Name: ____

Geometry Summer Assignment

The purpose of this assignment is to make sure you review the skills from Algebra I that you will need to be successful in Geometry next year. We will review and test over these topics the first week of school.

No Calculator

Find the value of the expression.

1. $7^2 + 3^2$

2. $8^2 + 6^2$

Write the fraction in simplest form.

3. $\frac{24}{40}$

4. $\frac{6}{33}$

EXAMPLE 1 *Solve linear equations*

Solve the equation $-3(x + 5) + 4x = 25$.

$-3(x + 5) + 4x = 25$	Write original equation.
$-3x - 15 + 4x = 25$	Use the Distributive Property.
$x - 15 = 25$	Group and combine like terms.
$x = 40$	Add 15 to each side.

Solve.

5. $7p + 5 = 47$

6. $\frac{e}{5} - 6 = -9$

7. $-3(x + 5) + 4x = 25$

8. $\frac{2x - 5}{7} = 4$

9. $2(0.3r + 1) = 23 - 0.1r$

EXAMPLE 2 *Solve a real-world problem*

MEMBERSHIP COSTS **A health club charges an initiation fee of \$50. Members then pay \$45 per month. You have \$400 to spend on a health club membership. For how many months can you afford to be a member?**

Let n represent the number of months you can pay for a membership.

\$400 = Initiation fee + (Monthly Rate × Number of Months)

$400 = 50 + 45n$ Substitute.

$350 = 45n$ Subtract 50 from each side.

$7.8 = n$ Divide each side by 45.

▸ You can afford to be a member at the health club for 7 months.

10. You have a \$50 gift certificate at a store. You want to buy a book that costs \$8.99 and boxes of stationery for your friends. Each box costs \$4.59. How many boxes can you buy with your gift certificate?

EXAMPLE 1 *Simplify rational expressions*

a. $\frac{2x^2}{4xy}$ b. $\frac{3x^2 + 2x}{9x + 6}$

Solution

To simplify a rational expression, factor the numerator and denominator. Then divide out any common factors.

a. $\frac{2x^2}{4xy} = \frac{\cancel{2} \cdot \cancel{x} \cdot x}{\cancel{2} \cdot 2 \cdot \cancel{x} \cdot y} = \frac{x}{2y}$ b. $\frac{3x^2 + 2x}{9x + 6} = \frac{x\cancel{(3x + 2)}}{3\cancel{(3x + 2)}} = \frac{x}{3}$

11. $\frac{5x^4}{20x^2}$ 12. $\frac{3x^2 - 6x}{6x^2 - 3x}$

EXAMPLE 2 ***Simplify radical expressions***

a. $\sqrt{54}$ **b.** $2\sqrt{5} - 5\sqrt{2} - 3\sqrt{5}$ **c.** $(3\sqrt{2})(-6\sqrt{6})$

Solution

a. $\sqrt{54} = \sqrt{9} \cdot \sqrt{6}$ — Use product property of radicals.

$= 3\sqrt{6}$ — Simplify.

b. $2\sqrt{5} - 5\sqrt{2} - 3\sqrt{5} = -\sqrt{5} - 5\sqrt{2}$ — Combine like terms.

c. $(3\sqrt{2})(-6\sqrt{6}) = -18\sqrt{12}$ — Use product property and associative property.

$= -18 \cdot 2\sqrt{3}$ — Simplify $\sqrt{12}$.

$= -36\sqrt{3}$ — Simplify.

Simplify the expression, if possible.

13. $\sqrt{64} \cdot \sqrt{81}$ 14. $\sqrt{\frac{36}{100}}$ 15. $\sqrt{75}$ 16. $\sqrt{2} - \sqrt{18} + \sqrt{6}$

17. $4\sqrt{8} + 3\sqrt{32}$ 18. $(6\sqrt{5})(2\sqrt{2})$

Slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$

When graphing rates of change, if all the segments have the same rate of change (same steepness), they form a straight line. This rate of change is called the **slope**.

Find the slope of the line.

Step 1: First choose any two points on the line.

Step 2: Begin at one of the points.

Step 3: Count vertically until you are even with the second point.

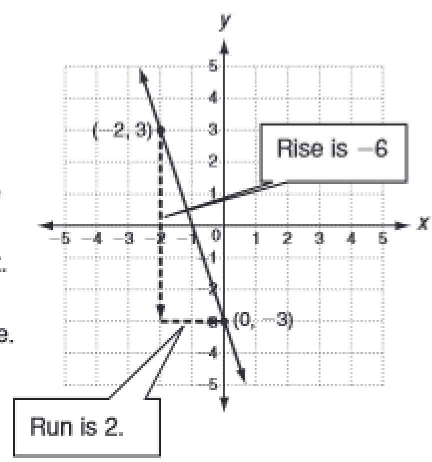
This is the rise. If you go down the rise will be negative. If you go up the rise will be positive.

Step 4: Count over until you are at the second point.

This is the run. If you go left the run will be negative. If you go right the run will be positive.

Step 5: Divide to find the slope.

slope $= \frac{\text{rise}}{\text{sun}} = -\frac{6}{2} = -3$



You can find the slope of a line from any two ordered pairs. The ordered pairs can be given to you, or you might need to read them from a table or graph.

Find the slope of the line that contains (–1, 3) and (2, 0).

Step 1: Name the ordered pairs. (It does not matter which is first and which is second.)

first ordered pair → $(-1, 3)$ $(2, 0)$ ← second ordered pair

Step 2: Label each number in the ordered pairs.

$(-1, 3)$ $(2, 0)$

(x_1, y_1) (x_2, y_2)

Step 3: Substitute the ordered pairs into the slope formula.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{0 - 3}{2 - (-1)}$$
$$= \frac{-3}{3}$$
$$= -1$$

The slope of the line that contains $(-1, 3)$ and $(2, 0)$ is -1.

Slope-intercept Form: $y = mx + b$, where *m* is the slope and *b* is the *y*-intercept.

Point-slope Form: $y - y_1 = m(x - x_1)$, where (x_1, y_1) is a point on the line.

Standard Form: $Ax + By = C$, where *A*, *B*, and *C* are not all zero.
A is not negative, and *A*, *B*, and *C* are not factions.

x-intercept: is where the line crosses the *x*-axis (let *y* = 0 and solve for *x*)

y-intercept: is where the line crosses the *y*-axis (let *x* = 0 and solve for *y*)

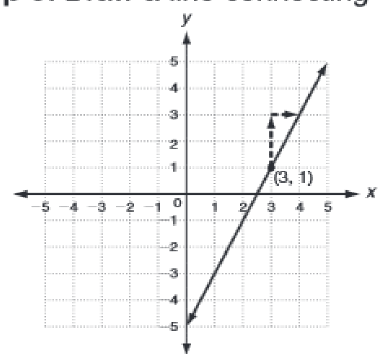
You can graph a line if you know the slope and any point on the line.

Graph the line with slope 2 that contains the point (3, 1).

Step 1: Plot (3, 1).

Step 2: The slope is 2 or $\frac{2}{1}$. Count 2 **up** and **1 right** and plot another point.

Step 3: Draw a line connecting the points.



Write an equation in point-slope form for the line with slope $-\frac{1}{3}$ that contains the point (5, 2).

The **point-slope form** of a linear equation is

$$\boldsymbol{y - y_1 = m(x - x_1)}.$$

m is the given slope.
(x_1, y_1) is the given point.

$y - y_1 = m(x - x_1)$.

$y - 2 = -\frac{1}{3}(x - 5)$ *Substitute $-\frac{1}{3}$ for m, 5 for x_1 and 2 for y_1.*

You can write a linear equation in slope-intercept form if you are given any two points on the line.

Write an equation in slope-intercept form for the line through the points (4, 2) and (6, −4).

Step 1: Find the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 2}{6 - 4} = \frac{-6}{2} = -3$$

Step 2: Write the line in point-slope form.

$y - y_1 = m(x - x_1)$

$y - 2 = -3(x - 4)$ *Substitute −3 for m and either one of the ordered pairs x_1 and y_1.*

Step 3: Change point-slope form to slope-intercept form.

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

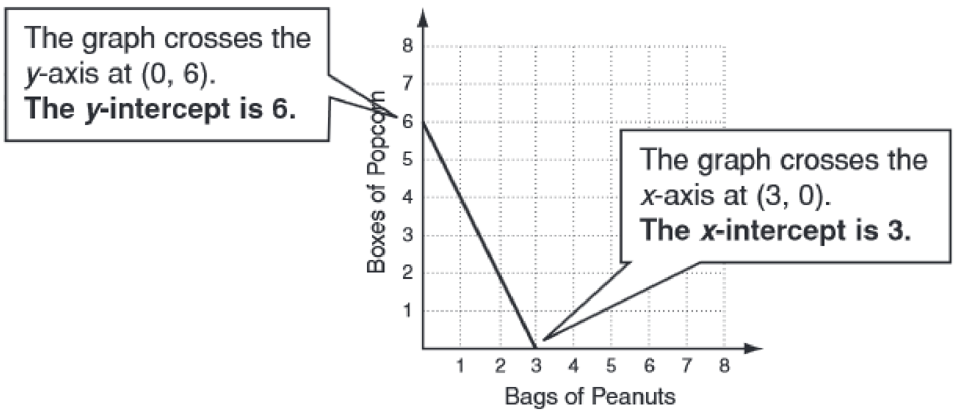
$y - 2 = -3x + 12$ *Distribute.*

$+2 \qquad +2$ *Add 2 to both sides.*

$y = -3x + 14$

The ***x*-intercept** is the *x*-coordinate of the point where the graph intersects the *x*-axis.
The ***y*-intercept** is the *y*-coordinate of the point where the graph intersects the *y*-axis.

At a baseball game, Doug has $12 to spend on popcorn and peanuts. The peanuts are $4 and the popcorn is $2. The function $4x + 2y = 12$ describes the amount of peanuts x and popcorn y he can buy if he spends all his money. The function is graphed below. Find the intercepts. What does each intercept represent?



The *x*-intercept 3 is the amount of peanuts Doug can buy if he buys no popcorn.

The *y*-intercept 6 is the amount of popcorn Doug can buy if he buys no peanuts.

You can find the *x*- and *y*-intercepts from an equation. Then you can use the intercepts to graph the equation.

Find the *x*- and *y*-intercepts of $4x + 2y = 8$.

To find the *x*-intercept, substitute 0 for *y*.

$$4x + 2y = 8$$
$$4x + 2(0) = 8$$
$$4x = 8$$
$$\frac{4x}{4} = \frac{8}{4}$$
$$x = 2$$

The *x*-intercept is 2.

To find the *y*-intercept, substitute 0 for *x*.

$$4x + 2y = 8$$
$$4(0) + 2y = 8$$
$$2y = 8$$
$$\frac{2y}{2} = \frac{8}{2}$$
$$y = 4$$

The *y*-intercept is 4.

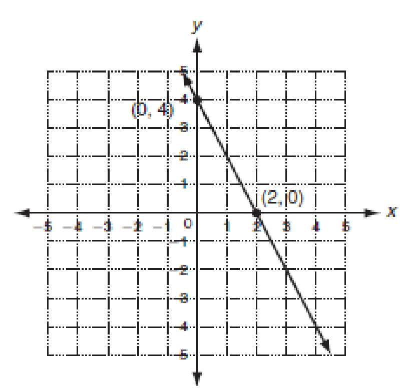
Use the intercepts to graph the line described by $4x + 2y = 8$.

Because the *x*-intercept is 2, the point (2, 0) is on the graph.

Because the *y*-intercept is 4, the point (0, 4) is on the graph.

Plot (2, 0) and (0, 4).

Draw a line through both points.



Two lines are **parallel** if they lie in the same plane and have no points in common. The lines will never intersect.

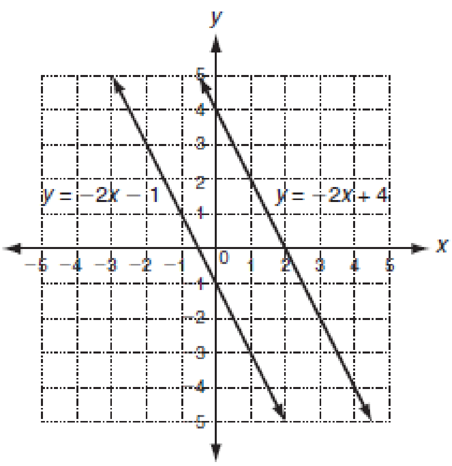
Identify which lines are parallel.

$y = -2x + 4; \quad y = 3x + 4; \quad y = -2x - 1$

If lines have the same slope, but different y-intercepts, they are parallel lines.

$y = -2x + 4;$	$y = 3x + 4;$	$y = -2x - 1$
$m = -2,$	$m = 3$	$m = -2$
$b = 4$	$b = 4$	$b = -1$

$y = -2x + 4$ and $y = -2x - 1$ are parallel.



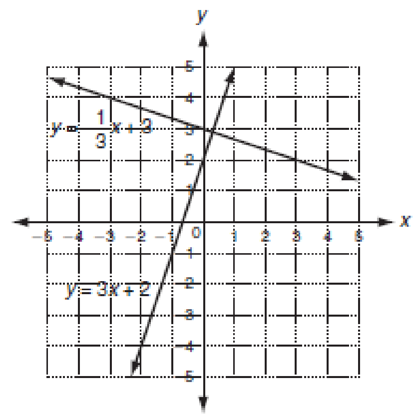
Two lines are **perpendicular** if they intersect to form right angles.

Identify which lines are perpendicular.

If the product of the slopes of two lines is -1, the two lines are perpendicular.

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

Because $3\left(-\frac{1}{3}\right) = -1$, $y = 3x + 2$ and $y = -\frac{1}{3}x + 3$ are perpendicular.



Horizontal Lines have a slope of zero and an equation of $y = y$-coordinate

Vertical Lines have undefined slope and an equation of $x = x$-coordinate

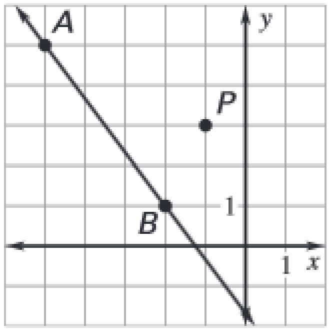
19) Determine the value of the missing coordinate so that a line passing through the given points would have the given slope.

a) $(10, y)$, $\quad (3,4)$ and $\quad m = -\frac{2}{7}$

b) $(5, 3)$, $(7, y)$ and $m = 0$

c) $(10, -4)$, $(x, 7)$ and $m =$ undefined

20. Graph the line **parallel** to line AB that passes through point P. Write the equation for that parallel line in all three forms.



Slope-intercept: $y = mx + b$

____

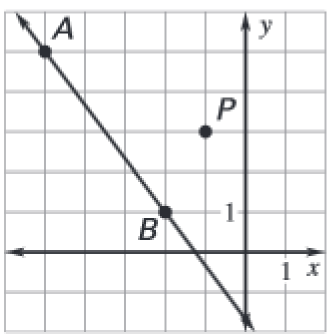
Standard: $Ax + By = C$

____

Point-Slope: $y - y_1 = m(x - x_1)$

____

21. Graph the line **perpendicular** to line AB that passes through point P. Write the equation for that parallel line in all three forms.



Slope-intercept: $y = mx + b$

____

Standard: $Ax + By = C$

____

Point-Slope: $y - y_1 = m(x - x_1)$

____

22. Find the x- and y-intercepts (write as a coordinate point), the slope, and the graph each line.

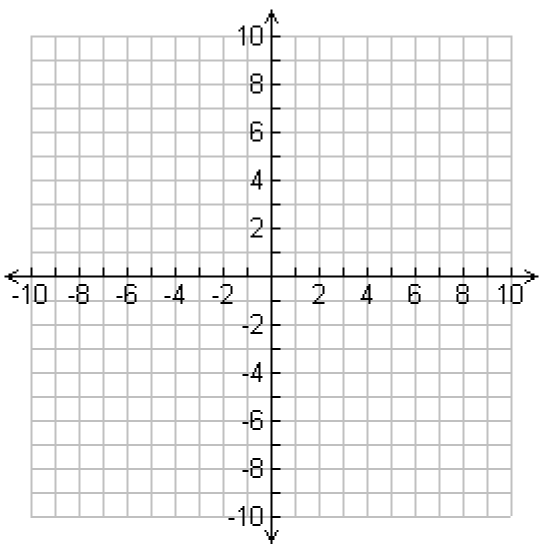
a) $3x + 4y = 24$

b) $y = -\frac{2}{3}x + 5$

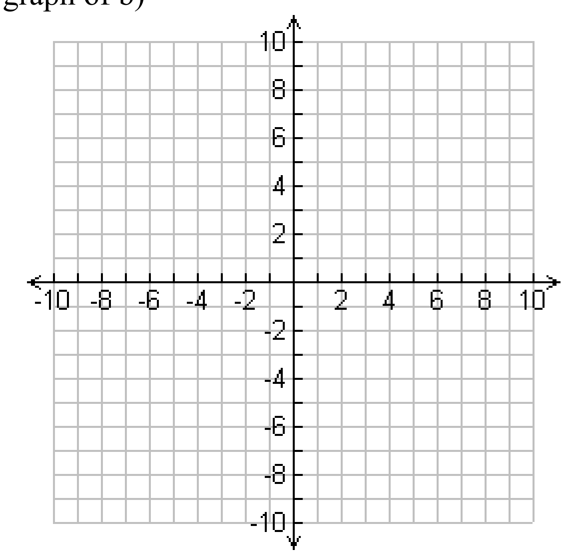
c) $y - 3 = \frac{4}{5}(x + 2)$

a)	b)	c)
x-intercept: __________	x-intercept: __________	x-intercept: __________
y-intercept: __________	y-intercept: __________	y-intercept: __________
slope: __________	slope: __________	slope: __________

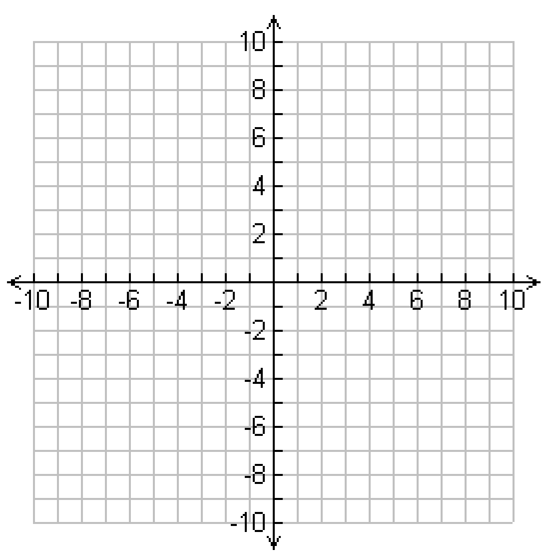
graph of a)



graph of b)

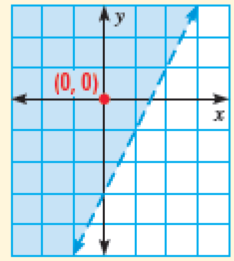


graph of c)



EXAMPLE 1 *Graph a linear inequality in two variables*

Graph the inequality $0 > 2x - 3 - y$.



Solution

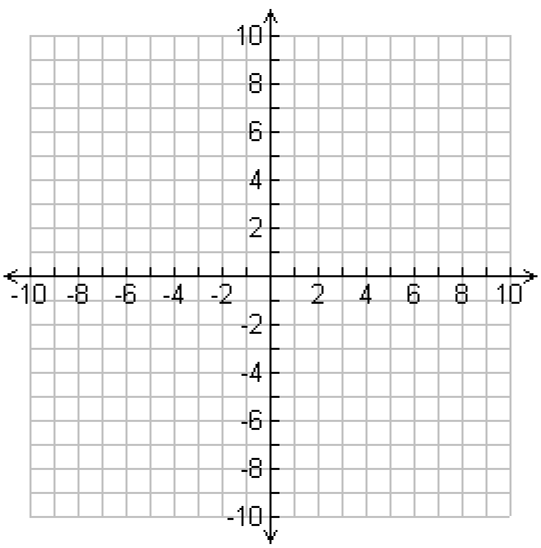
Rewrite the inequality in slope-intercept form, $y > 2x - 3$.

The boundary line $y = 2x - 3$ is not part of the solution, so use a dashed line.

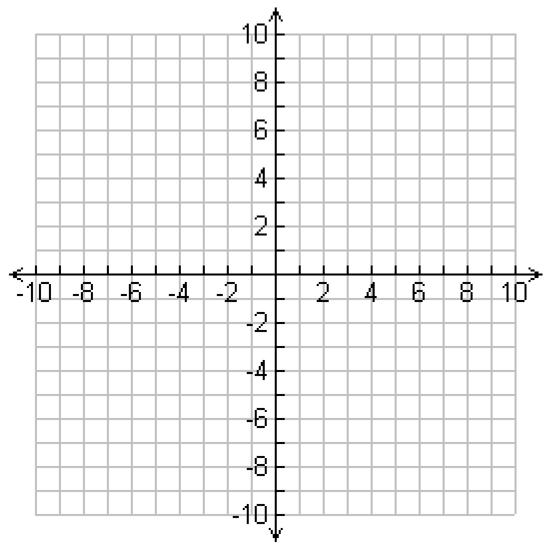
To decide where to shade, use a point not on the line, such as (0, 0), as a test point. Because $0 > 2 \cdot 0 - 3$, (0, 0) is a solution. Shade the half-plane that includes (0, 0).

Graph the linear inequality.

23. $y > -2x + 3$



24. $3x - 4y \le 8$



EXAMPLE 2 *Use an inequality to solve a real-world problem*

SAVINGS Lily has saved \$49. She plans to save \$12 per week to buy a camera that costs \$124. In how many weeks will she be able to buy the camera?

Solution

Let w represent the number of weeks needed.

$49 + 12w \ge 124$ **Write an algebraic model.**

$12w \ge 75$ **Subtract 49 from each side.**

$w \ge 6.25$ **Divide each side by 12.**

▶ She must save for 7 weeks to be able to buy the camera.

25. Maddy's quiz scores in history are 76, 81, and 77. What score must he get on his fourth quiz to have an average of at least 80?

EXAMPLE 1 *Solve inequalities*

Solve $-3x + 7 \leq 28$. Then graph the solution.

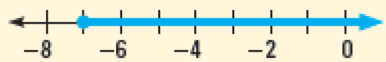
When you multiply or divide each side of an inequality by a *negative* number, you must reverse the inequality symbol to obtain an equivalent inequality.

$-3x + 7 \leq 28$ Write original inequality.

$-3x \leq 21$ Subtract 7 from both sides.

$x \geq -7$ Divide each side by -3. Reverse the inequality symbol.

▶ The solutions are all real numbers greater than or equal to -7. The graph is shown at the right.



Solve the inequality. Then graph the solution.

26. $7 - x \geq -1$

27. $5x + 3 \geq 2(x - 9)$

EXAMPLE 2 *Solve absolute value equations*

Solve $|2x + 1| = 5$.

The expression inside the absolute value bars can represent 5 or -5.

STEP 1 Assume $2x + 1$ represents 5.

$2x + 1 = 5$

$2x = 4$

$x = 2$

STEP 2 Assume $2x + 1$ represents -5.

$2x + 1 = -5$

$2x = -6$

$x = -3$

▶ The solutions are 2 and -3.

Solve the equation

28. $|5x - 2| = 8$

EXAMPLE 1 *Write a ratio in simplest form*

A team won 18 of its 30 games and lost the rest. Find its win-loss ratio.

The ratio of a to b, $b \neq 0$, can be written as a to b, $a:b$, and $\frac{a}{b}$.

$\frac{\text{wins}}{\text{losses}} = \frac{18}{30 - 18}$ **To find losses, subtract wins from total.**

$= \frac{18}{12} = \frac{3}{2}$ **Simplify.**

▶ The team's win-loss ratio is 3 : 2.

28. A scale drawing that is 2.5 feet long by 1 foot high was used to plan a mural that is 15 feet long by 6 feet high. Write each ratio in simplest form.

a) length to height of mural

b) length of scale drawing to length of mural

EXAMPLE 2 *Find and interpret a percent of change*

A \$50 sweater went on sale for \$28. What is the percent of change in price? The new price is what percent of the old price?

$$\text{Percent of change} = \frac{\text{Amount of increase or decrease}}{\text{Original amount}} = \frac{50 - 28}{50} = \frac{22}{50} = 0.44$$

▶ The price went down, so the change is a decrease. The percent of decrease is 44%. So, the new price is 100%−44% = 56% of the original price.

Find the percent of change.

29. From 150 pounds to 136.5 pounds

30. Write the percent comparing the new amount to the original amount. Then find the new amount.
75 feet increased by 4%

EXAMPLE 1 *Solve quadratic equations by finding square roots*

Solve the equation $4x^2 - 3 = 109$.

$4x^2 - 3 = 109$ **Write original equation.**

$4x^2 = 112$ **Add 3 to each side.**

$x^2 = 28$ **Divide each side by 4.**

$x = \pm\sqrt{28}$ **$\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$, so $\sqrt{28} = \pm\sqrt{4} \cdot \sqrt{7}$.**

$x = \pm 2\sqrt{7}$ **Simplify.**

Solve the equation. Write your answer in simplest radical form, if necessary.

31. $2x^2 - 1 = 49$

32. $-3(-x^2 + 5) = 39$

EXAMPLE 2 ***Simplify quotients with radicals***

Simplify the expression.

a. $\sqrt{\frac{10}{8}}$

b. $\sqrt{\frac{1}{5}}$

Solution

a. $\sqrt{\frac{10}{8}} = \sqrt{\frac{5}{4}}$ Simplify fraction.

$= \frac{\sqrt{5}}{\sqrt{4}}$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$.

$= \frac{\sqrt{5}}{2}$ Simplify.

b. $\sqrt{\frac{1}{5}} = \frac{1}{\sqrt{5}}$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ and $\sqrt{1} = 1$.

$= \frac{1}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$ Multiply numerator and denominator by $\sqrt{5}$.

$= \frac{\sqrt{5}}{5}$ Multiply fractions. $\sqrt{a} \cdot \sqrt{a} = a$.

Simplify the expression.

33. $\sqrt{\frac{7}{81}}$

34. $\sqrt{\frac{3}{5}}$

EXAMPLE 1 ***Graph a quadratic function***

Graph the equation $y = -x^2 + 4x - 3$.

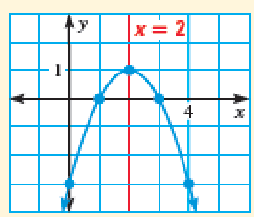
Because $a = -1$ and $-1 < 0$, the graph opens downward.

The vertex has x-coordinate $-\frac{b}{2a} = -\frac{4}{2(-1)} = 2$.

The y-coordinate of the vertex is $-(2)^2 + 4(2) - 3 = 1$.

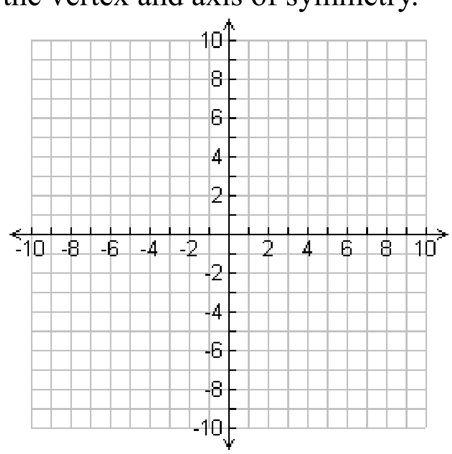
So, the vertex is (2, 1) and the axis of symmetry is $x = 2$.

Use a table of values to draw a parabola through the plotted points.



35. Graph the quadratic function. Label the vertex and axis of symmetry.

$y = -x^2 - 6x - 10$



EXAMPLE 1 *Multiply binomials*

Find the product $(2x + 3)(x - 7)$.

Solution

Use the **FOIL** pattern: Multiply the **F**irst, **O**uter, **I**nner, and **L**ast terms.

First, Outer, Inner, Last

$$(2x + 3)(x - 7) = 2x(x) + 2x(-7) + 3(x) + 3(-7)$$ Write the products of terms.

$$= 2x^2 - 14x + 3x - 21$$ Multiply.

$$= 2x^2 - 11x - 21$$ Combine like terms.

Find the product

36. $(x+3)(x-2)$

37. $(2x+1)(2x-1)$

38. $(-3x+1)^2$

EXAMPLE 2 *Solve a quadratic equation using the quadratic formula*

Solve $2x^2 + 1 = 5x$.

Solution

Write the equation in standard form to be able to use the quadratic formula.

$$2x^2 + 1 = 5x$$ Write the original equation.

$$2x^2 - 5x + 1 = 0$$ Write in standard form.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Write the quadratic formula.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(1)}}{2(2)}$$ Substitute values in the quadratic formula: $a = 2$, $b = -5$, and $c = 1$.

$$x = \frac{5 \pm \sqrt{25 - 8}}{4} = \frac{5 \pm \sqrt{17}}{4}$$ Simplify.

▶ The solutions are $\frac{5 + \sqrt{17}}{4} \approx 2.28$ and $\frac{5 - \sqrt{17}}{4} \approx 0.22$.

Use the quadratic formula to solve the equation.

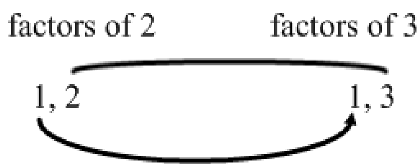
39. $3x^2 - 2x - 5 = 0$

40. $3x^2 = 5x - 1$

Examples of Factoring

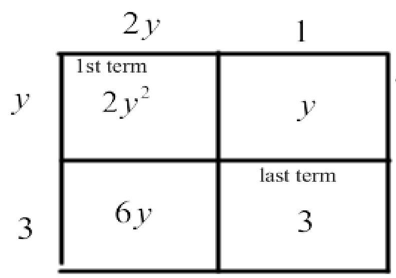
Factor $2y^2 + 7y + 3$

Guess & Check



$$(2y+1)(y+3)$$

Box Method: Find the factors of the product of first and last term that add to the middle term



Then find the GCF across

$$(2y+1)(y+3)$$

Grouping: Find the factors of the product that add to the middle and split the middle into two terms.

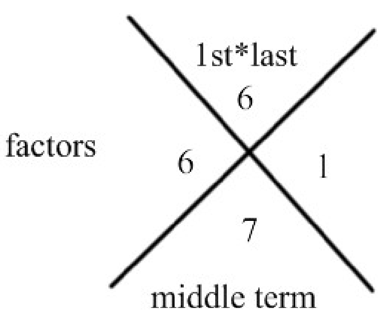
$$2y^2 + y + 6y + 3$$

Group the terms and find their GCF

$$y(2y+1)+3(2y+1)$$

$$(2y+1)(y+3)$$

The X method



Take factors and divide by the 1st term

$$\frac{6}{2} = 3$$

$$\frac{1}{2}$$

$$(y+3)(2y+1)$$

Factor the following quadratics.

41) $15x^2 - 19x + 6$

42) $6x^2 + 7x - 24$