$$1.4x + 1.1y + 1.3z = 25$$
$$14x + 11y + 13z = 250 \qquad \ldots\ldots(2)$$

Also, it is given that the weight of Red Delicious apples equals twice the combined weight of the other two kinds, that is

$$y = 2(x + z)$$
$$2x - y + 2z = 0 \qquad \ldots\ldots(3)$$

Equation 1, 2, and 3 form a system of equations in x, y, and z.

If we pick equations (1) and (3) and add them, the variable y gets eliminated.

$$\begin{aligned} x+y+z&=21 \\ 2x-y+2z&=0 \\ \hline 3x+3z&=21 \end{aligned} \qquad \ldots\ldots(4)$$

We now pick a different pair of equations (equations 2 and 3) and multiply equation (3) by 11 before adding them, the variable y gets eliminated.

$$\begin{aligned} 14x+11y+13z&=250 \\ 22x-11y+22z&=0 \\ \hline 36x+35z&=250 \end{aligned} \qquad \ldots\ldots(5)$$

Equations (4) and (5) form a system of two equations in x and z.

$$3x+3z=21 \qquad \ldots\ldots(4)$$
$$36x+35z=250 \qquad \ldots\ldots(5)$$

To solve this system multiply equations (4) by -12 so that the variable x gets eliminated when added.

$$\begin{aligned} -36x-36z&=-252 \\ 36x+35z&=250 \\ \hline -z&=-2 \\ z&=2 \end{aligned}$$

To find x, we substitute 2 for z in any equation containing x and z (such as equation 4) and solve for x:

$$\begin{aligned} 3x+3z&=21 \\ 3x+3(2)&=21 \\ 3x+6&=21 \\ 3x&=15 \\ x&=5 \end{aligned}$$

To find y, we substitute 5 for x and 2 for z in any equation containing x, y and z (such as equation 1) and solve for y:

$$\begin{aligned} x+y+z&=21 \\ 5+y+2&=21 \\ y&=14 \end{aligned}$$

There are $\boxed{\text{5 pounds}}$ of Empire apples, $\boxed{\text{14 pounds}}$ of Red Delicious apples, $\boxed{\text{2 pounds}}$ of Golden Delicious apples.

Answer 15ep.

We multiply each element in the matrix by the scalar to multiply a matrix by a scalar. Multiply each element in the matrix by −2.2.

$$-2.2\begin{bmatrix} 6 & 3.1 & 4.5 \\ -1 & 0 & 2.5 \\ 5.5 & -1.8 & 6.4 \end{bmatrix} = \begin{bmatrix} -2.2(6) & -2.2(3.1) & -2.2(4.5) \\ -2.2(-1) & -2.2(0) & -2.2(2.5) \\ -2.2(5.5) & -2.2(-1.8) & -2.2(6.4) \end{bmatrix}$$

Simplify.

$$\begin{bmatrix} -2.2(6) & -2.2(3.1) & -2.2(4.5) \\ -2.2(-1) & -2.2(0) & -2.2(2.5) \\ -2.2(5.5) & -2.2(-1.8) & -2.2(6.4) \end{bmatrix} = \begin{bmatrix} -13.2 & -6.82 & -9.9 \\ 2.2 & 0 & -5.5 \\ -12.1 & 3.96 & -14.08 \end{bmatrix}$$

Therefore,

$$-2.2\begin{bmatrix} 6 & 3.1 & 4.5 \\ -1 & 0 & 2.5 \\ 5.5 & -1.8 & 6.4 \end{bmatrix} = \begin{bmatrix} -13.2 & -6.82 & -9.9 \\ 2.2 & 0 & -5.5 \\ -12.1 & 3.96 & -14.08 \end{bmatrix}.$$

Answer 16e.

We have given $A = \begin{pmatrix} 5 & -4 \\ 3 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix}$

We need to find $A + B$

To add two matrices, simply add the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.

$$\begin{aligned} A + B &= \begin{pmatrix} 5 & -4 \\ 3 & -1 \end{pmatrix} + \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix} \\ &= \begin{pmatrix} 5+18 & -4+(-12) \\ 3+(-6) & -1+0 \end{pmatrix} \\ &= \begin{pmatrix} 23 & -16 \\ -3 & -1 \end{pmatrix} \end{aligned}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} 23 & -16 \\ -3 & -1 \end{pmatrix}}$.

Answer 17e.

Substitute the corresponding matrices for B and A.

$$B - A = \begin{bmatrix} 18 & -12 \\ -6 & 0 \end{bmatrix} - \begin{bmatrix} 5 & -4 \\ 3 & -1 \end{bmatrix}$$

In order to subtract two matrices, subtract the elements in the second matrix from the corresponding elements in the first. The resultant matrix will have the same dimensions as the matrices that are subtracted.

$$\begin{bmatrix} 18 & -12 \\ -6 & 0 \end{bmatrix} - \begin{bmatrix} 5 & -4 \\ 3 & -1 \end{bmatrix} = \begin{bmatrix} 18-5 & -12-(-4) \\ -6-3 & 0-(-1) \end{bmatrix}$$

Subtract.

$$\begin{bmatrix} 18-5 & -12-(-4) \\ -6-3 & 0-(-1) \end{bmatrix} = \begin{bmatrix} 18-5 & -12+4 \\ -6-3 & 0+1 \end{bmatrix}$$

$$= \begin{bmatrix} 13 & -8 \\ -9 & 1 \end{bmatrix}$$

Therefore,

$$B - A = \begin{bmatrix} 13 & -8 \\ -9 & 1 \end{bmatrix}.$$

Answer 18e.

We have given $A = \begin{pmatrix} 5 & -4 \\ 3 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix}$

We need to find $4A - B$

To subtract two matrices, simply subtract the elements in the corresponding positions. The dimensions of the two matrices are equal, hence can perform the indicated operation. But perform scalar multiplication before matrix subtraction.

$$4A - B = 4\begin{pmatrix} 5 & -4 \\ 3 & -1 \end{pmatrix} - \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 4(5) & 4(-4) \\ 4(3) & 4(-1) \end{pmatrix} - \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 20 & -16 \\ 12 & -4 \end{pmatrix} - \begin{pmatrix} 18 & -12 \\ -6 & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 20-18 & -16-(-12) \\ 12-(-6) & -4-0 \end{pmatrix}$$

$$= \begin{pmatrix} 2 & -4 \\ 18 & -4 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} 2 & -4 \\ 18 & -4 \end{pmatrix}}$.

Answer 19e.

Substitute the matrix for B.

$$\frac{2}{3}B = \frac{2}{3}\begin{bmatrix} 18 & -12 \\ -6 & 0 \end{bmatrix}$$

We multiply each element of the matrix by the scalar to multiply a matrix by a scalar.

Multiply each element of the matrix by $\frac{2}{3}$.

$$\frac{2}{3}\begin{bmatrix} 18 & -12 \\ -6 & 0 \end{bmatrix} = \begin{bmatrix} \frac{2}{3}(18) & \frac{2}{3}(-12) \\ \frac{2}{3}(-6) & \frac{2}{3}(0) \end{bmatrix}$$

Simplify.

$$\begin{bmatrix} \frac{2}{3}(18) & \frac{2}{3}(-12) \\ \frac{2}{3}(-6) & \frac{2}{3}(0) \end{bmatrix} = \begin{bmatrix} 2(6) & 2(-4) \\ 2(-2) & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 12 & -8 \\ -4 & 0 \end{bmatrix}$$

Therefore,

$$\frac{2}{3}B = \begin{bmatrix} 12 & -8 \\ -4 & 0 \end{bmatrix}.$$

Answer 20e.

We have given $C = \begin{pmatrix} 1.8 & -1.5 & 10.6 \\ -8.8 & 3.4 & 0 \end{pmatrix}$ and $D = \begin{pmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{pmatrix}$

We need to find $C + D$

To add two matrices, simply add the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.

$$C + D = \begin{pmatrix} 1.8 & -1.5 & 10.6 \\ -8.8 & 3.4 & 0 \end{pmatrix} + \begin{pmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{pmatrix}$$

$$= \begin{pmatrix} 1.8+7.2 & -1.5+0 & 10.6+(-5.4) \\ -8.8+2.1 & 3.4+(-1.9) & 0+3.3 \end{pmatrix}$$

$$= \begin{pmatrix} 9 & -1.5 & 5.2 \\ -6.7 & 1.5 & 3.3 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix} 9 & -1.5 & 5.2 \\ -6.7 & 1.5 & 3.3 \end{pmatrix}}$.

Answer 21e.

Substitute the corresponding matrices for C and D in $C+3D$.

$$C+3D=\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}+3\begin{bmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{bmatrix}$$

Multiply each element of matrix D by 3.

$$\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}+3\begin{bmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{bmatrix}=\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}+\begin{bmatrix}3(7.2) & 3(0) & 3(-5.4)\\ 3(2.1) & 3(-1.9) & 3(3.3)\end{bmatrix}$$

$$=\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}+\begin{bmatrix}21.6 & 0 & -16.2\\ 6.3 & -5.7 & 9.9\end{bmatrix}$$

In order to add two matrices, add the elements in corresponding positions.

$$\begin{bmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{bmatrix}+\begin{bmatrix}21.6 & 0 & -16.2\\ 6.3 & -5.7 & 9.9\end{bmatrix}=\begin{bmatrix}1.8+21.6 & -1.5+0 & 10.6+(-16.2)\\ -8.8+6.3 & 3.4+(-5.7) & 0+9.9\end{bmatrix}$$

$$=\begin{bmatrix}23.4 & -1.5 & -5.6\\ -2.5 & -2.3 & 9.9\end{bmatrix}$$

Therefore,

$$C+3D=\begin{bmatrix}23.4 & -1.5 & -5.6\\ -2.5 & -2.3 & 9.9\end{bmatrix}.$$

Answer 22e.

We have given $C=\begin{pmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{pmatrix}$ and $D=\begin{pmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{pmatrix}$

We need to find $D-2C$

To subtract two matrices, simply subtract the elements in the corresponding positions.
The dimensions of the two matrices are equal, hence can perform the indicated operation.
But perform scalar multiplication before matrix subtraction.

$$D-2C=\begin{pmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{pmatrix}-2\begin{pmatrix}1.8 & -1.5 & 10.6\\ -8.8 & 3.4 & 0\end{pmatrix}$$

$$=\begin{pmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{pmatrix}-\begin{pmatrix}2(1.8) & 2(-1.5) & 2(10.6)\\ 2(-8.8) & 2(3.4) & 2(0)\end{pmatrix}$$

$$=\begin{pmatrix}7.2 & 0 & -5.4\\ 2.1 & -1.9 & 3.3\end{pmatrix}-\begin{pmatrix}3.6 & -3 & 21.2\\ -17.6 & 6.8 & 0\end{pmatrix}$$

$$=\begin{pmatrix}7.2-3.6 & 0-(-3) & -5.4-21.2\\ 2.1-(-17.6) & -1.9-6.8 & 3.3-0\end{pmatrix}$$

$$=\begin{pmatrix}3.6 & 3 & -26.6\\ 19.7 & -8.7 & 3.3\end{pmatrix}$$

Therefore, the resulting value is $\boxed{\begin{pmatrix}3.6 & 3 & -26.6\\ 19.7 & -8.7 & 3.3\end{pmatrix}}$.

Answer 23e.

Substitute the corresponding matrices for C and D in $0.5C - D$.

$$0.5C - D = 0.5\begin{bmatrix} 1.8 & -1.5 & 10.6 \\ -8.8 & 3.4 & 0 \end{bmatrix} - \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix}$$

Multiply each element of matrix C by 0.5.

$$0.5\begin{bmatrix} 1.8 & -1.5 & 10.6 \\ -8.8 & 3.4 & 0 \end{bmatrix} - \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix}$$

$$= \begin{bmatrix} 0.5(1.8) & 0.5(-1.5) & 0.5(10.6) \\ 0.5(-8.8) & 0.5(3.4) & 0.5(0) \end{bmatrix} - \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix}$$

$$= \begin{bmatrix} 0.9 & -0.75 & 5.3 \\ -4.4 & 1.7 & 0 \end{bmatrix} - \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix}$$

In order to subtract two matrices, subtract the elements in corresponding positions.

$$\begin{bmatrix} 0.9 & -0.75 & 5.3 \\ -4.4 & 1.7 & 0 \end{bmatrix} - \begin{bmatrix} 7.2 & 0 & -5.4 \\ 2.1 & -1.9 & 3.3 \end{bmatrix} = \begin{bmatrix} 0.9-7.2 & -0.75-0 & 5.3-(-5.4) \\ -4.4-2.1 & 1.7-(-1.9) & 0-3.3 \end{bmatrix}$$

$$= \begin{bmatrix} -6.3 & -0.75 & 10.7 \\ -6.5 & 3.6 & -3.3 \end{bmatrix}$$

Therefore,

$$0.5C - D = \begin{bmatrix} -6.3 & -0.75 & 10.7 \\ -6.5 & 3.6 & -3.3 \end{bmatrix}.$$

Answer 24e.

The given equation is

$$\begin{pmatrix} -1 & 3x \\ -4 & 5 \end{pmatrix} = \begin{pmatrix} -1 & -18 \\ 2y & 5 \end{pmatrix}$$

Equate the corresponding elements to obtain equations involving x and y

$$3x = -18$$
$$2y = -4$$

Now solve the two resulting equations

$$3x = -18 \qquad\qquad 2y = -4$$
$$x = \frac{-18}{3} \qquad\qquad y = \frac{-4}{2}$$
$$x = -6 \qquad\qquad y = -2$$

Therefore, the solution is $\boxed{x = -6, y = -2}$.

Answer 25e.

Multiply each element of the second matrix by 2.

$$\begin{bmatrix} -2x & 6 \\ 1 & -8 \end{bmatrix} + \begin{bmatrix} 2(5) & 2(-1) \\ 2(-7) & 2(6) \end{bmatrix} = \begin{bmatrix} -9 & 4 \\ -13 & y \end{bmatrix}$$

$$\begin{bmatrix} -2x & 6 \\ 1 & -8 \end{bmatrix} + \begin{bmatrix} 10 & -2 \\ -14 & 12 \end{bmatrix} = \begin{bmatrix} -9 & 4 \\ -13 & y \end{bmatrix}$$

Add two matrices on the left side of the equation. For this, add the elements in corresponding positions.

$$\begin{bmatrix} -2x+10 & 6+(-2) \\ 1+(-14) & -8+12 \end{bmatrix} = \begin{bmatrix} -9 & 4 \\ -13 & y \end{bmatrix}$$

$$\begin{bmatrix} -2x+10 & 4 \\ -13 & 4 \end{bmatrix} = \begin{bmatrix} -9 & 4 \\ -13 & y \end{bmatrix}$$

Equate the corresponding elements.

$-2x + 10 = -9$ and $4 = y$

Solve the first equation for x. Subtract 10 from both the sides.

$$-2x + 10 - 10 = -9 - 10$$

$$-2x = -19$$

Divide both the sides by -2.

$$\frac{-2x}{-2} = \frac{-19}{-2}$$

$$x = \frac{19}{2}$$

Therefore, the solution is $x = \frac{19}{2}$ and $y = 4$.

Answer 26e.

The given equation is

$$2\begin{pmatrix} 8 & -x \\ 5 & 6 \end{pmatrix} - \begin{pmatrix} 3 & -9 \\ 10 & -4y \end{pmatrix} = \begin{pmatrix} 13 & 4 \\ 0 & 16 \end{pmatrix}$$

Let us simplify the left side of the equation

$$\begin{pmatrix} 2(8) & 2(-x) \\ 2(5) & 2(6) \end{pmatrix} - \begin{pmatrix} 3 & -9 \\ 10 & -4y \end{pmatrix} = \begin{pmatrix} 13 & 4 \\ 0 & 16 \end{pmatrix}$$

$$\begin{pmatrix} 16 & -2x \\ 10 & 12 \end{pmatrix} - \begin{pmatrix} 3 & -9 \\ 10 & -4y \end{pmatrix} = \begin{pmatrix} 13 & 4 \\ 0 & 16 \end{pmatrix}$$

$$\begin{pmatrix} 16-3 & -2x-(-9) \\ 10-10 & 12-(-4y) \end{pmatrix} = \begin{pmatrix} 13 & 4 \\ 0 & 16 \end{pmatrix}$$

$$\begin{pmatrix} 13 & -2x+9 \\ 0 & 12+4y \end{pmatrix} = \begin{pmatrix} 13 & 4 \\ 0 & 16 \end{pmatrix}$$

Now equate the corresponding elements to obtain equations involving x and y

$$-2x+9=4$$
$$12+4y=16$$

Now solve the two resulting equations

$$\begin{aligned} -2x+9&=4 \\ -2x&=-5 \\ x&=\frac{5}{2} \end{aligned} \qquad\qquad \begin{aligned} 12+4y&=16 \\ 4y&=4 \\ y&=1 \end{aligned}$$

Therefore, the solution is $\boxed{x=\frac{5}{2}, y=1}$.

Answer 27e.

Multiply each element of the left side matrix by $4x$.

$$\begin{bmatrix} 4x(-1) & 4x(2) \\ 4x(3) & 4x(6) \end{bmatrix} = \begin{bmatrix} 8 & -16 \\ -24 & 3y \end{bmatrix}$$

$$\begin{bmatrix} -4x & 8x \\ 12x & 24x \end{bmatrix} = \begin{bmatrix} 8 & -16 \\ -24 & 3y \end{bmatrix}$$

Two matrices are now equal since their dimensions are the same. Thus, the elements in corresponding positions are also equal.
Equate the corresponding elements.

$-4x = 8$

$8x = -16$

$12x = -24$

$24x = 3y$

Solve any one of the first three equations to solve for x.
Let us solve the first equation. For this, divide both the sides by -4.

$$\frac{-4x}{-4} = \frac{-8}{-4}$$
$$x = 2$$

Substitute 2 for x in $24x = 3y$.

$$24(2) = 3y$$
$$48 = 3y$$

Divide both the sides by 3 to solve for y.

$$\frac{48}{3} = \frac{3y}{3}$$
$$16 = y$$

Therefore, the solution is $x = 2$ and $y = 16$.

Answer 28e.

The given equation is

$$\begin{pmatrix} 2x & 0 \\ 0.5 & -0.75 \end{pmatrix} = \begin{pmatrix} 6.4 & 0 \\ 0.5 & 3y \end{pmatrix}$$

Equate the corresponding elements to obtain equations involving x and y

$2x = 6.4$

$3y = -0.75$

Now solve the two resulting equations

$$2x = 6.4 \qquad\qquad 3y = -0.75$$
$$x = \frac{6.4}{2} \qquad\qquad y = \frac{-0.75}{3}$$
$$x = 3.2 \qquad\qquad y = -0.25$$

Substituting the value of x and y in the expression $3x - 2y$ we get,

$$\begin{aligned} 3x - 2y &= 3(3.2) - 2(-0.25) \\ &= 9.6 + 0.5 \\ &= 10.1 \end{aligned}$$

Therefore, the value of the expression is $\boxed{10.1}$.

Answer 29e.

In order to subtract two matrices, they should have same dimension. Also, the resultant matrix will also have the same dimension. Thus, we can conclude that both A and B will be a 2×2 matrix.

Let us choose one matrix, say, B to be $\begin{bmatrix} 1 & 0 \\ 3 & 4 \end{bmatrix}$. Substitute this matrix for B in the given matrix equation.

$$2A - 3\begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix}$$

Multiply each element of the second matrix by 3.

$$2A - \begin{bmatrix} 3(1) & 3(0) \\ 3(3) & 3(4) \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix}$$

$$2A - \begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix}$$

Add $\begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix}$ to both the sides.

$$2A - \begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix} + \begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix}$$

$$2A = \begin{bmatrix} 5 & 0 \\ -1 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 0 \\ 9 & 12 \end{bmatrix}$$

Add each corresponding elements on the right side of the equation.

$$2A = \begin{bmatrix} 5+3 & 0+0 \\ -1+9 & 2+12 \end{bmatrix}$$

$$= \begin{bmatrix} 8 & 0 \\ 8 & 14 \end{bmatrix}$$

Multiply both the sides by $\frac{1}{2}$.

$$A = \frac{1}{2}\begin{bmatrix} 8 & 0 \\ 8 & 14 \end{bmatrix}$$

Multiply each element on the right by $\frac{1}{2}$.

$$A = \begin{bmatrix} \frac{1}{2}(8) & \frac{1}{2}(0) \\ \frac{1}{2}(8) & \frac{1}{2}(14) \end{bmatrix}$$
$$= \begin{bmatrix} 4 & 0 \\ 4 & 7 \end{bmatrix}$$

Therefore, two matrices which satisfy the given matrix equation are

$$A = \begin{bmatrix} 4 & 0 \\ 4 & 7 \end{bmatrix}$$

and

$$B = \begin{bmatrix} 1 & 0 \\ 3 & 4 \end{bmatrix}.$$

This is only such combination. Other combinations are also possible.

Answer 30e.

a. The given equation is

$$X + \begin{pmatrix} -5 & 0 \\ 4 & -3 \end{pmatrix} = \begin{pmatrix} 7 & -8 \\ -3 & 5 \end{pmatrix}$$

Keeping the unknown variable on the left and others to the right the equation becomes

$$X = \begin{pmatrix} 7 & -8 \\ -3 & 5 \end{pmatrix} - \begin{pmatrix} -5 & 0 \\ 4 & -3 \end{pmatrix}$$

Solving for X, we use matrix subtraction.

$$X = \begin{pmatrix} 7 & -8 \\ -3 & 5 \end{pmatrix} - \begin{pmatrix} -5 & 0 \\ 4 & -3 \end{pmatrix}$$
$$= \begin{pmatrix} 7-(-5) & -8-0 \\ -3-4 & 5-(-3) \end{pmatrix}$$
$$= \begin{pmatrix} 12 & -8 \\ -7 & 8 \end{pmatrix}$$

Therefore, the resulting value is $\boxed{X = \begin{pmatrix} 12 & -8 \\ -7 & 8 \end{pmatrix}}$.

b. The given equation is

$$X-\begin{pmatrix}2 & 3\\5 & 0\end{pmatrix}=\begin{pmatrix}8 & 6\\-1 & 3\end{pmatrix}$$

Keeping the unknown variable on the left and others to the right the equation becomes

$$X=\begin{pmatrix}8 & 6\\-1 & 3\end{pmatrix}+\begin{pmatrix}2 & 3\\5 & 0\end{pmatrix}$$

Solving for X, we use matrix addition.

$$\begin{aligned}X&=\begin{pmatrix}8 & 6\\-1 & 3\end{pmatrix}+\begin{pmatrix}2 & 3\\5 & 0\end{pmatrix}\\&=\begin{pmatrix}8+2 & 6+3\\-1+5 & 3+0\end{pmatrix}\\&=\begin{pmatrix}10 & 9\\4 & 3\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{X=\begin{pmatrix}10 & 9\\4 & 3\end{pmatrix}}$.

c. The given equation is

$$-X+\begin{pmatrix}-3 & 1\\4 & 7\end{pmatrix}=\begin{pmatrix}8 & -9\\0 & 10\end{pmatrix}$$

Keeping the unknown variable on the left and others to the right the equation becomes

$$\begin{aligned}-X&=\begin{pmatrix}8 & -9\\0 & 10\end{pmatrix}-\begin{pmatrix}-3 & 1\\4 & 7\end{pmatrix}\\X&=-\begin{pmatrix}8 & -9\\0 & 10\end{pmatrix}+\begin{pmatrix}-3 & 1\\4 & 7\end{pmatrix}\end{aligned}$$

This can be written as

$$X=\begin{pmatrix}-3 & 1\\4 & 7\end{pmatrix}-\begin{pmatrix}8 & -9\\0 & 10\end{pmatrix}$$

Solving for X, we use matrix subtraction.

$$\begin{aligned}X&=\begin{pmatrix}-3 & 1\\4 & 7\end{pmatrix}-\begin{pmatrix}8 & -9\\0 & 10\end{pmatrix}\\&=\begin{pmatrix}-3-8 & 1-(-9)\\4-0 & 7-10\end{pmatrix}\\&=\begin{pmatrix}-11 & 10\\4 & -3\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{X=\begin{pmatrix}-11 & 10\\4 & -3\end{pmatrix}}$.

d. The given equation is

$$3X-\begin{pmatrix}11 & -6\\ 2 & 1\end{pmatrix}=\begin{pmatrix}-13 & 15\\ -19 & 2\end{pmatrix}$$

Keeping the unknown variable on the left and others to the right the equation becomes

$$3X=\begin{pmatrix}-13 & 15\\ -19 & 2\end{pmatrix}+\begin{pmatrix}11 & -6\\ 2 & 1\end{pmatrix}$$

$$X=\frac{1}{3}\left(\begin{pmatrix}-13 & 15\\ -19 & 2\end{pmatrix}+\begin{pmatrix}11 & -6\\ 2 & 1\end{pmatrix}\right)$$

Solving for X, we use matrix addition before scalar multiplication.

$$\begin{aligned}X&=\frac{1}{3}\left(\begin{pmatrix}-13 & 15\\ -19 & 2\end{pmatrix}+\begin{pmatrix}11 & -6\\ 2 & 1\end{pmatrix}\right)\\ &=\frac{1}{3}\begin{pmatrix}-13+11 & 15+(-6)\\ -19+2 & 2+1\end{pmatrix}\\ &=\frac{1}{3}\begin{pmatrix}-2 & 9\\ -17 & 3\end{pmatrix}\\ &=\begin{pmatrix}\frac{-2}{3} & 3\\ \frac{-17}{3} & 1\end{pmatrix}\end{aligned}$$

Therefore, the resulting value is $\boxed{X=\begin{pmatrix}\frac{-2}{3} & 3\\ \frac{-17}{3} & 1\end{pmatrix}}$.

Answer 31e.

In order to write a matrix giving the change in sales, subtract the matrix that shows the number of each type of snowboard sold in 2003 from that in 2004.

$$\begin{bmatrix}32 & 47 & 30 & 19\\ 5 & 16 & 20 & 14\\ 29 & 39 & 36 & 31\end{bmatrix}-\begin{bmatrix}32 & 42 & 29 & 20\\ 12 & 17 & 25 & 16\\ 28 & 40 & 32 & 21\end{bmatrix}$$

In order to subtract two matrices with the same dimensions, subtract the elements in the corresponding positions.

$$\begin{bmatrix} 32 & 47 & 30 & 19 \\ 5 & 16 & 20 & 14 \\ 29 & 39 & 36 & 31 \end{bmatrix} - \begin{bmatrix} 32 & 42 & 29 & 20 \\ 12 & 17 & 25 & 16 \\ 28 & 40 & 32 & 21 \end{bmatrix} = \begin{bmatrix} 32-32 & 47-42 & 30-29 & 19-20 \\ 5-12 & 16-17 & 20-25 & 14-16 \\ 29-28 & 39-40 & 36-32 & 31-21 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 5 & 1 & -1 \\ -7 & -1 & -5 & -2 \\ 1 & -1 & 4 & 10 \end{bmatrix}$$

Therefore, a matrix that represents the change in sales for each type of snowboard from 2003 to 2004 is $\begin{bmatrix} 0 & 5 & 1 & -1 \\ -7 & -1 & -5 & -2 \\ 1 & -1 & 4 & 10 \end{bmatrix}$.

Answer 32e.

According to the given data, we organize the matrix as

$$A = \begin{pmatrix} 32 & 40 \\ 24 & 34 \\ 18 & 25 \\ 19 & 22 \end{pmatrix}$$

It is said that the next year, the measure of fuel economy increases by 8%.
Let B denote the increase by 8%, that is

$$B = 8\% \text{ of } A$$

$$= 0.08 \begin{pmatrix} 32 & 40 \\ 24 & 34 \\ 18 & 25 \\ 19 & 22 \end{pmatrix}$$

$$= \begin{pmatrix} 2.56 & 3.2 \\ 1.92 & 2.72 \\ 1.44 & 2 \\ 1.52 & 1.76 \end{pmatrix}$$

Therefore, the new matrix is

$$\text{New matrix} = A + B$$

$$= \begin{pmatrix} 32 & 40 \\ 24 & 34 \\ 18 & 25 \\ 19 & 22 \end{pmatrix} + \begin{pmatrix} 2.56 & 3.2 \\ 1.92 & 2.72 \\ 1.44 & 2 \\ 1.52 & 1.76 \end{pmatrix}$$

$$= \begin{pmatrix} 32+2.56 & 40+3.2 \\ 24+1.92 & 34+2.72 \\ 18+1.44 & 25+2 \\ 19+1.52 & 22+1.76 \end{pmatrix}$$

$$= \begin{pmatrix} 34.56 & 43.2 \\ 25.92 & 36.72 \\ 19.44 & 27 \\ 20.52 & 23.76 \end{pmatrix}$$

Hence for the next year, the indicated matrix will be $\boxed{\begin{pmatrix} 34.56 & 43.2 \\ 25.92 & 36.72 \\ 19.44 & 27 \\ 20.52 & 23.76 \end{pmatrix}}$.

Answer 33e.

a. We can represent the stores in the rows and the models of camera in the columns of the matrix. Let the columns of the matrix represent the different models of the digital camera, and the rows represent their stores.

It is given that there are 2 stores, one downtown and the other in the mall. Also, there are 3 models of digital camera A, B, and C.

Use two 2 by 3 matrices M and J to represent the sales for May and June.

$$\begin{array}{r} \\ \\ \text{Downtown} \\ \text{Mall} \end{array} \begin{array}{c} \text{May}\,(\boldsymbol{M}) \\ \begin{array}{ccc} \text{A} & \text{B} & \text{C} \end{array} \\ \begin{bmatrix} 31 & 42 & 18 \\ 22 & 25 & 11 \end{bmatrix} \end{array} \quad \begin{array}{c} \text{June}\,(\boldsymbol{J}) \\ \begin{array}{ccc} \text{A} & \text{B} & \text{C} \end{array} \\ \begin{bmatrix} 25 & 36 & 12 \\ 38 & 32 & 15 \end{bmatrix} \end{array}$$

b. In order to add two matrices with the same dimensions, add the elements in the corresponding positions.

$$\begin{bmatrix} 31 & 42 & 18 \\ 22 & 25 & 11 \end{bmatrix} + \begin{bmatrix} 25 & 36 & 12 \\ 38 & 32 & 15 \end{bmatrix} = \begin{bmatrix} 31+25 & 42+36 & 18+12 \\ 22+38 & 25+32 & 11+15 \end{bmatrix}$$

$$= \begin{bmatrix} 56 & 78 & 30 \\ 60 & 57 & 26 \end{bmatrix}$$

The rows represent the stores and the columns represent the type of camera. Thus, the sum, $M+J$, represents the number of cameras of each model sold by the stores in two months.

Therefore, the downtown store sold 56 of Model A, 78 of Model B, and 30 of Model C and the mall store sold 60 of Model A, 57 of Model B, and 26 of Model C.

c. The average monthly sales is the total sales for the period divided by the number of months. We have to find the average monthly sales for the two month period. Thus, divide the total sales for the two months by 2.

Therefore, an expression for the average monthly sales is $\frac{1}{2}(M+J)$.

Substitute the matrix for $M+J$ obtained in part **b.** in the expression.

$$\frac{1}{2}(M+J) = \frac{1}{2}\begin{bmatrix} 56 & 78 & 30 \\ 60 & 57 & 26 \end{bmatrix}$$

Multiply each element in the matrix by $\frac{1}{2}$.

$$\frac{1}{2}\begin{bmatrix} 56 & 78 & 30 \\ 60 & 57 & 26 \end{bmatrix} = \begin{bmatrix} 28 & 39 & 15 \\ 30 & 28.5 & 13 \end{bmatrix}$$

Therefore, a matrix that represents the average monthly sales for the two month period is $\begin{bmatrix} 28 & 39 & 15 \\ 30 & 28.5 & 13 \end{bmatrix}$.

Answer 34e.

According to the given data, the given matrices A and B represent the number of female athletes and the average team size for each sport during the 2000 – 2001 and 2001 – 2002 seasons.

The matrix $A+B$ cannot represent the same, since the female athletes may be present in both the seasons, which will not give a right meaning when adding the number of athletes in both seasons.

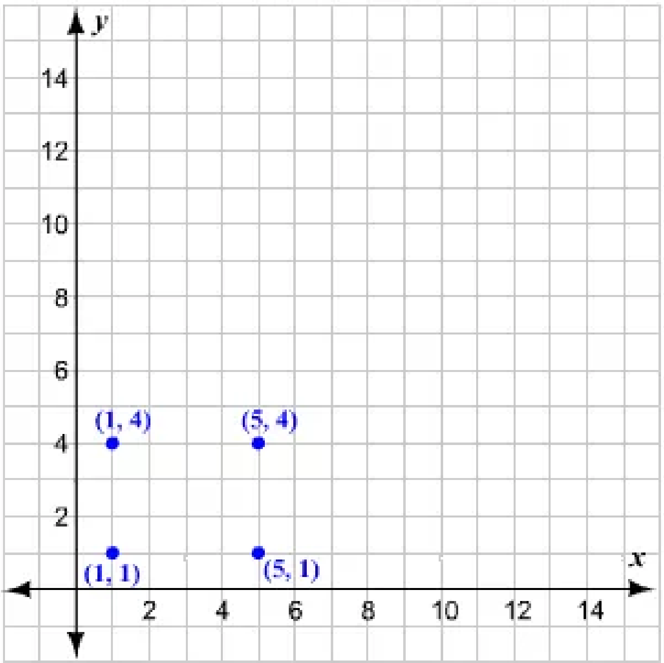
Therefore, the matrix $A+B$ will not give meaningful information.

Answer 35e.

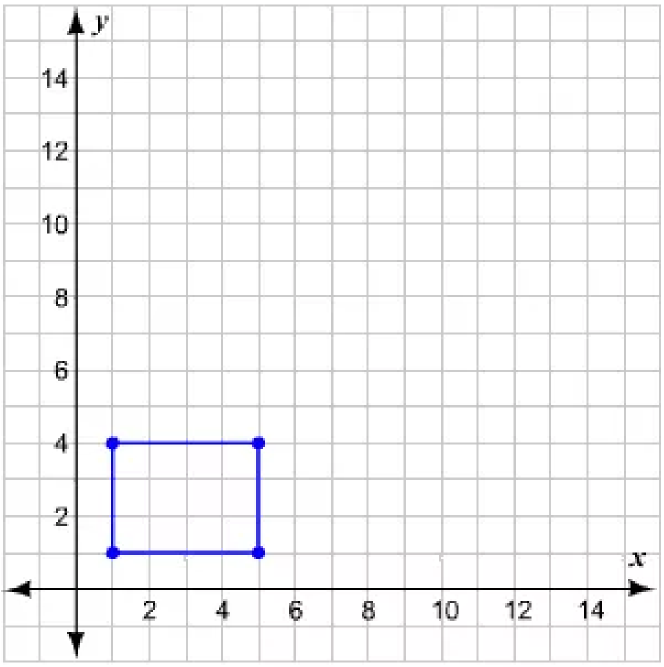
We can represent the x-coordinates of the vertices in the first column of the matrix and the y-coordinates in the second column.

$$A = \begin{bmatrix} 1 & 1 \\ 1 & 4 \\ 5 & 1 \\ 5 & 4 \end{bmatrix}$$

Plot the points (1, 1), (1, 4), (5, 1), and (5, 4) on a coordinate plane.



Connect the points using line segments.



Now multiply this matrix by 3.

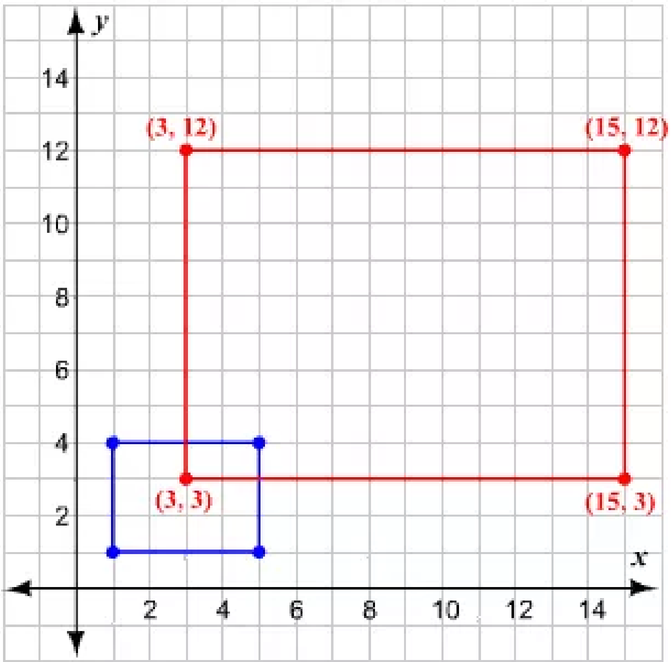
$$3A = 3\begin{bmatrix} 1 & 1 \\ 1 & 4 \\ 5 & 1 \\ 5 & 4 \end{bmatrix}$$

Multiply each element in the matrix by 3.

$$3\begin{bmatrix} 1 & 1 \\ 1 & 4 \\ 5 & 1 \\ 5 & 4 \end{bmatrix} = \begin{bmatrix} 3(1) & 3(1) \\ 3(1) & 3(4) \\ 3(5) & 3(1) \\ 3(5) & 3(4) \end{bmatrix}$$

$$= \begin{bmatrix} 3 & 3 \\ 3 & 12 \\ 15 & 3 \\ 15 & 12 \end{bmatrix}$$

Plot the points (3, 3), (3, 12), (15, 3), and (15, 12) and connect them using line segments on the same coordinate plane.



Answer 36e.

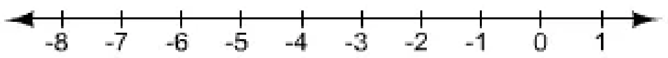
According to the rule of addition and subtraction, we can simplify the given expression as:

$$\begin{aligned} 5+(-8) &= 5-8 \\ &= -3 \end{aligned}$$

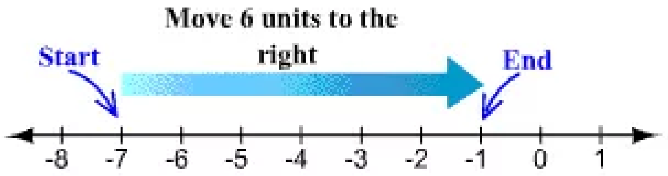
Therefore, the value of the given expression is $\boxed{-3}$.

Answer 37e.

In order to find the sum of the given numbers, draw a number line.



We know that to add a positive number, we have to move to the right. The number 6 is a positive number. Thus, start at -7 and move 6 units to the right.



The final position is -1.

Therefore,
$-7+6=-1$.

Answer 38e.

According to the rule of multiplication of negative numbers,

$(+)(+)=(+)$

$(-)(+)=(-)$

$(+)(-)=(-)$

$(-)(-)=(+)$

We can simplify the given expression as:

$8(-7)=-56$

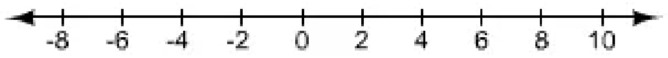
Therefore, the value of the given expression is $\boxed{-56}$.

Answer 39e.

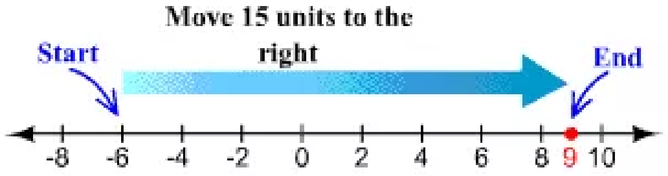
In order to subtract any number, add its opposite. The opposite of -15 is 15.

Thus,
$-6-(-15)=-6+15$.

Draw a number line to find the sum of the given numbers.



We know that to add a positive number, move to the right. The number 15 is a positive number. Thus, start at -6 and move 15 units to the right. The final position is 9.



Therefore,
$-6-(-15)=9.$

Answer 40e.

According to the rule of multiplication of negative numbers,

$(+)(+)=(+)$

$(-)(+)=(-)$

$(+)(-)=(-)$

$(-)(-)=(+)$

We can simplify the given expression as:

$(-5)(-9)=45$

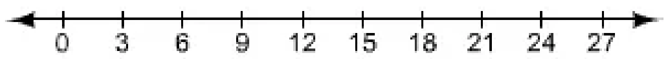
Therefore, the value of the given expression is $\boxed{45}$.

Answer 41e.

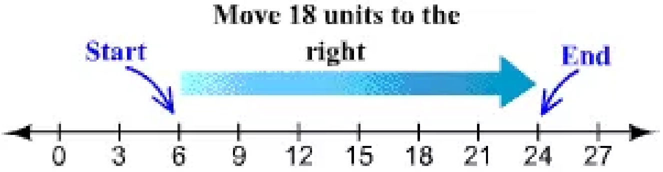
In order to subtract any number, add its opposite. The opposite of -18 is 18.

Thus,
$6-(-18)=6+18.$

Draw a number line to find the sum of the given numbers.



We know that to add a positive number, move to the right. The number 18 is a positive number. Thus, start at 6 and move 18 units to the right.



The final position is 24. Therefore,
$6-(-18)=24$.

Answer 42e.

According to the given graph, the point of intersection is $(0,1)$.

This type of graph has the equation of the form $y=|x|$, when the point of intersection is $(0,0)$.

Therefore, the equation of the given graph will be $y=|x|+1$, so that the given point of intersection satisfies.

The given graph represents $\boxed{y=|x|+1}$.

Answer 43e.

We know that the general form of an absolute value function is $y=a|x-h|+k$, where (h, k) is the vertex of the function.

From the given graph, we note that the vertex is (1, 1). Thus, the value of h and k is 1.

Substitute 1 for h, and 1 for k in the general form.

$y = a|x-1|+1$

One of the coordinates (3, −2) is given. Substitute 3 for x, and −2 for y in the equation.

$-2 = a|3-1|+1$

$-2 = a|2|+1$

$-2 = 2a+1$

Solve for a.

$-3 = 2a$

$\frac{-3}{2} = a$

Substitute $\frac{-3}{2}$ for a in $y = a|x-1|+1$.

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

Therefore, the required equation of the given graph is $y = -\frac{3}{2}|x-1|+1$.

Answer 44e.

According to the given graph, the point of intersection is $(3,-1)$.

This type of graph has the equation of the form $y=|x|$, when the point of intersection is $(0,0)$.

Therefore, the equation of the given graph will be $y=|x-3|-1$, so that the given point of intersection satisfies.

The given graph represents $\boxed{y=|x-3|-1}$.

Answer 45e.

We know that an ordered pair (x, y) is a solution of a linear inequality in two variables if the inequality is true when the values of x and y are substituted into it.

In order determine whether (0, 3) is a solution of the inequality, substitute 0 for x, and 3 for y.

$$0+2(3) \le -3$$
$$6 \le -3$$

The statement is not true and thus (0, 3) is not a solution.

Now, substitute –5 for x, and 1 for y in the given inequality to check whether (–5, 1) is a solution.

$$-5+2(1) \le -3$$
$$-3 \le -3$$

The statement is true.
Therefore, (–5, 1) is a solution of the given inequality.

Answer 46e.

The given inequality is $5x-y>2$

Let us substitute the point $(-5,0)$ in this inequality

$$5x-y>2$$
$$5(-5)-(0)>2$$
$$-25>2$$

The statement is not true, hence the point $(-5,0)$ is not a solution of the given inequality.

Let us substitute the point $(5,23)$ in this inequality

$$5x-y>2$$
$$5(5)-(23)>2$$
$$25-23>2$$
$$2>2$$

The statement is not true, hence the point $(5,23)$ is not a solution of the given inequality.

Answer 47e.

We know that an ordered pair (x, y) is a solution of a linear inequality in two variables if the inequality is true when the values of x and y are substituted into it.

In order determine whether $(-1, 1)$ is a solution of the inequality, substitute -1 for x, and 1 for y.

$$-8(-1) - 3(1) < 5$$

Evaluate.

$$8 - 3 < 5$$
$$5 < 5$$

The statement is not true and thus $(-1, 1)$ is not a solution.

Now, substitute 3 for x, and -9 for y in the given inequality to check whether $(-3, 9)$ is a solution.

$$-8(-3) - 3(9) < 5$$

Evaluate.

$$24 - 27 < 5$$
$$-3 < 5$$

The statement is true.
Therefore, $(-3, 9)$ is a solution of the given inequality.

Answer 48e.

The given inequality is $21x - 10y > 4$

Let us substitute the point $(2,3)$ in this inequality

$$21x - 10y > 4$$
$$21(2) - 10(3) > 4$$
$$42 - 30 > 4$$
$$12 > 4$$

The statement is true; hence the point $(2,3)$ is a solution of the given inequality.

Let us substitute the point $(-1,0)$ in this inequality

$$21x - 10y > 4$$
$$21(-1) - 10(0) > 4$$
$$-21 > 4$$

The statement is not true; hence the point $(-1,0)$ is not a solution of the given inequality.