Click on the links below to jump directly to the relevant section

Fractions Practice: Answers

Practice #1 Answers

1. $\frac{6}{28}$ This fraction can be simplified to $\frac{3}{14}$
2. $\frac{36}{104}$ This fraction can be simplified to $\frac{9}{26}$
3. $\frac{924}{3192}$ This fraction can be simplified to $\frac{11}{38}$

Practice #2 Answers

1. $\frac{9}{15}$ This fraction can be simplified to $\frac{3}{5}$
2. $\frac{70}{52}$ This fraction can be simplified to $\frac{35}{26}$

Practice #3 Answers

	Groups	Solutions
A.	$\frac{2}{3}, \frac{25}{28}$	$\frac{2}{3} < \frac{25}{28}$
B.	$\frac{7}{10}, \frac{9}{14}, \frac{21}{28}$	$\frac{9}{14} < \frac{7}{10} < \frac{21}{28}$
C.	$\frac{29}{85}, \frac{33}{105}, \frac{47}{150}$	$\frac{47}{150} < \frac{33}{105} < \frac{29}{85}$

Practice #4 Answers

	Groups	Solutions
A.	$\frac{5}{8}, \frac{3}{4}$	$\frac{5}{8} < \frac{3}{4}$
B.	$\frac{16}{20}, \frac{11}{15}, \frac{21}{25}$	$\frac{11}{15} < \frac{16}{20} < \frac{21}{25}$

Practice #5 Answers

1. Complete the multiplication for each of the following:

   a. $\frac{4}{5}\times\frac{15}{17}=\frac{12}{17}$ b. $\frac{5}{14}\times\frac{3}{10}\times\frac{7}{12}=\frac{1}{16}$

2. Complete the division for each of the following:

   a. $\frac{5}{2}\div\frac{7}{12}=\frac{30}{7}$ b. $\frac{20}{11}\div\frac{100}{99}=\frac{9}{5}$

3. Complete the addition for each of the following:

   a. $\frac{3}{8}+\frac{5}{2}=\frac{23}{8}$ b. $\frac{13}{85}+\frac{12}{45}=\frac{107}{255}$

4. Complete the subtraction for each of the following:

   a. $\frac{13}{16}-\frac{2}{3}=\frac{7}{48}$ b. $\frac{3}{8}-\frac{5}{2}=\frac{-17}{8}$

Practice #6 Answers

1. Complete the multiplication for each of the following:

   a. $\frac{2}{9}\times\frac{3}{8}=\frac{1}{12}$

   b. $\frac{20}{6}\times\frac{15}{10}=5$

2. Complete the division for each of the following:

   a. $\frac{1}{4}\div\frac{7}{26}=\frac{13}{14}$

   b. $\frac{2}{7}\div\frac{5}{24}=\frac{48}{35}$

3. Complete the addition for each of the following:

   a. $\frac{7}{8}+\frac{1}{6}=\frac{25}{24}$

   b. $\frac{5}{2}+\frac{7}{12}=\frac{37}{12}$

4. Complete the subtraction for each of the following:

   a. $\frac{3}{2}-\frac{7}{12}=\frac{11}{12}$

   b. $\frac{5}{2}-\frac{1}{7}=\frac{33}{14}$

Percents Practice: Answers

Practice #1 Answers

1. Express the following decimals as percents.

   a. .96 = 96% b. .0036 = .36%

2. Express each of the following fractions as percents.

   a. 69/100 = 69% b. 5/8 = 62.5%

3. Express each of the following percents as both a fraction and a decimal.

   a. 58% Fraction: 29/50 Decimal: .58

   b. 135% Fraction: 27/20 Decimal: 1.35

Practice #2 Answers

1. Express the following decimals as percents.

   a. .25 = 25% b. 1.25 = 125%

2. Express each of the following fractions as percents.

   a. 75/100 = 75% b. 1/5 = 20%

3. Express each of the following percents as both a fraction and a decimal.

   a. 30% Decimal: .3 Fraction: 3/10

   b. 80% Decimal: .8 Fraction: 4/5

Practice #3 Answer

We are measuring the percent change from 1985 to 1995. Therefore, we use the population in Raleigh in 1985 as our base (X_0) and the 1995 population as the changed value (X_1).

Percent change = $[\Delta X / X_0] \times 100 = [(X_1 - X_0) / X_0] \times 100$

$= [(241{,}000 – 171{,}000)/171{,}000] \times 100$

$= 41\%$

The population of Raleigh, North Carolina grew by 41% from 1985 to 1995.

Practice #4 Answer

1980 Pullman Population: $X_0 = 17{,}316$
1990 Pullman Population: $X_1 = 18{,}373$

Then, Percent Change = $[\Delta X/ X_0] \times 100 = [(X_1 - X_0)/X_0] \times 100$

$= [(18{,}373 – 17{,}316)/17{,}316] \times 100$

$= 0.061 \times 100$

$= 6.1\%$

The population of Pullman grew by 6.1% from 1980 to 1990.

Practice #5 Answer

Percent change $=[\Delta X/ X_0] \times 100 = [(X_1 - X_0)/X_0] \times 100$
$= [(375 - 420)/420] \times 100$
$= -0.107 \times 100$
$= 10.7\%$

The owner’s energy costs decreased by 10.7% from last year to this year.

Practice #6 Answers

What is 45% of 300?   135 is 45% of 300.

60 is what % of 240? 60 is 25% of 240.

30 is 15% of what number? 30 is 15% of 200.

Ratios Practice: Answers

Practice #1 Answer

The package of boneless chicken costs $3.15 for 1.5 pounds. Ground beef costs $5.48 for 2 pounds. Which of these two would be a better buy, in terms of pounds of food per dollar?

The chicken costs $2.10/lb., while ground beef sells for $2.74/lb.
Therefore, the chicken is the better buy.

Practice #1 Detailed Answer

The first thing we need to do is set up a table for our information.

	Cost (in $)	Size (in lbs.)	Ratio
Chicken	3.15	1.5	
Beef	5.48	2.0	

We need to determine the ratio that goes in the last column. We will use the ratio of Cost/Size, or dollars per pound.

Ratio Cost/Size for Chicken: $\frac{\$3.15}{1.5\text{ lbs.}} = \frac{\$2.10}{\text{lb.}}$

Ratio Cost/Size of Ground Beef: $\frac{5.48}{2\text{ lbs.}} = \frac{\$2.74}{\text{lb.}}$

We can now fill in the table:

	Cost (in $)	Size (in lbs.)	Ratio
Chicken	3.15	1.5	$2.10/ lb
Beef	5.48	2.0	$2.74/ lb

When we compare these, we can see that the chicken is a better buy.

Practice #2 Answer

On average, a man earns $40/week while a woman earns $45/week. Therefore, on average, women earn more per week.

Practice #2 Detailed Answer

The first thing we need to do is set up a table for our information.

	Money Earned ($/week)	Number of Persons	Ratio
Men	6,000	150	
Women	5,625	125	

We need to determine the ratio that goes in the last column. We will use the ratio of Dollars a week/Size, or dollars per person.

Ratio Dollars a week/person for men: $\frac{\$6{,}000 \text{ a week}}{150 \text{ men}} = \frac{\$40 \text{ a week}}{\text{man}}$

Ratio Dollars a week/person for women: $\frac{\$5{,}625 \text{ a week}}{125 \text{ women}} = \frac{\$45 \text{ a week}}{\text{woman}}$

We can now fill in the table:

	Money Earned ($/week)	Number of Persons	Ratio (dollars/person)
Men	6,000	150	$40 a week/man
Women	5,625	125	$45 a week/woman

When we compare these, we can see that, on average, women earn more money per week then men do.

Proportions Practice: Answers

Practice #1 Answers

1. If you can travel an average of 15 miles per hour on a bicycle, how long will it take you to travel 50 miles?

   3 hours and 20 minutes or 3 1/3 hours

2. 2,500 flights took off from Boston's Logan International Airport in the last two days. At that rate, how many will take off in the next week (7 days)?

   8750 take-offs

3. If Japan and the United States combined to spend approximately 65% of the world's private expenditures (which totaled 3.2 trillion dollars), how much did they spend? Keep your answer in trillions of dollars, rounded the hundredths place.

   2.08 trillion dollars have been spent by Japan and the US.

Practice #1 Detailed Answers

Item 1: If you can travel an average of 15 miles per hour on a bicycle, how long will it take you to travel 50 miles?

1. Set up a table of information to determine what we know and what we want to find.

	Miles	**Time (hrs)**
Average Trip	15	1
New Trip	50	*x*

2. Use the information in the table to set up a proportion.

$$\frac{1\text{ hour}}{15\text{ miles}} = \frac{x\text{ hours}}{50\text{ miles}}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$50 \times \frac{1}{15} = x \quad or \quad \frac{50}{15} = x$$

4. Simplify the result.

$$33.3 \text{ hours} = x$$

It will take 3.33 hours to ride 50 miles.

Item 2: 2,500 flights took off from Boston's Logan International Airport in the last two days. At that rate, how many will take off in the next week (7 days)?

1. Set up a table of information to determine what we know and what we want to find.

	Days	**Take-Offs**
Initial Time Frame	2	2,500
New Time Frame	7	x

2. Use the information in the table to set up a proportion.

$$\frac{2{,}500 \text{ take-offs}}{2 \text{ days}} = \frac{x \text{ take-offs}}{7 \text{ days}}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$7 \times \frac{2{,}500}{2} = x \quad or \quad \frac{17{,}500}{2} = x$$

4. Simplify the result.

$$8{,}750 = x$$

There will be 8,750 take-offs in the next 7 days at Boston's airport.

Item 3: If Japan and the United States combined to spend approximately 65% of the world's private expenditures (which totaled 3.2 trillion dollars), how much did they spend? Keep your answer in trillions of dollars, rounded to the hundredths place.

This problem is a percent problem, so we should be looking for a part to whole relationship.

1. Set up a table of information to determine what we know and what we want to find.

	Percent	Number of Cases (in trillions)
Part of Group	65	x
Whole Group	100	3.2

2. Use the information in the table to set up a proportion.

$$\frac{65}{100} = \frac{x}{3.2 \text{ trillion}}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$3.2 \times \frac{65}{100} = x \quad or \quad \frac{208}{100} = x$$

4. Simplify the result.

2.08 trillion = *x*

Practice #2 Answers

1. In a major city, 8% of the potential work force (which consists of 550,000 people) are unemployed. How many people are unemployed?

44,000 people are unemployed.

2. Of the 112 small businesses in the local industrial park, 18 have declared bankruptcy within the last five years. What percent of the businesses is this? Round to the nearest tenth.

16.1% of the businesses have declared bankruptcy.

3. If eleven students dropped out of a high school within the last three years, how many will drop out in the next five? Assume the drop out rate will not change.

   18 students will drop out (18.33 rounded down to the nearest whole number).

Practice #2 Detailed Answers

Item 1: In a major city, 8% of the potential work force (which consists of 550,000 people) are unemployed. How many people are unemployed?

1. Set up a table of information to determine what we know and what we want to find.

	Percent	**Number**
Part	8	*x*
Whole	100	550,000

2. Use the information in the table to set up a proportion.

$$\frac{8}{100} = \frac{x}{550{,}000}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$550{,}000 \times \frac{8}{100} = x \quad or \quad \frac{4{,}400{,}000}{100} = x$$

4. Simplify the result.

$$44{,}000 \text{ people} = x$$

   44,000 people are unemployed.

Item 2

Of the 112 small businesses in the local industrial park, 18 have declared bankruptcy within the last five years. What percent of the businesses is this? Round to the nearest tenth.

1. Set up a table of information to determine what we know and what we want to find.

	Percent	Number of Bankruptcies
Part	*x*	18
Whole	100	112

2. Use the information in the table to set up a proportion.

$$\frac{x}{100} = \frac{18}{112}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$x = \frac{18}{112} \times 100 \quad or \quad x = \frac{1800}{112}$$

4. Simplify the result.

$$16.07 = x$$

If we round up to the nearest tenth, we get 16.1%.

Item 3
If eleven students dropped out of a high school within the last three years, how many will drop out in the next five? Assume the drop out rate will not change.

This problem is a rate problem.

1. Set up a table of information to determine what we know and what we want to find.

	Time Frame	Number of Dropouts
Previous Dropouts	3 years	11
Expected Dropouts	5 years	*x*

2. Use the information in the table to set up a proportion.

$$\frac{11 \text{ dropouts}}{3 \text{ years}} = \frac{x \text{ dropouts}}{5 \text{ years}}$$

3. Multiply both sides of the proportion by the denominator of the fraction containing the unknown.

$$5 \times \frac{11}{3} = x \text{ or } \frac{55}{3} = x$$

4. Simplify the result.

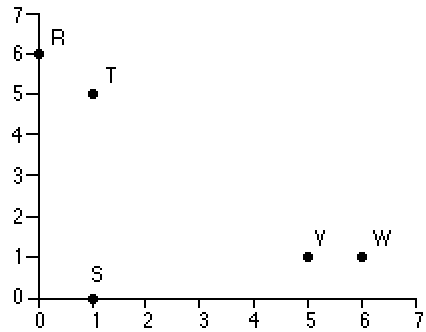
$$18.33 \text{ dropouts} = x$$

The result is 18.33. Since we can't have .33 people as dropouts, this result is rounded down to 18. We anticipate 18 dropouts over the next 5 years.

Graphing Practice: Answers

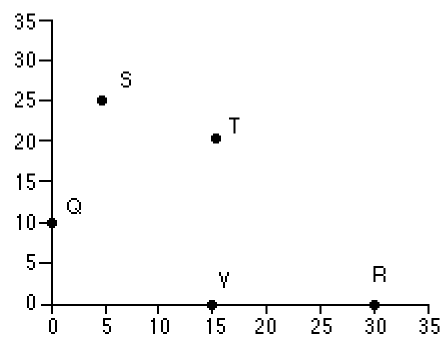
Practice #1 Answers

1. Which point is (0, 6)?
   point R
2. What is the *y*-coordinate of point S?
   zero
3. What are the coordinates of point T?
   (1, 5)



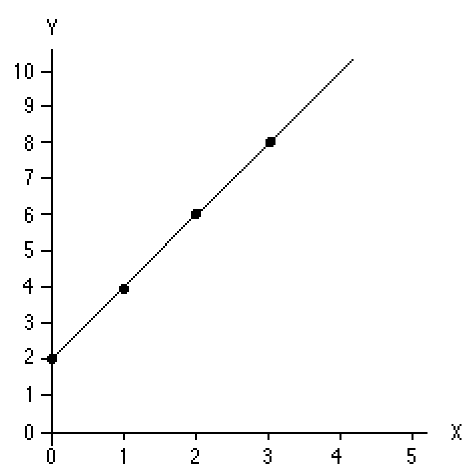
Practice #2 Answers

1. Which point(s) lie on the *x*-axis?
   points V and R
2. What is the *y*-coordinate of point S?
   25
3. What are the coordinates of point Q?
   (0, 10)
4. What are the coordinates of point T?
   (15, 20)



Practice #3 Answer

The graph of the equation $y = 2x + 2$ should look like the one shown at the right.



Practice #3 Detailed Answer

1. **Generate a list of points for the relationship.**

   Create a table to obtain some points. A sample using 0, 1, 2, and 3 for x is shown in the table.

x	*y*
0	2
1	4
2	6
3	8

   To obtain *y* values, plug the *x* values into the equation $y = 2x + 2$ and compute.

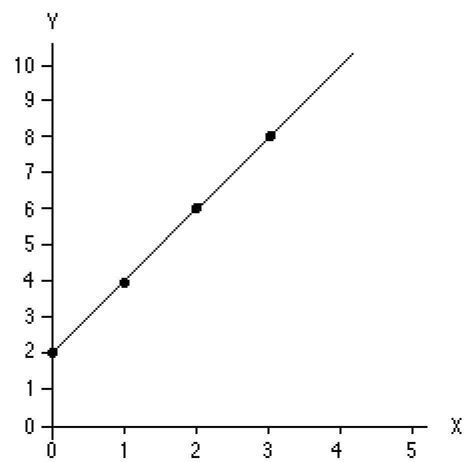
$x = 0$	$x = 1$	$x = 2$	$x = 3$
$y = 2\ (0) + 2$	$y = 2\ (1) + 2$	$y = 2\ (2) + 2$	$y = 2\ (3) + 2$
$y = 0 + 2$	$y = 2 + 2$	$y = 4 + 2$	$y = 6 + 2$
$y = 2$	$y = 4$	$y = 6$	$y = 8$

   The points that we have defined here are:

   (0, 2), (1, 4), (2, 6), (3, 8)

2. **Draw a set of axes and define the scale.**
   This part was done for you in the problem.

3. **Plot the points on the axes.**
   Plot the points (0, 2), (1, 4), (2, 6), and (3, 8).
   NOTE: Regardless of the points you selected, your graph of the line will still be the same.
4. **Draw the line by connecting the points.**
   Once you have plotted the points, connect them to get a line.

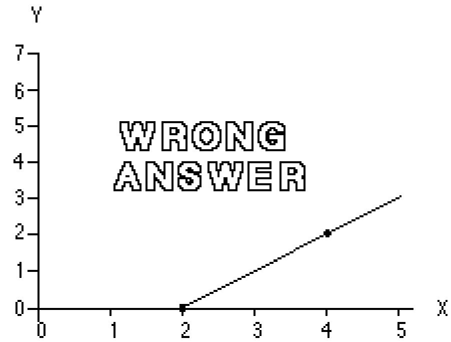


What if your graph does not look like this? If your graph does not look like the one shown here, read through the suggestions below to determine where you may have made a mistake.

If any of your points do not lie on your straight line:

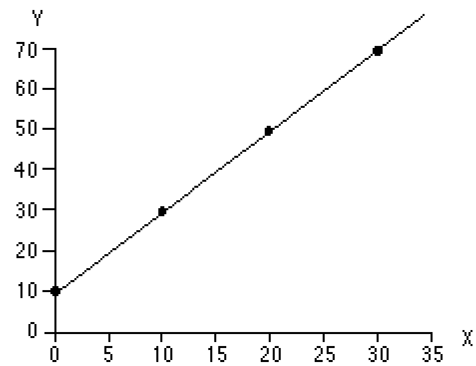
- Check your calculations for an error in computing y values. You should have at least three of the following points: (0, 2), (1, 4), (2, 6), (3, 8).
- Remember that points are given in the coordinate notation of (x, y), with x first and y second.
- Check to be sure all of your points are plotted correctly.

If your graph looks like the one shown here, you have switched your x and y values when plotting. Remember that points are given in the coordinate notation of (x, y), with x first and y second. Be sure that you plotted the points correctly.



Practice #4 Answer

The graph of the equation $y = 2x + 10$ should look like the one at the right.



Practice #4 Detailed Answer

1. **Generate a list of points for the relationship.**

   Create a table to obtain some points. A sample using 0, 1, 2, and 3 for x is shown in the table.

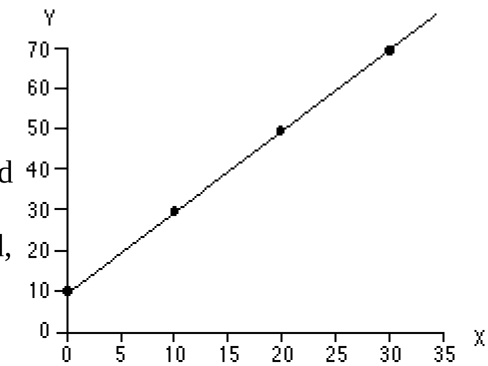
   To obtain y values, plug the x values into the equation $y = 2x + 10$ and compute.

x	*y*
0	10
10	30
20	50
30	70

$x = 0$	$x = 10$	$x = 20$	$x = 30$
$y = 2\ (0) + 10$	$y = 2\ (10) + 10$	$y = 2\ (20) + 10$	$y = 2\ (30) + 10$
$y = 0 + 10$	$y = 20 + 10$	$y = 40 + 10$	$y = 60 + 10$
$y = 10$	$y = 30$	$y = 50$	$y = 70$

The points that we have defined here are:

(0, 10), (10, 30), (20, 50), (30. 70)



2. **Draw a set of axes and define the scale.**
   This part was done for you in the problem.

3. **Plot the points on the axes.**
   Plot the points (0, 10), (10, 30), (20, 50), and (30. 70).
   NOTE: Regardless of the points you selected, your graph of the line will still be the same.
4. **Draw the line by connecting the points.**
   Once you have plotted the points, connect them to get a line.

If your graph does not look like the one shown here, read through the suggestions below to determine where you may have made a mistake.

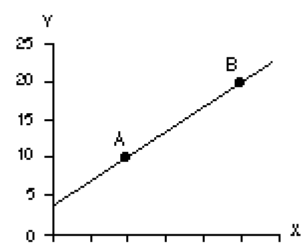
If any of your points do not lie on your straight line:

- Check your calculations for an error in computing y values. Check our calculations to be sure they are correct.
- Remember that points are given in the coordinate notation of (x, y), with x first and y second.
- Check to be sure all of your points are plotted correctly.

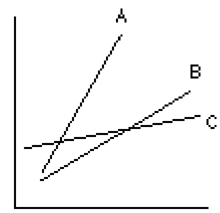
Practice #5 Answers

1. The slope of the line connecting the points (0, 3) and (8, 5) is 1/4 or .25.

2. The slope of the straight line on the graph is 1/3 or .33.



3. In the figure, the line that has the slope with the **largest** value is line A.
The line with the slope with the **smallest** value is line C.



Practice #5 Detailed Answers

1. What is the slope of the line connecting the points (0, 3) and (8, 5)?

To calculate the slope of this line you need to:

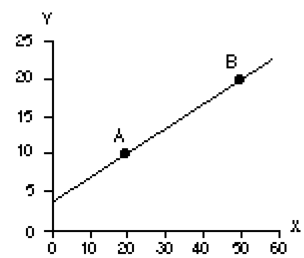
Step One: Identify two points on the line.
You were given points (0, 3) and (8, 5) on the line.

Step Two: Select one to be (x_1, y_1) and the other to be (x_2, y_2).
Let's take (0, 3) to be (x_1, y_1). Let's take the point (8, 5) to be the point (x_2, y_2).

Step Three: Use the slope equation to calculate slope.
Using the given points, your calculations will look like:

$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(5-3)}{(8-0)} = \frac{2}{8} = \frac{1}{4}$$

2. Calculate the slope of the line given in the figure below.



Step One: Identify two points on the line.
Identify points A (20, 10) and B (50, 20) on the line.

Step Two: Select one to be (x_1, y_1) and the other to be (x_2, y_2).
Let's take A (20, 10) to be (x_1, y_1). Let's take the point B (50, 20) to be the point (x_2, y_2).

Step Three: Use the slope equation to calculate slope.
Using points A (20, 10) and B (50, 20), your calculations will look like:

$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(20-10)}{(50-20)} = \frac{10}{30} = \frac{1}{3}$$

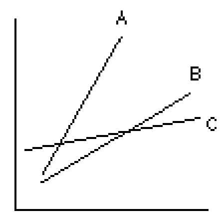
Note: If your slope was 3, you inverted the slope equation.

3. In the figure below, which line (A, B, or C) has the slope with the largest value? Which one has the slope with the smallest value?

Since the three lines are drawn on the same set of axes, we can determine which line has the largest slope and which line has the smallest slope by simply looking at the graph.

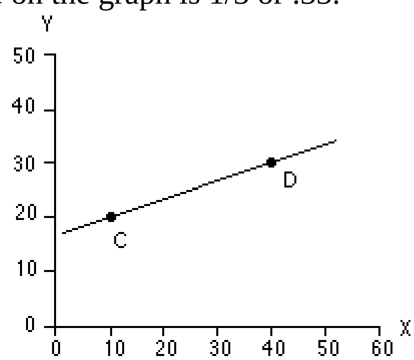
Line A is the steepest so would have the largest slope.

Line C is the least steep so would have the smallest slope.



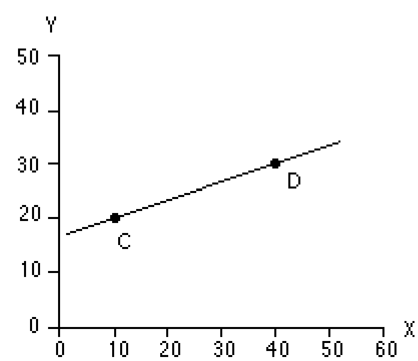
Practice #6 Answer

The slope of the straight line on the graph is 1/3 or .33.



Practice #6 Detailed Answer

1. **Step One:** Identify two points on the line.
   Identify points C (10, 20) and D (40, 30) on the line.
2. **Step Two:** Select one to be (x_1, y_1) and the other to be (x_2, y_2).
   Let's take C (10, 20) to be (x_1, y_1). Let's take the point D (40, 30) to be the point (x_2, y_2).
3. **Step Three:** Use the slope equation to calculate slope.
   Using points C (10, 20) and D (40, 30) your calculations will look like:

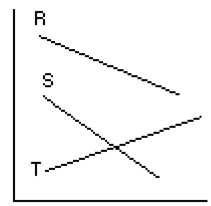


$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(30 - 20)}{(40 - 10)} = \frac{10}{30} = \frac{1}{3}$$

Practice #7 Answers

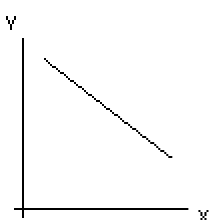
1. In the figure below, which line(s) (R, S, or T) have a positive slope? Which one(s) have a negative slope?

The line T has a **positive** slope.
Both line R and line S have a **negative** slope

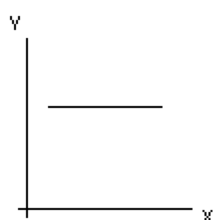


2. In the graphs below (a through f), which contain(s) a line with a positive slope? A negative slope? Slope of zero? Infinite slope?

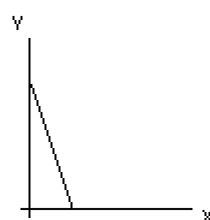
(a) negative slope (b) slope of zero (c) negative slope
(d) infinite slope (e) positive slope (f) slope of zero



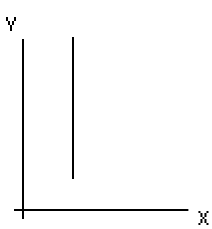
(a)



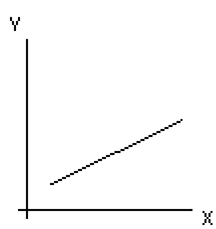
(b)



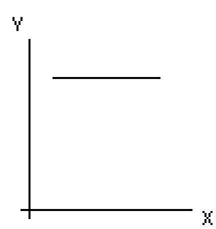
(c)



(d)



(e)



(f)

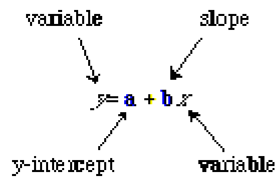
Practice #8 Answers

What are the slopes and *y*-intercepts of the following equations?

	Slope	*y*-intercept
1. $y = 2/3\, x + 6$	2/3	6
2. $y = 25 + 10\, x$	10	25
3. $y = 2 - 5\, x$	-5	2
4. $y = 3\, x$	3	0

Practice #8 Detailed Answers

What are the slopes and *y*-intercepts of the following equations?
The equation of a straight line has the form:



1. $y = 2/3\, x + 6$ Slope = 2/3 *y*-intercept = 6

In this question, the constant that multiplies the *x* variable is 2/3, therefore this is the slope. The constant that you get when $x = 0$ is 6, therefore the *y*-intercept is 6.

2. $y = 25 + 10\, x$ Slope = 10 *y*-intercept = 25

In this question, the constant that multiplies the *x* variable is 10, therefore this is the slope. The constant that you get when $x = 0$ is 25, therefore the *y*-intercept is 25.

3. $y = 2 - 5\, x$ Slope = -5 *y*-intercept = 2

In this question, the constant that multiplies the *x* variable is 5, therefore this is the slope. The constant that you get when $x = 0$ is 2, therefore the *y*-intercept is 2.

4. $y = 3\, x$ Slope = 3 *y*-intercept = 0

In this question, the constant that multiplies the *x* variable is 3, therefore this is the slope. The constant that you get when $x = 0$ is 0, therefore the *y*-intercept is 0.

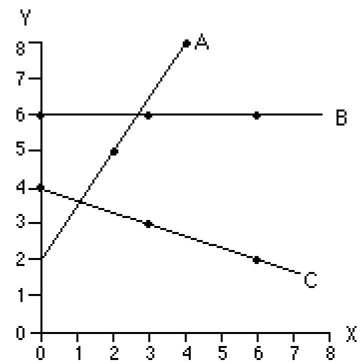
Practice #9 Answers

What are the slopes and *y*-intercepts of the following equations?

	Slope	*y*-intercept
1. $y = 5x + 1$	5	1
2. $y = x$	1	0
3. $y = 21 - 3x$	-3	21
4. $y = -30x + 2$	-30	2

Practice #10 Answers

- The equation of line A is (f) $y = (3/2)x + 2$
- The equation of line B is (b) $y = 6$
- The equation of line C is (e) $y = 4 - (1/3)x$

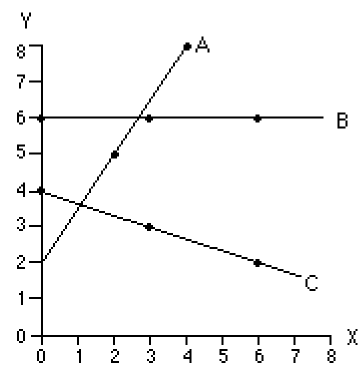


Practice #10 Detailed Answers

When matching the equation of a line to the graph of a line, the things we need to check for are:

- the *y*-intercept
- the slope of the line on the graph

Let's take these lines on the graph one at a time and examine them.



The equation of line A is (f) $y = (3/2)x + 2$

- the *y*-intercept:

  If you examine the graph, you should notice that the line crosses the *y*-axis at the point (0, 2). Therefore, the *y*-intercept is 2.

  If you look at line A on the graph, you notice that the *y*-intercept is 2. In the choices given to choose from, only (f) $y = (3/2)x + 2$ has a *y*-intercept of 2. To verify that this is the correct answer, you should calculate the slope of A.

- the slope of the line on the graph:

  Using the points (2, 5) and (4, 8) from the graph (NOTE: you can use any two points from the graph), the slope is calculated to be:

$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(8-5)}{(4-2)} = \frac{3}{2}$$

  The slope of line A is (3/2). A line of slope (3/2) and *y*-intercept of 2 gives the equation *y* = (3/2)*x* + 2.

The equation of line B is (b) *y* = 6

- the *y*-intercept:

  If you examine the graph, you should notice that the line crosses the *y*-axis at the point (0, 6). Therefore, the *y*-intercept is 6.

  There is more than one equation here with a *y*-intercept of 6. Both (b) *y* = 6 and (d) *y* = *x* + 6 have a *y*-intercept of 6, so you must determine the slope of the line.

- the slope of the line on the graph:

  Line B is a horizontal line. This means the slope of the line is zero.

  A line with *y*-intercept of 6 and slope of zero has the equation *y* = (0) *x* + 6 which is simplified to *y* = 6.

The equation of line C is (e) *y* = 4 - (1/3) *x*.

- the y-intercept:

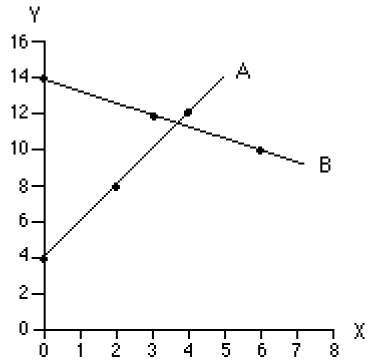
  If you examine the graph, you should notice that the line crosses the *y*-axis at the point (0, 4). Therefore, the *y*-intercept is 4. Of our choices, both (a) *y* = 4 + (1/3) *x*, and (e) *y* = 4 - (1/3) *x*, has a *y*-intercept of four. Let's take a look at the slope to determine which is the correct answer.

- the slope of the line on the graph:

  Line C slopes downward to the right. This means that the slope must be negative. *y* = 4 - (1/3) *x* also has a negative slope, so is consistent with our answer.

Practice #11 Answers

- The equation of line A is (d) $y = 4 + 2x$
- The equation of line B is (f) $y = 14 - (2/3)x$

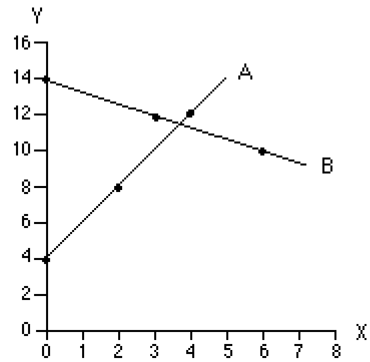


Practice #11 Detailed Answers

When matching the equation of a line to the graph of a line, the things we need to check for are:

- the *y*-intercept
- the slope of the line on the graph

Let's take these lines on the graph one at a time and examine them.



The equation of line A is (d) $y = 4 + 2x$

- the *y*-intercept:

  If you examine the graph, you should notice that line A crosses the *y*-axis at the point (0, 4). Therefore, the *y*-intercept is 4.

  Of the choices given, (a) $y = 4 - 2x$, and (d) $y = 4 + 2x$, both have a *y*-intercept of 4. To determine which is the correct answer, we must look at the slope of the line for each equation.

- the slope of the line on the graph:

  As you should notice, line A slopes upward. This means the slope is positive. Given this, the answer must be (d) $y = 4 + 2x$. But, just to make sure, let's calculate the slope of the line A from two points.

  Using the points (2, 5) and (4, 8) from the graph (NOTE: you can use any two points from the graph), the slope is calculated to be:

$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(12-8)}{(4-2)} = \frac{4}{2} = 2$$

The slope of line A is (3/2). A line of slope (3/2) and *y*-intercept of 2 gives the equation *y* = (3/2)*x* + 2.

The equation of line B is (f) *y* = 14 - (2/3)*x*

- the *y*-intercept:

  If you examine the graph, you should notice that the line crosses the *y*-axis at the point (0, 14). Therefore, the *y*-intercept is 14.

  Of the choices given, (b) *y* = (2/3)*x* + 14, (e) *y* = 14 - (3/2)*x*, and (f) *y* = *y* = 14 - (2/3)*x*, all have a *y*-intercept of 14. To determine which is the correct answer, we must look at the slope of the line for each equation.

- the slope of the line on the graph:

  Line B slopes downward. This means the slope of the line is negative. Two of our choices have a negative slope, (e) *y* = 14 - (3/2) *x*, and (f) *y* = 14 - (2/3) *x*. To determine the correct solution, we will have to calculate the slope of line B using two points.

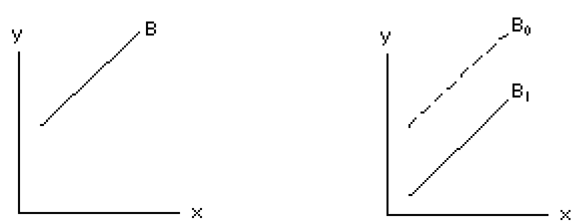
  Using the points (3, 12) and (6, 10) from the graph (NOTE: you can use any two points from the graph), the slope is calculated to be:

$$\text{slope} = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(10-12)}{(6-3)} = \frac{-2}{3} = -\frac{2}{3}$$

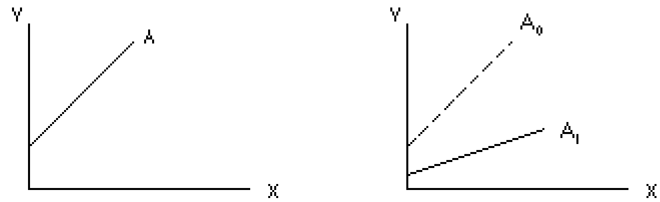
  The slope of line B is (-2/3). The equation with a slope of (-2/3) and *y*-intercept of 14 is (f) *y* = 14 - (2/3)*x*.

Practice #12 Answers

1. In the graph below, the straight line B is given by the equation *y* = T*x* + P. As the line shifted, **the constant "P," which is the *y*-intercept, must have changed.**

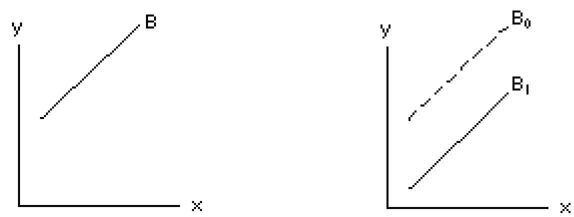


2. In the graph below, the line A is given by the equation y = Z + Wx. As the line shifted, **the constant "W," which is the slope, must have changed.** Also, **the constant "Z," the y-intercept, changed.**



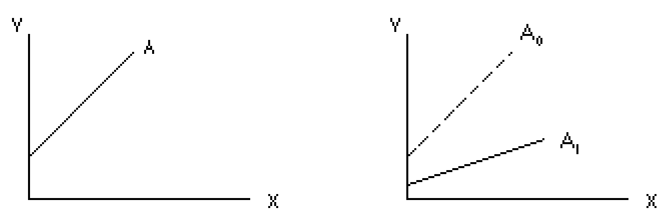
Practice #12 Detailed Answers

1. In the graph below, the straight line B is given by the equation y = Tx + P. If the line shifts from this initial position B_0 to a new position of B_1, what must have changed in the equation?



   - In this graph, the line shifted down but did not change its slope.
   - "P" is the y-intercept. If you extend both lines to the y-axis, you will find B_1 intersects the axis at a smaller number. Therefore, the **constant "P" changed in the equation. It also must have decreased.**
   - "T" is the slope of the line. Since the slope did not change, the **constant "T" remains the same.**

2. In the graph below, the line A is given by the equation y = Z + Wx. If the line shifts from this initial position A_0 to a new position of A_1, what must have changed in the equation?



   - In this graph, the line has changed in steepness which means the slope must have changed.

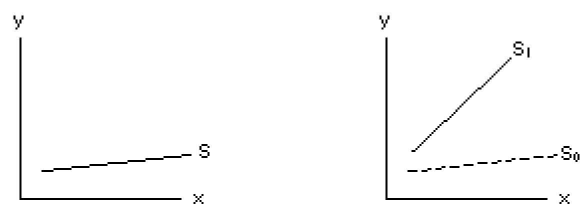
- Also, we can see that the *y*-intercept changed when the line shifted.
- "W" is the slope of the line. Since the slope must have changed, the constant **"W" must have changed.**
- Since A_1 is less steep than A_0, **"W" must have decreased.**
- "Z" is the *y*-intercept. Both lines are shown intersecting the *y*-axis. Since they do not meet the *y*-axis at the same point, the ***y*-intercept must also have changed.**
- A_1 meets the *y*-axis at a smaller number. Therefore, the constant **"Z" must have decreased as the line shifted.**

Practice #13 Answer

The straight line S is given by the equation $y = c + dx$. As the line shifted, the constant "d," which is the slope, must have changed. It is difficult to tell if the constant "c," the *y*-intercept, also changed unless you extend the lines to meet the *y*-axis.

Practice #13 Detailed Answer

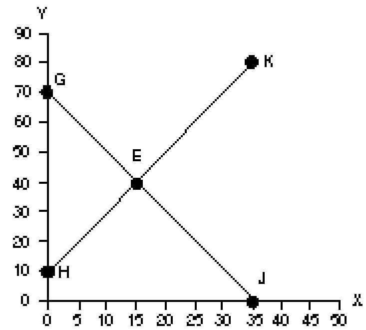
In the graph below, the straight line S is given by the equation $y = c + dx$. If the line shifts from this initial position S_0 to a new position of S_1, what must have changed in the equation?



- In this graph, the line has **changed in steepness, which means the slope must have changed**.
- In the equation $y = c + dx$, **"d" is the slope of the line.** Since the slope must have changed, the **constant "d" must have changed. Since S_1 is steeper than S_0 , "d" must have increased.**
- In the equation $y = c + dx$, **"c" is the *y*-intercept.** In the graph, **the lines have not been extended to where they intercept the *y*-axis, so it is hard to tell if "c" changed or not.** Unless you extend the lines to the *y*-axis and can be certain the two lines both intercept the *y*-axis in the same place, **it is hard to tell if "c" changed or not, but we can be certain that "d" did change.**
- **If you do extend both lines through the *y*-axis, you will find they have the same *y*-intercept, which means "c" does not change.**

Practice #14 Answers

1. Using the graph below, answer the following questions.



    1. At what coordinates does the line GJ intersect the *y*-axis?
       GJ intersects the *y*-axis at (0, 70).
    2. What are the coordinates of the intersection of lines GJ and HK?
       The coordinates of the intersection of lines GJ and HK are (15, 40).
    3. At a *y* value of 60, what is the *x* value for line GJ?
       When *y* has a value of 60, the value of *x* on line GJ is 5.
    4. At point K, what is the *y*-coordinate?
       At point K, the *y*-coordinate is about 80. You may have answered 81 or 82.

2. How is the point of intersection affected by this shift (how do the coordinates of the intersection change)?

The initial point of intersection between lines P and Q is at point A. After line P shifts from P_1 to P_2, the new point of intersection is point B. To determine how this shift affects the intersection, you should look at what happens to the values for the *x* and *y* coordinates.

First, look at the change in the *x*-coordinate (figure 2). The *x*-coordinate shifts from x_A to x_B. The value of x_B is larger than x_A. Therefore, **the *x*-coordinate increases.**

Second, look at the change in the *y*-coordinate (figure 1). The *y*-coordinate shifts from y_A to y_B. The value of y_B is larger than y_A. Therefore, **the *y*-coordinate increases.**

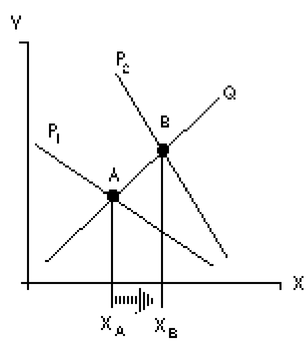


Figure 2

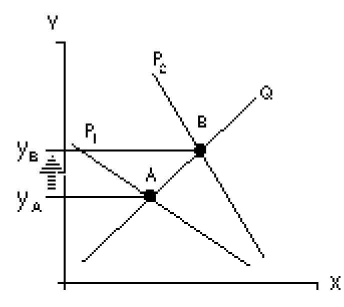
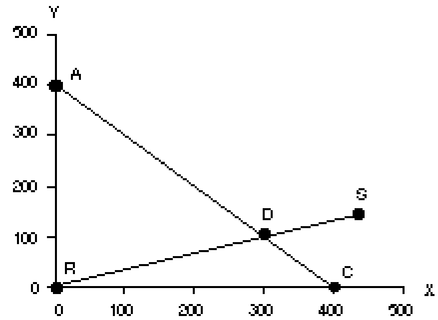


Figure 1

Practice #15 Answers

Using the graph below, answer the following questions.

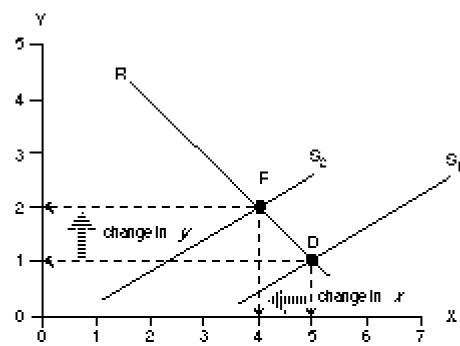


1. At what coordinates does the line AC intersect the *y*-axis?
   AC intersects the *y*-axis at (0, 400).
2. At a *y* value of 200, what is the *x* value for line AC?
   When *y* has a value of 200, the value of *x* on line AC is 200.
3. What are the coordinates of the intersection of lines AC and RS?
   The coordinates of the intersection of lines AC and RS are (300, 100).

2. How is the point of intersection affected by this shift (how do the coordinates of the intersection change)?

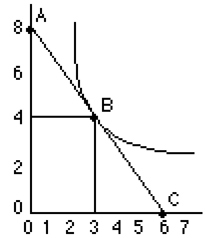
The initial point of intersection between lines S and R is at point D. After line S shifts from S_1 to S_2, the new point of intersection is point F. To determine how this shift affects the intersection, you should look at what happens to the values for the *x* and *y* coordinates.

- That the *x*-coordinate shifts from 5 to 4. The value of the ***x*-coordinate decreases.**
- The value of *y*-coordinate shifts from 1 to 2. The value of the ***y*-coordinate increases.**



Practice #16 Answer

Find the slope of the following curve at point B.

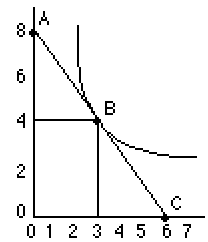


The slope at point B is:

$$\text{slope} = \frac{(0-8)}{(6-0)} = \frac{-8}{6} = -\frac{4}{3}$$

Practice #16 Detailed Answer

The straight line AC is tangent to the curve at point B. To calculate the slope of the curve at point B, you need to calculate the slope of line AC.



Step One: Identify two points on the line.
Two points are A (0, 8) and C (6, 0).

Step Two: Select one to be (x_1, y_1) and the other to be (x_2, y_2).
Let point A (0, 8) be (x_1, y_1).
Let point C (6, 0) be (x_2, y_2).

Step Three: Use the slope equation to calculate slope.
Using points A (0, 8) and B (6, 0), your calculations will look like:

$$\text{slope} = \frac{(0-8)}{(6-0)} = \frac{-8}{6} = -\frac{4}{3}$$

Algebra Operations Practice: Answers

Practice #1 Answer

$3 + 2 \cdot 8 - 4 = 15$

Practice #2 Answer

$(9 \cdot 3) + (5 - 2)^3 = 54$

Practice #3 Answer

$(5 + 7)^2 \cdot 4 \div 2 - 88 = 200$

Practice #4 Answer

$\{4\ [2\ (2 + 2)^3 \div 2]\} \div 2 = 128$

Practice #5 Answer

$3b^2 + 5b^2 \div 2b \cdot 8b - 4b = 23b^2 - 4b$

Practice #6 Answer

$(5rs + 7r) \cdot r(4 \div 2)^3 = 40r^2s + 56r^2$

Practice #7 Answer

$(9 \cdot x) \div (5x - 2y)x = 9/(5x - 2y)$

Practice #8 Answer

$\{2\ [15kz + (32k^2 \div 4k)^2\ ] - 30kz\} \div 8 = 16k^2$

Practice #1 Detailed Answer

When evaluating expressions, first consider the order of operations: PE[MD][AS].

$3 + 2 \cdot 8 - 4 = 15$

Work through the order of operations: P-Parentheses, E-Exponents, [M-Multiplication and D-Division], [A-Addition and S-Subtraction].	$3 + 2 \cdot 8 - 4 =$ $3 + 16 - 4 =$ $19 - 4 = 15$

Practice #2 Detailed Answer

$(9 \cdot 3) + (5 - 2)^3 = 54$

We have two different sets of parentheses. The expressions within each set of parentheses are evaluated first.	$(9 \cdot 3) + (5 - 2)^3 = (27) + (3)^3$
Now work through the exponents in the expression.	$27 + (3)^3 = 27 + 27$
Finally, we are left only with the operation of addition.	$27 + 27 = 54$

Practice #3 Detailed Answer

$(5 + 7)^2 \cdot 4 \div 2 - 88 = 200$

Evaluate the expression inside the parentheses. This is shown on the right.	$(5 + 7)^2 \cdot 4 \div 2 - 88 =$ $12^2 \cdot 4 \div 2 - 88$
Then evaluate the terms with exponents.	$12^2 \cdot 4 \div 2 - 88 =$ $144 \cdot 4 \div 2 - 88$
Once the parentheses and exponents are evaluated, we perform [MD][AS] in the appropriate order. This is shown on the right.	$144 \cdot 4 \div 2 - 88 =$ $576 \div 2 - 88 =$ $288 - 88 = 200$

Practice #4 Detailed Answer

$\{4\,[2\,(2 + 2)^3 \div 2]\} \div 2 = 128$

This expression has multiple sets of parentheses and brackets that group parts of the expression. For each set of grouping symbols, the order of operations holds.

Working from the inside out, we perform the order of operations on the inner set of parentheses, including the exponent operation associated with that set of parentheses.	$\{4\,[2\,(2 + 2)^3 \div 2]\} \div 2 =$ $\{4\,[2\,(4)^3 \div 2]\} \div 2 =$ $\{4\,[2\,(64) \div 2]\} \div 2=$
Now look at the inner set of brackets. Follow the order of operations to evaluate the expression contained in the brackets.	$\{4\,[128 \div 2]\} \div 2=$ $\{4\,[64]\} \div 2$
Now we have the final set of brackets to work with. In this case, there is only a multiplication to perform inside these braces.	$\{4\,[64]\} \div 2 =$ $\{256\} \div 2$
Now that there are no grouping symbols left, we perform the final operation.	$256 \div 2= 128$

Practice #5 Detailed Answer

$3b^2 + 5b^2 \div 2b \bullet 8b - 4b = 23b^2 - 4b$

Work through the order of operations: P-Parentheses, E-Exponents, M-Multiplication, D-Division, A-Addition, D-division.

There are no parentheses or exponents to perform, so we move on to the multiplication and division in this expression.	$3b^2 + 5b^2 \div 2b \bullet 8b - 4b =$ $3b^2 + 5b/2 \bullet 8b - 4b =$ $3b^2 + 20b^2 - 4b$
We are left with addition and subtraction. We add the two *like terms*, $3b^2$ and $20b^2$, but we cannot perform the subtraction since $23b^2$ and -4b are not *like terms*.	$3b^2 + 20b^2 - 4b =$ $23b^2 - 4b$

Practice #6 Detailed Answer

$\mathbf{(5rs + 7r) \bullet r(4 \div 2)^3 = 40r^2s + 56r^2}$

First, evaluate the expressions inside the parentheses. The first set of parentheses contains two terms to be added. Since these are not *like terms,* we cannot add them. But we can perform the indicated operations associated with the second set of parentheses. First divide 4 by 2, then perform the operation indicated by the exponent. Then multiply the result by the variable *r*.	$(5rs + 7r) \bullet r(4 \div 2)^3 =$ $(5rs + 7r) \bullet r(2)^3 =$ $(5rs + 7r) \bullet r8 =$ $(5rs + 7r) \bullet 8r$
By the distributive property, we multiply $8r$ through the parentheses.	$(5rs + 7r) \bullet 8r =$ $40r^2s + 56r^2$

Practice #7 Detailed Answer

$\mathbf{(9 \bullet x) \div (5x - 2y)x = 9/(5x - 2y)}$

First, we evaluate the expressions inside the parentheses. For the first parentheses, we perform the multiplication. The terms within the second set are not *like terms,* so they cannot be subtracted.	$(9 \bullet x) \div (5x - 2y)x =$ $9x \div (5x - 2y)x$
We could multiply *x* through this set of parentheses as per the distributive property. Notice, however, that we leave the parentheses in the equation. This is to be sure we are clear that 9 is divided by the entire expression in the parentheses.	$9x \div (5x - 2y)x =$ $9x \div x(5x - 2y) =$ $9/(5x - 2y)$

Practice #8 Detailed Answer

$\mathbf{\{2\ [15kz + (32k^2 \div 4k)^2] - 30kz\} \div 8 = 16k^2}$

This expression has multiple sets of parentheses, brackets and braces that group parts of the expression. We perform the order of operations from the inside out.

Begin with the inside set of parentheses. Then apply the exponent outside of the parentheses.	$\{2\ [15kz + \mathbf{(32k^2 \div 4k)^2}\ ] - 30kz\} \div 8 =$ $\{2\ [15kz + \mathbf{(8k)^2}\ ] - 30kz\} \div 8 =$ $\{2\ [15kz + \mathbf{64k^2}] - 30kz\} \div 8$

Now look at the brackets. Follow the order of operations within the brackets. Since the terms inside the brackets are not *like terms,* they cannot be added. Using the distributive property, multiply 2 through the equation.	$\{\mathbf{2\ [15}\boldsymbol{kz}\ \mathbf{+\ 64}\boldsymbol{k}^{\mathbf{2}}\mathbf{]} - 30kz\} \div 8 =$ $\{\mathbf{30}\boldsymbol{kz}\ \mathbf{+\ 128}\boldsymbol{k}^{\mathbf{2}} - 30kz\} \div 8$
If we look at the remaining braces, operations of addition and subtraction are left.	$\mathbf{\{30}\boldsymbol{kz}\ \mathbf{+\ 128}\boldsymbol{k}^{\mathbf{2}}\ \mathbf{-\ 30}\boldsymbol{kz}\mathbf{\}} \div 8 =$ $\mathbf{\{128}\boldsymbol{k}^{\mathbf{2}}\mathbf{\}} \div 8 =$ $\mathbf{128}\boldsymbol{k}^{\mathbf{2}} \div 8$
We are now left with an expression containing only one operation, division.	$128k^{2} \div 8 = 16k^{2}$

Algebra Solving Equations Practice: Answers

Practice #1 Answers

For each equation given, solve for the requested variable.

(1) $10 - 7 = x - 1$	$4 = x$
(2) $2z - 4 = 36 - 3z$	$z = 8$
(3) $4(x + 3) = 25 + 2 + x$	$x = 5$
(4) $\frac{4q + 5}{4} = 2(3q + 5)$	$-7/4 = q$

Practice #1 Detailed Answers

1. $10 - 7 = x - 1$ $\quad$ $4 = x$

1. **Combine like terms.**
On the left side of the equation, there are two numerical terms that we combine.

$$10 - 7 = x - 1$$
$$3 = x - 1$$

2. **Isolate the terms that contain the variable you wish to solve for.**
To isolate the x variable, we must add a 1 to both sides of the equation.

$$3 + 1 = x - 1 + 1$$
$$4 = x$$

3. **Isolate the variable you wish to solve for.**
The variable has a coefficient of 1 so it is already isolated. Our solution is $4 = x$.

$$4 = x$$

4. **Substitute your answer into the original equation and check that it works.**
Substitute 4 into the equation and show that the equality holds.

$$10 - 7 = x - 1$$
$$3 = 4 - 1$$
$$3 = 3$$

2. $2z - 4 = 36 - 3z$ $z = 8$

1**. Combine like terms.**
Combine the terms containing the variable z. Notice that $-3z$ is on the right side of the equation. We combine it with $2z$ on the left side of the equation by adding $-3z$ to both sides of the equation.

$$2z - 4 = 36 - 3z$$
$$2z - 4 + 3z = 36 - 3z + 3z$$
$$5z - 4 = 36$$

2. **Isolate the terms that contain the variable you wish to solve for.**
We want to get the term containing the variable by itself on one side of the equation. We do this by adding 4 to both sides.

$$5z - 4 + 4 = 36 + 4$$
$$5z = 40$$

3. **Isolate the variable you wish to solve for.**
Since z is multiplied by 5, we must divide both sides by 5 to isolate z.

$$5z \div 5 = 40 \div 5$$
$$z = 8$$

4. **Substitute your answer into the original equation and check that it works.**
When we substitute 8 for the variable z, we find that the equality holds.

$$2z - 4 = 36 - 3z$$
$$2(8) - 4 = 36 - 3(8)$$
$$16 - 4 = 36 - 24$$
$$12 = 12$$

3. $4(x + 3) = 25 + 2 + x$ $x = 5$

1. **Combine like terms.**
First, distribute 4 to both terms inside the parentheses. To combine like terms, x is subtracted from both sides. (Note that 25 was also added to 2.)

$$4(x + 3) = 25 + 2 + x$$
$$4x + 12 = 25 + 2 + x$$
$$4x + 12 - x = 27 + x - x$$
$$3x + 12 = 27$$

2. **Isolate the terms that contain the variable you wish to solve for.**
Subtract 12 from both sides to *isolate* the $3x$ term that contains the variable.

$$3x + 12 - 12 = 27 - 12$$
$$3x = 15$$

3. **Isolate the variable you wish to solve for.**
To isolate $3x$, divide both sides by 3.

$$3x = 15$$
$$x = 5$$

4. **Substitute your answer into the original equation and check that it works.**
When we substitute 5 for the variable x, we find that the equality holds. Our solution of $x = 5$ is correct.

$$4(x + 3) = 25 + 2 + x$$
$$4(5 + 3) = 25 + 2 + 5$$
$$4(8) = 32$$
$$32 = 32$$

4. $\frac{4q+5}{4} = 2(3q+5)$ **–7/4 = *q***

1. **Combine like terms.**
To combine like terms in this equation, first simplify the right side of the equation by distributing 2 into the parentheses. Then multiply both sides by 4. Combine like terms by subtracting 4*q* from both sides.

$$\frac{4q+5}{4} = 2(3q+5)$$
$$\frac{4q+5}{4} = 6q+10$$
$$\cancel{4} \bullet \frac{4q+5}{\cancel{4}} = 4(6q+10)$$
$$4q+5 = 24q+40$$
$$4q+5-4q = 24q+40-4q$$
$$5 = 20q+40$$

2. **Isolate the terms that contain the variable you wish to solve for.**
Subtract 40 from both sides to isolate the term containing the variable.

$$5 = 20q + 40 – 40$$
$$–35 = 20q$$

3. **Isolate the variable you wish to solve for.**
Isolate *q* by dividing both sides by 20. When we do this, we find *q* = –7/4.

$$–35 \div 20= 20q \div 20$$
$$–7/4 = q$$

4. **Substitute your answer into the original equation and check that it works.**
To check our solution, we must substitute –7/4 for *q*. We find the equality holds, so our solution is correct.

$$\frac{4q+5}{4} = 2(3q+5)$$
$$\frac{4(\frac{-7}{4})+5}{4} = 2(3(\frac{-7}{4})+5)$$
$$\frac{-7+5}{4} = 2(\frac{-21}{4}+5)$$
$$\frac{-2}{4} = \frac{-21}{2}+10$$
$$\frac{-1}{2} = \frac{-21}{2}+\frac{20}{2}$$
$$\frac{-1}{2} = \frac{-1}{2}$$

Practice #2 Answers

For each equation given, solve for the requested variable.

1. $9 = q - 5$ solution: $q = 14$
2. $3x + 5 = 25 - x$ solution: $x = 5$
3. $2(c + 4) = 3(2c - 13)$ solution: $c = 47/4 = 11\frac{3}{4}$

Practice #2 Detailed Answers

Solve each of the following for the requested variable.

1. $9 = q - 5$ $q = 14$

1. **Combine like terms.**
There is only one term with the variable q, so there is no need to combine terms.

$$9 = q - 5$$

2. **Isolate the terms that contain the variable you wish to solve for.**
Since 5 is subtracted from q, add 5 to both sides.

$$9 = q - 5$$
$$9 + 5 = q - 5 + 5$$
$$14 = q$$

3. **Isolate the variable you wish to solve for.**
The variable q has a coefficient of 1, so it is already isolated.

$$14 = q$$

4. **Substitute your answer into the original equation and check that it works.**
Substitute 14 for q into our original equation. When we do this, we find the equality holds. Our solution of 14 = q is correct.

$$9 = q - 5$$
$$9 = 14 - 5$$
$$9 = 9$$

2. $\mathbf{3x + 5 = 25 - x}$ $\mathbf{x = 5}$

1. **Combine like terms.**
There are two terms that contain the variable x. $3x$ is on the left side of the equation, and $-x$ is on the right side. To combine these, we add x to both sides.

$$3x + 5 = 25 - x$$
$$3x + 5 + x = 25 - x + x$$
$$4x + 5 = 25$$

2. **Isolate the terms that contain the variable you wish to solve for.**
To isolate the term with the variable, we subtract 5 from both sides.

$$4x + 5 - 5 = 25 - 5$$
$$4x = 20$$

3. **Isolate the variable you wish to solve for.**
Since x is multiplied by 4, we divide both sides by 4.

$$4x \div 4 = 20 \div 4$$
$$x = 5$$

4. **Substitute your answer into the original equation and check that it works.**
Substitute $x = 5$ into our original equation. When we do this, we find the equality holds.

$$3x + 5 = 25 - x$$
$$3(5) + 5 = 25 - 5$$
$$15 + 5 = 20$$
$$20 = 20$$

3. $\mathbf{2(c + 4) = 3(2c - 13)}$ $\mathbf{c = 47/4 = 11\frac{3}{4}}$

1. **Combine like terms.**
To combine the terms that contain the variables, we eliminate the parentheses to simplify both sides of the equation. Once we do this, we subtract $2c$ from both sides.

$$2(c + 4) = 3(2c - 13)$$
$$2c + 8 = 6c - 39$$
$$2c + 8 - 2c = 6c - 39 - 2c$$
$$8 = 4c - 39$$

2. **Isolate the terms that contain the variable you wish to solve for.**
Since 39 is subtracted from the term containing the variable, we add 39 to both sides of the equation.

$$8 + 39 = 4c - 39 + 39$$
$$47 = 4c$$

3. **Isolate the variable you wish to solve for.**
The variable c is multiplied by 4, so we isolate c by dividing both sides by 4. We find c is equal to 47/4, which is also $11\frac{3}{4}$.

$$47 \div 4 = 4c \div 4$$
$$47/4 = c$$
$$11\tfrac{3}{4} = c$$

4. **Substitute your answer into the original equation and check that it works.**
Substitute our solution into our original equation. After simplifying the expressions on both sides of the equation, we find that the equality holds.

$$2(c + 4) = 3(2c - 13)$$
$$2(47/4 + 4) = 3[2(47/4) - 13]$$
$$47/2 + 8 = 3[47/2 - 13]$$
$$23\tfrac{1}{2} + 8 = 3[23\tfrac{1}{2} - 13]$$
$$31\tfrac{1}{2} = 3[10\tfrac{1}{2}]$$
$$31\tfrac{1}{2} = 31\tfrac{1}{2}$$

Practice #3 Answers

1. $2a + 4b = 12$ $\quad\quad\quad\quad$ $a = 6 - 2b$
2. $6x^2y = z + 7x^2y$ $\quad\quad\quad\quad$ $y = -z/x^2$
3. $3cz + c = 9cz + 5$ $\quad\quad\quad\quad$ $c = 5/(1 - 6z)$

Practice #3 Detailed Answers

1. $2a + 4b = 12$ Solve this equation for a.

1. **Combine like terms.**
There is only one term for each variable, so this step is done.

$$2a + 4b = 12$$

2. **Isolate the terms that contain the variable you wish to solve for.**
Since we are solving for the variable a, we need to isolate the term $2a$. This means we subtract $4b$ from both sides.

$$2a + 4b - 4b = 12 - 4b$$
$$2a = 12 - 4b$$

3. **Isolate the variable you wish to solve for.**
To isolate the variable a, divide by 2.

$$2a \div 2 = (12 - 4b) \div 2$$
$$a = 6 - 2b$$

4. **Substitute your answer into the original equation and check that it works.**
The entire expression $6 - 2b$ must be substituted for the variable a in our original equation. When we do this, we find the equality is true.

$$2a + 4b = 12$$
$$2(6 - 2\mathrm{b}) + 4b = 12$$
$$12 - 4b + 4b = 12$$
$$12 = 12$$

2. $6x^2y = z + 7x^2y$ Solve this equation for y.

1. **Combine like terms.**
We are solving for y, so we want to get all terms containing y together. To do this, we subtract $7x^2y$ from both sides of the equation.

$$6x^2y = z + 7x^2y$$
$$6x^2y - 7x^2y = z + 7x^2y - 7x^2y$$
$$-x^2y = z$$

2. **Isolate the terms that contain the variable you wish to solve for.**
The term containing y is already isolated.

$$-x^2y = z$$

3. **Isolate the variable you wish to solve for.**
The variable y is multiplied by x^2. To isolate y, we divide by x^2.

$$-x^2y \div -x^2 = z \div -x^2$$
$$y = -z/x^2$$

4. **Substitute your answer into the original equation and check that it works.**
Now we substitute $-z/x^2$ into our original equation. Then we simplify the expressions on both sides of the equation to see if the equality holds.

$$6x^2y = z + 7x^2y$$
$$6x^2\frac{-z}{x^2} = z + 7x^2\frac{-z}{x^2}$$
$$6(-z) = z + 7(-z)$$
$$-6z = z - 7z$$
$$-6z = -6z$$

3. $3cz + c = 9cz + 5$ Solve this equation for c.

1. **Combine like terms.**

$$3cz + c = 9cz + 5$$
$$3cz + c - 9cz = 9cz + 5 - 9cz$$
$$c - 6cz = 5$$

2. **Isolate the terms that contain the variable you wish to solve for.**
The terms containing the variable c are already on one side of the equation.

$$c - 6cz = 5$$

3. **Isolate the variable you wish to solve for.**
To isolate c, first use the distributive property to pull c from both terms on the left side of the equation. Then divide both sides of the equation by the expression $(1 - 6z)$.

$$c - 6cz = 5$$
$$c\,(1 - 6z) \div (1 - 6z) = 5 \div (1 - 6z)$$
$$c = 5/(1 - 6z)$$

4. **Substitute your answer into the original equation and check that it works.**
Substitute the expression $c = 5/(1 - 6z)$ for c into our original equation. Simplify both sides of the equation to check that the equality holds.

$$3cz + c = 9cz + 5$$
$$3\frac{5}{1-6z}z + \frac{5}{1-6z} = 9\frac{5}{1-6z}z + 5$$
$$\frac{15}{1-6z}z + \frac{5}{1-6z} = \frac{45z}{1-6z} + 5$$
$$(1-6z)\left(\frac{15z}{1-6z} + \frac{5}{1-6z}\right) = (1-6z)\left(\frac{45z}{1-6z} + 5\right)$$
$$15z + 5 = 45z + (1-6z)5$$
$$15z + 5 = 45z + 5 - 30z$$
$$15z + 5 = 15z + 5$$

Practice #4 Answers

1. $3xy + 3z = 3$ — *solution:* $z = 1 - xy$
2. $11ab – 3b = 2ab$ — *solution:* $a = 1/3$
3. $10kpq – q = 2kp + 3q$ — *solution:* $q = kp/(5kp - 2)$

Practice #4 Detailed Answers

1. $3xy + 3z = 3$ Solve this equation for z.

1. **Combine like terms.**
There is only one term for each variable, so this step is done.

$$3xy + 3z = 3$$

2**. Isolate the terms that contain the variable you wish to solve for.**
Because we are solving for the variable z, we isolate the term $3z$. This means we should subtract $3xy$ from both sides.

$$3xy + 3z – 3xy = 3 – 3xy$$
$$3z = 3 – 3xy$$

3. **Isolate the variable you wish to solve for.**
To isolate the variable, divide by 3. When dividing the expression $3 – 3xy$, we must be sure to divide each term in the expression by 3.

$$3z \div 3= (3 – 3xy) \div 3$$
$$z = (3 \div 3)– (3xy \div 3)$$
$$z = 1 – xy$$

4. **Substitute your answer into the original equation and check that it works.**
The entire expression $1 – xy$ must be substituted for the variable z in our original equation. After simplifying the expression on the left side of the equation, we find the equality is true. Our solution is correct.

$$3xy + 3z = 3$$
$$3xy + 3(1 – xy) = 3$$
$$3xy + 3 – 3xy = 3$$

2. $11ab – 3b = 2ab$ Solve this equation for a.

1. **Combine like terms.**
We are solving for a, so we need to get all the terms containing a together. To do this, we can subtract $11ab$ on both sides of the equation.

$$11ab – 3b – 11ab = 2ab – 11ab$$
$$– 3b = –9ab$$

2. **Isolate the terms that contain the variable you wish to solve for.**
The term with the variable a is isolated, so we move on to the next step.

$$– 3b = –9ab$$

3. **Isolate the variable you wish to solve for.**
The variable *a* is multiplied by –9 and the variable *b*. To isolate *a*, we divide both sides by –9*b*.

$$-3b \div -9b = -9ab \div -9b$$
$$1/3 = a$$

4. **Substitute your answer into the original equation and check that it works.**

$$11ab - 3b = 2ab$$
$$11(1/3)b - 3b = 2(1/3)b$$
$$11b/3 - 3b = 2b/3$$
$$2b/3 = 2b/3$$

3. $10kpq - q = 2kp + 3q$ Solve this equation for *q*.

1. **Combine like terms.**
Three terms contain the variable *q*: $10kpq$, $-q$, and $3q$. First, get all terms containing *q* on one side of the equation. We do this by subtracting $3q$ from both sides. The $-q$ and $3q$ are like terms.

$$10kpq - q - 3q = 2kp + 3q - 3q$$
$$10kpq - 4q = 2kp$$

2. **Isolate the terms that contain the variable you wish to solve for.**
In the last step, we chose to subtract $3q$ from both sides. This left us with all the terms that contain *q* isolated on the left side of the equation.

$$10kpq - 4q = 2kp$$

3. **Isolate the variable you wish to solve for.**
To isolate *q*, we factor it out of all terms on the left side of the equation. We do this using the distributive property. Then divide both sides by $10kp - 4$.

$$q(10kp - 4) = 2kp$$
$$q(10kp - 4) \div (10kp - 4) = 2kp \div (10kp - 4)$$
$$q = \cancel{2}kp/\cancel{2}(5kp - 2)$$

$$q = kp/(5kp - 2)$$

4. **Substitute your answer into the original equation and check that it works.**

$$10kp\left(\frac{kp}{5kp-2}\right) - \left(\frac{kp}{5kp-2}\right) = 2kp + 3\left(\frac{kp}{5kp-2}\right)$$

After simplifying both sides of the equation, we see that the equality does hold. Our solution of $q = kp/(5kp - 2)$ is correct.

$$\frac{10k^2p^2 - kp}{5kp-2} = 2kp\left(\frac{5kp-2}{5kp-2}\right) + 3\left(\frac{kp}{5kp-2}\right)$$
$$\frac{10k^2p^2 - kp}{5kp-2} = \left(\frac{10k^2p^2 - 4kp}{5kp-2}\right) + \left(\frac{3kp}{5kp-2}\right)$$
$$\frac{10k^2p^2 - kp}{5kp-2} = \frac{10k^2p^2 - kp}{5kp-2}$$

Practice #5 Answers

Q1. At what value of their sales, x, will the income for both options be the same? Salespersons will get paid $\boldsymbol{y}$ **= $525** when they make $\boldsymbol{x}$ **= $3750** in sales.

Q2. The point where the cost of ice cream will be equal to the cost of using The Great American Treehouse is: $\boldsymbol{x}$ **= 26** people.
At this point, the cost for either will be $\boldsymbol{y}$ **= $ 102.96**

Practice #5 Detailed Answers

Q1. Salesmen at Northern Castings pay for supplies under one of two payment plans.

Payment Plan Option I: $300 base salary per month and 6% commission on sales made. If x is the amount of sales, the amount of monthly pay earned, y, is given by the equation $y_I = 300 + 0.06x$.

Payment Plan Option II: Base pay of $150 and 10% commission on sales made. If x is the amount of sales, the amount of monthly pay earned, y, is given by the equation $y_{II} = 150 + 0.10x$.

At what value of their sales, x, will the income for both options be the same, $y_I = y_{II} = y$? The two equations are:

$$y = 300 + 0.06x$$

$$y = 150 + 0.10x$$

Substitution

1. Choose one equation and isolate one variable; this equation will be considered the first equation.

The variable y is already isolated in both equations, so this is done. For the purposes of solving this problem, we select y = 150 + 0.10x as the first equation.

2. Substitute the solution from step 1 into the second equation and solve for the variable in the equation.

Because both equations give the variable y as equal to an expression containing x, set these two equal to each other. Solve the resulting equation for the variable x.	Substitute y = 150 + 0.10x into y = 300 + 0.06x 150 + 0.10x = 300 + 0.06x
Isolate all terms containing the variable x on one side of the equation. We use addition and subtraction to do this.	300 + 0.06x - 150 = 150 + 0.10x - 150 150 + 0.06x - 0.06x = 0.10x - 0.06x 150 = 0.04x

Use division to solve for the value of x	$150/0.04 = 0.04x /0.04$ $x = 3750$

3. Using the value found in step 2, substitute it into the first equation and solve for the second variable.

Now that we've found a numerical value for x, we substitute the value for x into the first equation and solve for the numerical value of y.	$y = 150 + 0.10x$ and $x = 3750$ $y = 150 + 0.10 (3750)$ $y = 150 + 375$ $y = 525$

4. Substitute the values for both variables into both equations to show they are correct.

Substitute the value of $x = 3750$ and $y = 525$ into both of our original equations.	$y = 300 + 0.06x$ $525= 300 + 0.06(3750)$ $525 = 300 + 225$ $525 = 525$ $y = 150 + 0.10x$ $525 = 150 + 0.10(3750)$ $525 = 150 + 375$ $525 = 525$

Addition/Subtraction Method

1. Algebraically manipulate both equations so that all the variables are on one side of the equal sign and in the same order. (Line the equations up, one on top of the other.)

The system of equations was given as $y = 300 + 0.06x$ and $y = 150 + 0.10x$. We manipulate each equation to get the variables on one side of the equation.	$y = 300 + 0.06x$ $y - 0.06x = 300 + 0.06x - 0.06x$ $y - 0.06x = 300$ $y = 150 + 0.10x$ $y - 0.10x = 150 + 0.10x - 0.10x$ $y - 0.10x = 150$

2. If needed, multiply one of the equations by a constant so that there is one variable in each equation that has the same coefficient.

Both equations have a y variable with the	$y - 0.06x = 300$

coefficient of one. $y - 0.10x = 150$

3. Subtract one equation from the other.

When we subtract one equation from the other, we subtract each of the like terms from one another.

$$
\begin{array}{l}
\quad y - 0.06x = 300 \\
-\,(y - 0.10x = 150) \\
\hline
0.04x = 150
\end{array}
$$

4. Solve the resulting equation for the one variable.

Isolate x in the equation from step 3.

$0.04x/0.04 = 150/0.04$
$x = 3750$

5. Using the value found in the step 4, substitute it into either equation and solve for the remaining variable.

Now we take the value x = 3750 and substitute it into one of our equations and solve for y.

$y = 300 + 0.06x$
$y = 300 + 0.06(3750)$
$y = 300 + 225$
$y = 525$

6. Substitute the values for both variables into the equation not used in step 5 to be sure our solution is correct.

Now we substitute the values x = 3750 and y = 525 into the equation not used in step 5 and show that the equality holds.

$y = 150 + 0.10x$
$525 = 150 + 0.10(3750)$
$525 = 150 + 375$
$525 = 525$

Q2. The Great American Treehouse is a place that holds parties. The base cost for a party is $69.96 for up to 15 people, then $3 for each additional person over 15 people. For parties over 15 people, the cost of a party (in dollars) at The Great American Treehouse is given by the following equation, where *y* is the total cost, and *x* is the number of people attending the party. $y = 69.96 + 3\,(x - 15)$

If you wish to purchase ice cream for the party from Chunk's Ice Cream Parlor, you can purchase unlimited amounts of ice cream at a cost of $3.96 per person. The cost of ice cream is given by the following equation, where *y* is the total cost and *x* is the number of persons. $y = 3.96x$

Solve this system of equations. Find both the cost and number of people for whom the cost of ice cream will be equal to the cost of using The Great American Treehouse.

Substitution

1. Choose one equation and isolate one variable; this equation will be considered the first equation.

The variable y is already solved for in both equations, so this is done. For the purpose of solving this problem, we identify $y = 3.96x$ as the first equation.

2. Substitute the solution from step 1 into the second equation and solve for the variable in the equation.

Since both equations give the variable y as equal to an expression containing x, we set these two equal to each other. Now we solve the resulting equation for the variable x.	Substitute $y = 3.96x$ into $y = 69.96 + 3(x - 15)$ $3.96x = 69.96 + 3(x - 15)$
Isolate all terms containing the variable x on one side of the equation. Follow the order of operations to simplify both sides. Solve for x.	$3.96x = 69.96 + 3(x - 15)$ $3.96x = 69.96 + 3x - 45$ $3.96x - 3x = 24.96 + 3x - 3x$ $0.96x /0.96 = 24.96/0.96$ $x = 26$

3. Using the value found in step 2, substitute it into the first equation and solve for the second variable.

Now that we've found a numerical value for x, we substitute the value for x into the first equation and solve for the numerical value of y.	$y = 3.96x$ $y = 3.96(26)$ $y = 102.96$

4. Substitute the values for both variables into both equations to show they are correct.

Now we substitute $x = 26$ and $y = 102.96$ into our equations to check that this solution is correct. When we do this, we find that the equalities hold, Our solution	$y = 3.96x$ $102.96 = 3.96(26)$ $102.96 = 102.96$

is correct.	$y = 69.96 + 3(x - 15)$ $102.96 = 69.96 + 3(26 - 15)$ $102.96 = 69.96 + 3(11)$ $102.96 = 69.96 + 33$ $102.96 = 102.96$

Addition/Subtraction Method

1. Algebraically manipulate both equations so that all the variables are on one side of the equal sign and in the same order. (Line the equations up, one on top of the other.)

The system of equations was given as $y = 69.96 + 3(x - 15)$ and $y = 3.96x$. Manipulate each equation to get the variables on one side of the equation.	$y = 69.96 + 3(x - 15)$ $y = 69.96 + 3x - 45$ $y = 24.96 + 3x$ $y - 3x = 24.96 + 3x - 3x$ $y - 3x = 24.96$ $y - 3.96x = 3.96x - 3.96x$ $y - 3.96x = 0$
Line the two equations up on top of each other.	$y - 3x = 24.96$ $y - 3.96x = 0$

2. If needed, multiply one of the equations by a constant so that there is one variable in each equation that has the same coefficient.

In both equations, the variable y has a coefficient of 1.	$y - 3x = 24.96$ $y - 3.96x = 0$

3. Subtract one equation from the other.

Subtract the bottom equation from the top one. Keep in mind this means subtracting each term from the one above it.	$y - 3x = 24.96$ $-(y - 3.96x = 0)$ ――――――――― $0.96x = 24.96$

4. Solve the resulting equation for the one variable.

To isolate the x variable, divide both sides by 0.96.	$0.96x / 0.96 = 24.96/0.96$ $x = 26$

5. Using the value found in step 4, substitute it into either equation and solve for the remaining variable.

Substitute the value for x into either one of the equations and solve for the numerical value of y.	$y = 3.96x$ and $x = 26$ $y = 3.96\,(26)$ $y = 102.96$

6. Substitute the values for both variables into the equation not used in step 5 to be sure our solution is correct.

We've found that $26 = x$ and $y = 102.96$. We now substitute both of these into the equation: $y = 69.96 + 3(x - 15)$.	$y = 69.96 + 3(x - 15)$ $102.96 = 69.96 + 3(26 - 15)$ $102.96 = 69.96 + 3(11)$ $102.96 = 69.96 + 33$ $102.96 = 102.96$

Practice #6 Answer

The amount of time they both traveled is: $t = 2.5$ hours.

The distance John traveled is: $D = 100$ miles.

Practice #6 Detailed Answer

Substitution

1. Choose one equation and isolate one variable; this equation will be considered the first equation.

The variable D is already isolated in the equation $40t = D$, so this is done. We will use this as our first equation.

2. Substitute the solution from step 1 into the second equation and solve for the variable in the equation.

We take the value of D from our first equation and substitute it into the second	Substitute: $D = 40t$ into $30t = D - 25$ $30t = 40t - 25$

equation.

Solve for the variable *t* in the equation.

30t - 40t = 40t - 40t - 25
- 10t¸ -10 = -25 ¸ -10
t = 2.5

3. Using the value found in step 2, substitute it into the first equation and solve for the second variable.

Now that we've found a numerical value for *t*, we substitute the value for *t* into the first equation and solve for the numerical value of D.

40t = D and t = 2.5
40 (2.5) = D
100 = D

4. Substitute the values for both variables into both equations to show they are correct.

Substitute the value of t = 2.5 and D = 100 into both of our original equations.

40t = D
40(2.5) = 100
100 = 100

30t = D - 25
30(2.5) = 100 - 25
75 = 75

Addition/Subtraction Method

1. Algebraically manipulate both equations so that all the variables are on one side of the equal sign and in the same order.

The system of equations was given as 40t = D and 30t = D - 25. Manipulate each equation to get the variables on one side of the equation.

40t = D
40t - D = D - D
40t - D = 0

30t = D - 25
30t - D = D - 25 - D
30t - D = -25

2. If needed, multiply one of the equations by a constant so that there is one variable in each equation that has the same coefficient.

The coefficient of D in both equations is the same. This means we subtract the two equations to eliminate D.

$$40t - D = 0$$
$$30t - D = -25$$

3. Subtract one equation from the other.

When we subtract one equation from the other, we subtract each of the like terms from one another.

$$40t - D = 0$$
$$-\ (30t - D = -25)$$

$$10t = 25$$

4. Solve the resulting equation for the one variable.

Isolate t in the equation from step 3.

$$10t\ /10 = 25\ /10$$
$$t = 2.5$$

5. Using the value found in the step 4, substitute it into either equation and solve for the remaining variable.

Take the value $t = 2.5$ and substitute it into one of our equations. Solve for D.

$$40t = D$$
$$40(2.5) = D$$
$$100 = D$$

6. Substitute the values for both variables into the equation not used in step 5 to be sure our solution is correct.

We substitute the values $t = 2.5$ and $D = 100$ into the equation not used in step 5 and show that the equality holds.

$$30t = D - 25$$
$$30(2.5) = 100 - 25$$
$$75 = 75$$

Practice #7 Answer

Enola has time to read about 50 pages of a novel a day. Write an expression for the approximate number of days it will take her to read a novel that is *p* pages long. How long will it take Enola to read the 1083-page novel *Chesapeake* by James Michener?

The first sentence of the problem gives us all the information we need. If Enola reads 50 pages per day, then we can say that it takes Enola about $\frac{p}{50}$ days to read a novel *p* pages long.

When $p = 1083$, then we substitute our value for *p* in the above expression to determine how long it will take to read the Michener novel:

$$\frac{p}{50} = \frac{1083}{50} = 21.66 \text{ days}$$

It will take Enola about 22 days to read *Chesapeake.*

Practice #8 Answer

Copies cost $0.05 each, and there is a service fee of $1.00. Write an equation for this relationship, and be sure to define your variables. Which variable is dependent upon the other?
Let x represent the number of copies, and let y represent the total cost. Then,

$$y = 0.05x + 1$$

Y is dependent on x. If more copies are made, then the total cost will increase.

Practice #9 Answer

In your Intro to Policy class, there are half as many men as there are women. Write an equation for this relationship, and be sure to define your variables.

Let x represent the number of women and y represent the number of men. Then,

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

Practice #10 Answer

When Bryant leaves town, he has to take his cat Smokey to a kennel. The cost of the kennel is $7 per day. He always has them give Smokey one flea bath that costs $18.

a) Write an equation that represents the relationship.
b) When Bryant left Smokey at the kennel in July, the total cost was $46. Write an equation that can be solved to find how many days the cat stayed at the kennel, and solve.

a) If c = total cost and d = number of days, then
$c = 7d + 18$, where c is dependent upon d.

b) We are given that $c = 46$. Then,
$46 = 7d + 18$
$7d = 46-18 = 28$
$d = 28/7 = 4$

The cat stayed 4 days at the kennel.