$\qquad$
$\qquad$
$\qquad$

## Short Answer

Write a verbal expression for the algebraic expression.

1. $12 x$
2. $\frac{3}{5}+2$

Identify the hypothesis and conclusion of the statement. Then write the statement in if-then form.
3. Squares have four sides.

Find a counterexample for the statement.
4. If $3 x-1 \leq 8$, then $x<3$.

Name the sets of numbers to which each number belongs.
5. $-\sqrt{1}$

The following table shows the monthly charges for subscribing to the local newspaper.

| Number of <br> Months | 1 | 2 | 3 | 4 | 5 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Total Cost (\$) | 15.25 | 30.50 | 45.75 | 61.00 | 76.25 |

6. Draw a graph of the data in the newspaper subscription table.

Translate the equation into a verbal sentence.
7. $m^{3}+24=47-n$
8. $4 x=8 x-y$
9. $x+6=y \div 3$

Solve the equation. Then check your solution.
10. $-\frac{2}{5}+a=\frac{1}{5}$
11. $\frac{4}{5}+x=\frac{3}{7}$
12. $\frac{v}{7}=3$
13. $1.6 a=-9.12$

Solve the equation or formula for the variable specified.
14. $d f+10 h=3$ for $d$

Two trains leave Chicago at the same time, one traveling east and the other traveling west. The eastbound train travels at 50 miles per hour, and the westbound train travels at 40 miles per hour. Let $t$ represent the amount of time since their departure.

|  | $r$ | $t$ | $d=r t$ |
| :---: | :---: | :---: | :---: |
| Eastbound Train |  |  |  |
| Westbound Train |  |  |  |

15. Write an equation that could be used to determine when the trains will be 405 miles apart.

Fumiko and Kenji leave home at the same time, traveling in opposite directions. Fumiko drives 50 miles per hour, and Kenji drives 55 miles per hour.

|  | $r$ | $t$ | $d=r t$ |
| :---: | :---: | :---: | :---: |
| Fumiko |  |  |  |
| Kenji |  |  |  |

16. Complete the table representing the situation.

Ye Olde Coffee Shop sells Colombian Coffee for $\$ 9.25$ per pound. Brazilian Coffee sells for $\$ 7.75$ per pound. The management wishes to mix 6 pounds of Colombian Coffee with an amount of Brazilian Coffee so that the mixture sells for $\$ 8.25$ per pound.

|  | Pounds | Price per Pound | Total Price |
| :---: | :--- | :--- | :--- |
| Columbian |  |  |  |
| Brazilian |  |  |  |
| Mixture |  |  |  |

17. How many pounds of Brazilian Coffee should be mixed with 6 pounds of Colombian Coffee to get the desired mixture?

Express each relation as a graph and a table. Then determine the domain and range.
18. $\{(4,0),(3,2),(3,0),(-3,-2),(4,-1)\}$

Determine whether the sequence is an arithmetic sequence. If it is, state the common difference.
19. $5,0,-5,-10, \ldots$
20. $2.6,4.2,3.1,2.4, \ldots$

Write a direct variation equation that relates the variables. Then graph the equation.
21. The total cost is $C$ for $n$ bags of peanuts priced at $\$ 2.98$ per bag.

Write an equation of the line that passes through the pair of points.
22. $(-5,-2),(3,-1)$

Determine whether the graph shows a positive correlation, a negative correlation, or no correlation. If there is a positive or negative correlation, describe its meaning in the situation.
23.


Source: National Center for Health Statistics, U.S.
Dept. of Health and Human Services

24. Use the scatter plot that shows the number of quarts of strawberries picked each hour. Use the points (1, $73)$ and $(8,41)$ to write the slope-intercept form of an equation for the line of fit shown in the scatter plot.

Write the slope-intercept form of an equation that passes through the given point and is perpendicular to the graph of the equation.
25. (2, 2), $y=-\frac{1}{5} x+5$
26. Lisa earns $\$ 7.15$ per hour working after school. She needs at least $\$ 235$ to buy a stereo system. Write and solve an inequality to find the minimum number of hours she must work to buy the stereo.

Henry performed an experiment with three graduated cylinders filled with different amounts of water. He measured the volume of the three cylinders. Then he added a red marble in the first cylinder, a yellow marble in the second cylinder, and a white marble in the third cylinder. He again measured the volume of the three cylinders. His measurements are shown in the table below.

| Volume of Graduated Cylinders |  |  |
| :---: | :---: | :---: |
| Cylinder | Volume Before <br> Adding the Marble <br> (cc) | Volume After <br> Adding the Marble <br> (cc) |
| Cylinder 1 | 3.5 | 4.1 |
| Cylinder 2 | 2.5 | 3.5 |
| Cylinder 3 | 2.8 | 3.0 |

27. Write an expression that could be used to determine the increase in volume of the three cylinders if 40 red marbles, 55 yellow marbles, and 50 white marbles are added to the cylinders respectively. Evaluate the expression, indicating the property used in each step.
28. Write an algebraic expression for one-fourth the sum of $2 x$ and $8 y$ decreased by half $x$. Then simplify, indicating the properties used.

Solve each problem.
29. A square has an area of 49 units $^{2}$. Find the side length and perimeter of the square.
30. A monthly phone bill consists of a $\$ 23$ flat fee plus $\$ 0.13$ per minute in call charges. Use the graph to find the total amount paid for 100 minutes of calls in one month.
31. A potted tree weighs 21 pounds. The pot weighs 3 pounds. If $w$ represents the weight of the tree without the pot, write an equation to find the weight of the tree without the pot.
32. Jack's school is 20 miles from his house. He has already traveled 13 miles. If $d$ represents the distance he still needs to travel to reach his school, write an equation to represent this situation. Then use this equation to find the distance Jack still needs to travel to reach his destination.
33. At a certain gas station, gas costs $\$ 2.85$ a gallon. Jason paid $\$ 25.50$ to fill his tank. Write and solve an equation to find how many gallons of gas he bought?
34. In Madison, mail carriers deliver an average of 450 pieces of mail each day. Write and solve an equation to find the number of days required to deliver 5850 pieces of mail.
35. The table shows the ratings of two popular television shows and the rate at which their popularity is increasing. How long will it take the two shows to reach the same viewership?

| Television Show | Viewer <br> (millions) | Increase in Viewers <br> Every Year (millions) |
| :---: | :---: | :---: |
| $A$ | 3.2 | 0.75 |
| $B$ | 435 | 0.35 |

36. Mr. Jones surveyed a group of college students. He noticed in a sample of 36 students, thirty students went hiking on their summer vacations. If there were 758 students in the college, about how many students went hiking?
37. In a purse containing only nickels and dimes, four out of every five coins is a nickel. If there are 25 coins altogether, how many nickels are there?

Write an equation and solve for the variable specified.
38. Twelve more than a number, $s$, equals another number, $p$, minus 4 . Solve for $s$.
39. An alloy of metals is $40 \%$ iron. Another alloy is $35 \%$ iron. How much of each should be mixed to make 500 grams of an alloy that is $38 \%$ iron?

Express the relation shown in each table, mapping, or graph as a set of ordered pairs. Then write the inverse of the relation.
40.

41. A car rental is given by $R=0.17 m+34$, where $m$ is the number of miles driven. Write the equation in function notation and then find $f(250), f(450)$, and $f(800)$.
42. Find the $x$ - and $y$-intercepts of the graph of $\frac{5}{4} x+\frac{3}{2} y=9$.
43. What is the difference between proportional and nonproportional relationships?
44. A country paid $\$ 541$ million in interest on its national debt in 1940 and $\$ 1291$ million in 1970. What was the annual rate of change from 1940 to 1970? Explain the meaning of the rate of change.
45. The table below shows the calories Christie burned by dancing.

| Time (min) | 10 | 15 | 20 | 25 | 30 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Calories | 72 | 81 | 95 | 140 | 158 |

Make a broken line graph of the data. Use the graph to determine in which time period Christie burned the most calories. Explain your reasoning.

Suppose $y$ varies directly as $x$. Write a direct variation equation that relates $x$ and $y$. Then solve.
46. If $y=8$ when $x=6$, find $y$ when $x=9$.
47. If $y=35$ when $x=14$, find $y$ when $x=41$.
48. The cost of admission to an amusement park is $\$ 9.50$ plus $\$ 1.50$ per ride. Write a linear equation in slope-intercept form for the amount spent if $r$ rides are taken.
49. The table below shows the time in hours an investor spent researching the stock market each week and the percent gain on investments.

| Time (h) | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Gain (\%) | 23 | 35 | 36 | 41 | 44 | 55 | 47 | 45 |

Make a scatter plot and draw a line of fit for the data.
50. Determine whether $y=4 x+5$ and $y=\frac{1}{4} x-2$ are perpendicular. Explain.

## Answer Section

## SHORT ANSWER

1. ANS:
the product of 12 and $x$
Translate the algebraic expression into a verbal expression using key operation words.
PTS: 1 DIF: Basic REF: Lesson 1-1
OBJ: 1-1.2 Write verbal expressions for mathematical expressions.
NAT: NA $1 \mid$ NA $3 \mid$ NA $9 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 8A. $9 \mid$ IL I 8A
TOP: Write verbal expressions for mathematical expressions
KEY: Write Expressions | Verbal Expressions
2. ANS:
the sum of three-fifths and two
Translate the algebraic expression into a verbal expression using key operation words.
PTS: 1 DIF: Basic REF: Lesson 1-1
OBJ: 1-1.2 Write verbal expressions for mathematical expressions.
NAT: NA $1 \mid$ NA $3 \mid$ NA $9 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 8A. $9 \mid$ IL I 8A
TOP: Write verbal expressions for mathematical expressions
KEY: Write Expressions | Verbal Expressions
3. ANS:

H : a figure is a square
C: the figure has four sides
If a figure is a square, then the figure has four sides.
The hypothesis is the part of the conditional following the word if, and the conclusion is the part of the conditional following the word then.

PTS: 1 DIF: Average REF: Lesson 1-7
OBJ: 1-7.1 Identify the hypothesis and conclusion in a conditional statement.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 6B | IL I 8A.6 | IL I 8A
TOP: Identify the hypothesis and conclusion in a conditional statement
KEY: Conditional Statements | Hypothesis | Conclusion
4. ANS:
$x=3$
A counterexample is a specific case in which a statement is false. It takes only one counterexample to show that a statement is false.

PTS: 1 DIF: Average REF: Lesson 1-7
OBJ: 1-7.2 Use a counterexample to show that an assertion is false.
NAT: NA $6 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid N A 7$
TOP: Use a counterexample to show that an assertion is false
KEY: Counterexample | Deductive Reasoning
5. ANS:

Real, rational, and integer
The real numbers can be divided into rational numbers and irrational numbers. Rational numbers can be expressed as fractions and includes natural numbers, whole numbers, and integers. Irrational numbers cannot be expressed as fractions.

PTS: 1 DIF: Average REF: Lesson 1-8 OBJ: 1-8.1 Classify real numbers.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 6
STA: IL I 6B. $2 \mid$ IL I 6C | IL I 6C.1 | IL I 6B TOP: Classify real numbers
KEY: Real Numbers | Classifying
6. ANS:


The $x$-coordinate is graphed on the horizontal axis, and the $y$-coordinate is graphed on the vertical axis.

PTS: 1 DIF: Basic REF: Lesson 1-9 OBJ: 1-9.2 Draw graphs of functions.
NAT: NA $1 \mid$ NA $6 \mid$ NA $8 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 8B. $10 \mid$ IL I 8B
TOP: Draw graphs of functions KEY: Graphs | Functions
7. ANS:
$m$ cubed plus 24 is equal to 47 minus $n$.
Using key words for operations, translate the equation into a number sentence.

PTS: 1 DIF: Basic REF: Lesson 2-1
OBJ: 2-1.2 Translate equations into verbal sentences.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 2
TOP: Translate equations into verbal sentences
STA: IL I 8A. $2 \mid$ IL I 8A
8. ANS:

Four times $x$ equals eight times $x$ minus $y$.
Using key words for operations, translate the equation into a number sentence.

PTS: 1
DIF: Basic
REF: Lesson 2-1
OBJ: 2-1.2 Translate equations into verbal sentences.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 2
TOP: Translate equations into verbal sentences
STA: IL I 8A. 2 | IL I 8A
KEY: Equations | Verbal Sentences
9. ANS:

The sum of $x$ and six is equal to $y$ divided by three.
Using key words for operations, translate the equation into a number sentence.

PTS: 1 DIF: Basic REF: Lesson 2-1
OBJ: 2-1.2 Translate equations into verbal sentences.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 2
TOP: Translate equations into verbal sentences

STA: IL I 8A. $2 \mid$ IL I 8A
KEY: Equations | Verbal Sentences
10. ANS:
$\frac{3}{5}$
To solve an equation means to find all the values of the variable that make the equation a true statement. One way to do this is to isolate the variable on one side of the equation. You can sometimes do this by adding the same number to both sides of the equation.

PTS: 1 DIF: Average REF: Lesson 2-2
OBJ: 2-2.2 Solve equations with fractions by using addition.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 2
STA: IL I 8D. $1 \mid$ IL I 8D
TOP: Solve equations with fractions by using addition
KEY: Solve Equations | Addition | Fractions
11. ANS:
$-\frac{13}{35}$
To solve an equation means to find all the values of the variable that make the equation a true statement. One way to do this is to isolate the variable on one side of the equation. You can sometimes do this by subtracting the same number from both sides of the equation.

PTS: 1 DIF: Average REF: Lesson 2-2
OBJ: 2-2.5 Solve equations with fractions by using subtraction.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 2
STA: IL I 8D. $1 \mid$ IL I 8D
TOP: Solve equations with fractions by using subtraction
KEY: Solve Equations | Subtraction | Fractions
12. ANS:

21
If an equation is true and each side is multiplied by the same number, the resulting equation is true.

PTS: 1 DIF: Basic REF: Lesson 2-3
OBJ: 2-3.1 Solve equations with integers by using multiplication.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 8D. $1 \mid$ IL I 8D
TOP: Solve equations with integers by using multiplication
KEY: Solve Equations | Multiplication | Integers
13. ANS:
$-5.7$
If an equation is true and each side is multiplied or divided by the same number, the resulting equation is true.

PTS: 1 DIF: Basic REF: Lesson 2-3
OBJ: 2-3.5 Solve equations with decimals using multiplication and division.
NAT: NA $1 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA $2 \quad$ STA: IL I 8D. $1 \mid$ IL I 8D
TOP: Solve equations with decimals by using multiplication and division
KEY: Solve Equations | Multiplication \| Division \| Decimals
14. ANS:
$d=\frac{3-10 h}{f}$
If an equation that contains more than one variable is to be solved for a specific variable, use the properties of equality to isolate the specified variable on one side of the equation.

PTS: 1 DIF: Average REF: Lesson 2-8
OBJ: 2-8.1 Solve equations for given variables.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 6
TOP: Solve equations for given variables
STA: IL I 6D.1| IL I 6D

ANS:
$50 t+40 t=405$
Uniform motion problems are problems where an object moves at a certain speed, or rate. Use the formula $d=r t$ to solve these problems, where $d$ is the distance, $r$ is the rate, and $t$ is the time. Complete the table using the given information. The sum of the distances the two trains travel is equal to the total distance.

PTS: 1 DIF: Average REF: Lesson 2-9
OBJ: 2-9.1 Solve uniform motion problems.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA $6 \quad$ STA: IL I 8D. $1 \mid$ IL I 8D
TOP: Solve uniform motion problems KEY: Uniform Motion | Solve Problems
16. ANS:

|  | $r$ | $t$ | $d=r t$ |
| :---: | :---: | :---: | :---: |
| Fumiko | 50 | $t$ | $50 t$ |
| Kenji | 55 | $t$ | $55 t$ |

Uniform motion problems are problems where an object moves at a certain speed, or rate. Use the formula $d=r t$ to solve these problems, where $d$ is the distance, $r$ is the rate, and $t$ is the time. Complete the table using the given information.

PTS: 1 DIF: Average REF: Lesson 2-9
OBJ: 2-9.1 Solve uniform motion problems.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 6
STA: IL I 8D.1| IL I 8D
TOP: Solve uniform motion problems KEY: Uniform Motion | Solve Problems
17. ANS:

12 pounds
Complete the table with expressions for price per pound, total price, and mixture. Use the total price column to write an equation for the problem. Use the properties of equality to solve the equation for the amount of Brazilian Coffee in the mixture.

PTS: 1 DIF: Average REF: Lesson 2-9 OBJ: 2-9.2 Solve mixture problems.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA $6 \quad$ STA: IL I 7C.1 | IL I 7C
TOP: Solve mixture problems KEY: Mixture Problems | Solve Problems
18. ANS:


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

$\mathrm{D}=\{-3,3,4\} ; \mathrm{R}=\{-2,-1,0,2\}$
A relation is a set of ordered pairs. A relation can also be represented by a table, a graph, or a mapping.

PTS: 1 DIF: Average REF: Lesson 3-1
OBJ: 3-1.1 Represent relations of sets of ordered pairs, tables, mappings, and graphs.
TOP: Represent relations as sets of ordered pairs, tables, mappings, and graphs
KEY: Relations | Ordered Pairs | Tables | Mappings | Graphs
19. ANS:
yes, -5
If the difference between successive terms in a sequence is constant, then it is called an arithmetic sequence. The difference between the terms is called the common difference.

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.1 Recognize arithmetic sequences.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 3
STA: IL I 8A. 9 | IL I 8A
TOP: Recognize arithmetic sequences KEY: Sequences | Arithmetic Sequences
20. ANS:
no
If the difference between successive terms in a sequence is constant, then it is called an arithmetic sequence. The difference between the terms is called the common difference.

PTS: 1 DIF: Average REF: Lesson 3-4
OBJ: 3-4.1 Recognize arithmetic sequences.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 3
STA: IL I 8A. 9 | IL I 8A
TOP: Recognize arithmetic sequences KEY: Sequences |Arithmetic Sequences
21. ANS:

C $=2.98 n$


Direct variation equations are of the form $y=k x$, where $k \neq 0$. The graph of $y=k x$ always passes through the origin.

PTS: 1 DIF: Average REF: Lesson 4-2
OBJ: 4-2.2 Solve problems involving direct variation.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9|N A 10| N A 4$
TOP: Solve problems involving direct variation
STA: IL I 8B. 9 | IL I 8D. 4 | IL I 8B
KEY: Direct Variation | Solve Problems
22. ANS:
$y=\frac{1}{8} x-\frac{11}{8}$
Find the slope of the line with the slope formula. Find the $y$-intercept by replacing $x$ and $y$ with the given point and $m$ with the slope in the slope-intercept form. Solve for $b$. Write the equation in slope-intercept form using the given $m$ and the calculated $b$.

PTS: 1 DIF: Average REF: Lesson 4-4
OBJ: 4-4.2 Write an equation of a line given two points on the line.
NAT: NA $2 \mid$ NA $8 \mid$ NA $9 \mid$ NA $10 \mid$ NA 6
STA: IL I 8B. 4 | IL I 8B
TOP: Write an equation of a line given two points on the line
KEY: Slope | Lines | Equations
23. ANS:
negative correlation; as time passes, the birth rate decreases.
A scatter plot is a graph in which two sets of data are plotted as ordered pairs in a coordinate plane. There is a positive correlation when as $x$ increases, $y$ increases. There is a negative correlation when as $x$ increases, $y$ decreases. There is no correlation when $x$ and $y$ are not related.

PTS: 1 DIF: Average REF: Lesson 4-6
OBJ: 4-6.1 Interpret points on a scatter plot.
NAT: NA $2 \mid$ NA $6 \mid$ NA $7 \mid$ NA $9 \mid$ NA 3
STA: IL I 9A \| IL I 9A. 3
TOP: Interpret points on a scatter plot
KEY: Scatter Plot | Interpret Data
24. ANS:
$y=-4.57 x+77.57$
Use the two points to calculate the slope of the line. Then find the slope intercept form of the equation of the line using the slope and one of the points.

PTS: 1 DIF: Average REF: Lesson 4-6
OBJ: 4-6.2 Use lines of fit to make and evaluate predictions.
NAT: NA $2 \mid$ NA $6 \mid$ NA $7 \mid$ NA $9 \mid N A 5$
STA: IL I 10A. 2
TOP: Write equations for lines of fit KEY: Best Fit Line | Equations
25. ANS:
$y=5 x-8$
Two nonvertical lines are perpendicular if the slopes are opposite reciprocals of each other. Use the given point with the slope of the perpendicular line in point-slope form. Then change to slope-intercept form.

PTS: 1 DIF: Average REF: Lesson 4-7
OBJ: 4-7.2 Write an equation of the line that passes through a given point, perpendicular to a given line.
TOP: Write an equation of the line that passes through a given point, perpendicular to a given line KEY: Lines | Equations | Perpendicular
26. ANS:
$7.15 x \geq 235$; about 32.87 hours

Amount earned per hourtotal number of hours worked $\geq$ cost of the stereo

PTS: 1 DIF: Basic
TOP: Solve multi-step problems.

REF: Lesson 1-3 OBJ: 1-3.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
27. ANS:

$$
\begin{array}{ll}
=40(4.1-3.5)+55(3.5-2.5)+50(3-2.8) \\
=40(0.6)+55(1)+50(0.2) & \\
=40(0.6)+55+50(0.2) & \text { Substitution } \\
=24+55+10 & \\
=89 & \text { Sultipicative Identity } \\
= & \text { Substitution }
\end{array}
$$

number of red marbles $\left(V_{1}-V_{0}\right)+$ number of yellow marbles $\left(V_{1}-V_{0}\right)+$ number of white marbles $\left(V_{1}-V_{0}\right)$ where, $V_{1}=$ Volume of cylinder after adding the marbles, and $V_{0}=$ Volume of cylinder before adding the marbles.

Solve the expression using the Substitution and Multiplicative Identities.

PTS: 1 DIF: Average
TOP: Solve multi-step problems.
28. ANS:
$\frac{1}{4}(2 x+8 y)-\frac{1}{2} x ;$
$=\frac{1}{4}(2 x)+\frac{1}{4}(8 y)-\frac{1}{2} x \quad$ Distributive Property
$=\frac{1}{2} x+2 y-\frac{1}{2} x \quad$ Substitution
$=\frac{1}{2} x-\frac{1}{2} x+2 y \quad$ Commutative Property
$=2 y \quad$ Additive Inverse

Example: Two-fifth the sum of $4 x$ and $10 y$ increased by one-fifth of $x$ translates into $\frac{2}{5}(4 x+10 y)+\frac{1}{5} x$; $=\frac{2}{5}(4 x)+\frac{2}{5}(10 y)+\frac{1}{5} x \quad$ Distributive Property
$=\frac{8}{5} x+\frac{1}{5} x+4 y \quad$ Commutative Property

$$
=\frac{8}{5} x+\frac{1}{5} x+4 y \quad \text { Commutative Property }
$$

$$
=\frac{9}{5} x+4 y \quad \text { Addition }
$$

PTS: 1 DIF: Average
TOP: Solve multi-step problems.

REF: Lesson 1-4 OBJ: 1-4.3 Solve multi-step problems. KEY: Multi-step | Problem Solving

$$
=\frac{8}{5} x+4 y+\frac{1}{5} x \quad \text { Substitution }
$$

REF: Lesson 1-6 OBJ: 1-6.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
29. ANS:

Side length $=1$ unit; Perimeter $=4$ units

The area of a square is equal to the product of its sides.
$A=s \times s$

The perimeter of a square is equal to the sum of its four sides.
$P=s+s+s+s$

PTS: 1
DIF: Basic
REF: Lesson 1-8 OBJ: 1-8.5 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
30. ANS:

\$36
Find the ordered pair $(x, y)$ for the function and plot a graph for each $x$ and $y$-value which corresponds to the $x$-axis and the $y$-axis respectively.

PTS: 1
DIF: Advanced
REF: Lesson 1-9 OBJ: 1-9.3 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
31. ANS:
$3+w=21$

Read each statement carefully and write the equation according to the given information.

PTS: 1 DIF: Average REF: Lesson 2-1 OBJ: 2-1.3 Solve multi-step problems.
TOP: Solve multi-step problems.
KEY: Multi-step | Problem Solving
32. ANS:
$13+d=20 ; 7$ miles

Read each statement carefully and write the equation according to the given information. Solve the written equation by isolating the variable on one side of the equation.

PTS: 1
DIF: Advanced TOP: Solve multi-step problems.

REF: Lesson 2-1 OBJ: 2-1.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
33. ANS:
$\$ 2.85 n=\$ 25.50$; about 8.95 gallons

Read each statement carefully and write the equation according to the given information. Solve the written equation by isolating the variable on one side of the equation.

PTS: 1 DIF: Basic REF: Lesson 2-3 OBJ: 2-3.6 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
34. ANS:
$450 d=5850 ; 13$ days
Read each statement carefully and write the equation according to the given information. Solve the written equation by isolating the variable on one side of the equation.

PTS: 1 DIF: Average REF: Lesson 2-3 OBJ: 2-3.6 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
35. ANS:
3.25 years

Read each statement carefully and write the equation according to the given information.
Use the Addition and/or Subtraction Properties of Equality to get the variables on one side of the equals sign and the numbers without variables on the other side of the equals sign.
Simplify the expressions on each side of the equals sign.
Use the Multiplication or Division Property of Equality to solve.

PTS: 1 DIF: Advanced REF: Lesson 2-5 OBJ: 2-5.7 Solve multi-step problems. TOP: Solve multi-step problems.

KEY: Multi-step | Problem Solving
36. ANS:
about 632 students

Read each statement carefully and write the equation according to the given information. To solve a proportion containing a variable, use cross products and other techniques to solve the equation.

PTS: 1 DIF: Advanced REF: Lesson 2-6 OBJ: 2-6.3 Solve multi-step problems. TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
37. ANS:

20

Read each statement carefully and write the equation according to the given information. To solve a proportion containing a variable, use cross products and other techniques to solve the equation.

PTS: 1 DIF: Average
TOP: Solve multi-step problems.

REF: Lesson 2-6 OBJ: 2-6.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
38. ANS:
$12+s=p-4 ; s=p-16$

First translate the verbal sentences into equations by using key words and phrases you have learned to replace words with symbols. Then to solve an equation for a specific variable, use the properties of equality to isolate the specified variable on one side of the equation.

PTS: 1 DIF: Basic
TOP: Solve multi-step problems.
REF: Lesson 2-8 OBJ: 2-8.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
39. ANS:

300 g of $40 \%$ alloy, 200 g of $35 \%$ alloy
Mixture problems, in which one or more parts are combined into a whole, are solved using weighted averages i.e. the sum of the product of the number of units and the value per unit divided by the sum of the number of units.

PTS: 1 DIF: Average REF: Lesson 2-9 OBJ: 2-9.3 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
40. ANS:
$\{(1,9),(5,7),(-4,2),(-6,2)\} ;\{(9,1),(7,5),(2,-4),(2,-6)\}$

To find the inverse of a relation, exchange $x$ and $y$ in each ordered pair.
PTS: 1 DIF: Advanced REF: Lesson 3-1 OBJ: 3-1.3 Solve multi-step problems. TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
41. ANS:
$f(m)=0.17 m+34 ; 76.5,110.5,170$

Equations that are functions can be written in the form called function notation. For example, consider $y=5 x+8$.
equation function notation
$y=5 x+8 \quad f(x)=5 x+8$
The function value $f(a)$ is found by substituting $a$ for $x$ in the equation.

PTS: 1 DIF: Average
TOP: Solve multi-step problems.
REF: Lesson 3-2 OBJ: 3-2.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
42. ANS:
$\frac{36}{5}, 6$

To find the $x$-intercept, set $y=0$ and solve for $x$.
To find the $y$-intercept, set $x=0$ and solve for $y$.

PTS: 1 DIF: Advanced TOP: Solve multi-step problems.

REF: Lesson 3-3 OBJ: 3-3.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
43. ANS:

Sample answer: Sometimes a pattern can lead to a general rule. If the equation that represents the pattern is of the form $y=k x$, then the relationship is proportional.
In a nonproportional situation, you must add or subtract a constant to write an equation for the relationship. It is of the form $y=k x \pm c$. Also, nonlinear relationships are nonproportional because they do not have a constant rate of change.

The circumference of a circle and its diameter is an example of a proportional relationship. Final velocity of a moving object which is given by $v=u+a t$, where $u$ is initial velocity, $t$ is the time, and $a$ is acceleration is an example of a nonproportional relationship.

PTS: 1 DIF: Advanced REF: Lesson 3-5 OBJ: 3-5.2 Solve multi-step problems. TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
44. ANS:
$\$ 25$ million/year; There was an average increase of $\$ 25$ million per year in interest on the public debt.
Slope can be used to describe a rate of change. The rate of change tells, on average, how a quantity changes over time.

PTS: 1 DIF: Basic
TOP: Solve multi-step problems.
45. ANS:

$20-25$; steepest part of the graph
Slope can be used to describe a rate of change. The rate of change tells, on average, how a quantity changes over time.

PTS: 1 DIF: Advanced

REF: Lesson 4-1 OBJ: 4-1.3 Solve multi-step problems. KEY: Multi-step | Problem Solving

TOP: Solve multi-step problems.

REF: Lesson 4-1 OBJ: 4-1.3 Solve multi-step problems. KEY: Multi-step | Problem Solving
46. ANS:
$y=\frac{4}{3} x ; 12$
A direct variation is described by an equation of the form $y=k x$, where $k \neq 0$. We say that $y$ varies directly with $x$. In the equation $y=k x, k$ is the constant of variation.

PTS: 1 DIF: Average REF: Lesson 4-2 OBJ: 4-2.3 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
47. ANS:
$y=\frac{5}{2} x ; 102.5$

A direct variation is described by an equation of the form $y=k x$, where $k \neq 0$. We say that $y$ varies directly with $x$. In the equation $y=k x, k$ is the constant of variation.

PTS: 1 DIF: Average REF: Lesson 4-2 OBJ: 4-2.3 Solve multi-step problems.
TOP: Solve multi-step problems. KEY: Multi-step | Problem Solving
48. ANS:
$y=1.5 r+9.50$
If a quantity changes at a constant rate over time, it can be modeled by a linear equation. The $y$-intercept represents a starting point, and the slope represents the rate of change.

PTS: 1
DIF: Basic
TOP: Solve multi-step problems.
REF: Lesson 4-3 OBJ: 4-3.3 Solve multi-step problems.
KEY: Multi-step | Problem Solving
49. ANS:


A scatter plot is a graph in which two sets of data are plotted as ordered pairs in a coordinate plane. There is a positive correlation when $y$ increases as $x$ increases. There is a negative correlation when $y$ decreases as $x$ increases. There is no correlation when $x$ and $y$ are not related.

If the data points do not all lie on a line, but are close to a line, you can draw a line of fit. This line describes the trend of the data.

PTS: 1 DIF: Advanced
TOP: Solve multi-step problems.
REF: Lesson 4-6 OBJ: 4-6.3 Solve multi-step problems.
. ANS:
No; the slopes are 4 and $\frac{1}{4}$.

Two nonvertical lines are perpendicular if the slopes are opposite reciprocals of each other.

PTS: 1 DIF: Basic
TOP: Solve multi-step problems.

REF: Lesson 4-7 OBJ: 4-7.3 Solve multi-step problems.
KEY: Multi-step | Problem Solving

