Algebra 1
Math Summer
Review Packet

Hello Families!

This is a packet of some specifically chosen math review topics for your child to review over the summer. This will help them keep math fresh in their mind over summer break as well as solidifying some important topics from their math class this past year. I will be emailing out the answer key to you in the next week if you want to be able to check your child's answers.

If students complete this packet over the summer and return it to me in the fall, they will receive some extra credit!

There are a couple other ways that your child can work on their math skills this summer in addition to this review packet. They can log on to their IXL account (they have used this many times during the school year) and practice skills. I recommend that they complete the "Diagnostic" (on the green bar at the top of the main page) at the beginning of the summer so that IXL knows their specific skill level. Spending about 20 minutes on this is all that is needed, and it is important for students to take their time so that the results are accurate. After they complete the Diagnostic, students can go to "Recommendations" and begin learning. If you or your child needs help logging in and completing practice problems on IXL, feel free to reach out to me! The other way they can practice math this summer is on Khan Academy. This is a website with grade-level based lesson videos and practice problems. Students have used this a couple times this past year in math.

Have a great summer!

Mrs. Franck

1-3 Reteach to Build Understanding

Solving Equations with Variables on Both Sides

Each of these equations has a different type of solution.

$6x - 12 = 3x - 12$	$6x - 12 = 6x - 12$	$6x - 18 = 6x - 12$
$6x + 3x = 12 - 12$	$6x - 6x = 12 - 12$	$6x - 6x = 18 - 12$
$x = 0$	$0 = 0$	$0 \neq 6$
One solution, $x = 0$.	Infinitely many solutions.	No solution.
Only one value of x makes the equation true.	Any value of x makes the equation true.	No value of x will make the equation true.

1. Simplify each equation so there is one expression on each side of the equation.

a. $2m = 8 - 6m$ $8m = 8$

b. $3x = 9 + 9x$

c. $4 \cdot 3t = 12 - 2t$

d. $4y = 3(3y - 4)$

For each equation in Items 2–4, fill in the blank to form an identity.

2. $-5x + 9 = 9$ **3.** $\_\_\_ + 14n = 14n + 16$ **4.** $\_\_\_ - 18 = -5 - k - 13$

For Items 5–7, fill in the blank to form an equation that has no solution.

5. $\_\_\_ + 12 - 3d = 5d + 6$ **6.** $\_\_\_(m - 2) = -2(-2m + 6)$ **7.** $\_\_\_ + 2y - 8 = 3(y - 11)$

8. Replace the answer you chose for Item 7 so that $y = 5$.

9. Describe and correct the error Isabel made when solving $26(3 - b) = -13(b - 1)$. Place an X next to the incorrect statement and describe what was actually done.

a. Use the Distributive Property to get $78 - 26b = -13b + 13$.

b. Subtract $13b$ from each side to get $78 - 13b = 13$.

c. Subtract 78 from each side to get $-13b = -65$.

d. Divide each side by -13 to get $b = 5$.

1-5 Reteach to Build Understanding

Solving Inequalities in One Variable

Many of the same rules apply for solving an inequality as for solving an equality. The main difference is that when you multiply or divide each side of the inequality by a negative number the inequality sign is reversed.

1. Match each step on the left with its description on the right.

$4t + 9 > 4$	Simplify.
$4t + 9 - 9 > 4 - 9$	Divide each side by 4.
$4t > -5$	Combine like terms and simplify.
$\frac{4t}{4} > \frac{5}{4}$	Subtract 9 from each side.
$t > \frac{5}{4}$	Original inequality

2. Benito has \$120 to go shopping. He spends \$30 on a pair of jeans. Benito also wants to buy some rings that cost \$18 each. He writes and solves an inequality to determine how many rings *r* he can buy. Describe and correct the error he made when solving the inequality.

$18r + 30 \leq 120$

$18r + 30 - 30 \geq 120 - 30$

$\frac{18r}{18} \geq \frac{90}{18}$

$r \geq 5$

Benito can purchase 5 or more rings.

3. Complete the steps to solve each inequality. Then, complete the sentences to describe the solutions.

a. $3(p - 2) - 7p < 6$

$3p - 6 - 7p < 6$

$-4p \quad\quad < 6$

$-4p - 6 + 6 < 6$

$-4p <$

$p \quad\quad -3$

The solution to this inequality is

b. $2(3b + 7) - 6b > 12$

$+ 10 - 6b > 12$

> 12

There are solutions to this inequality.

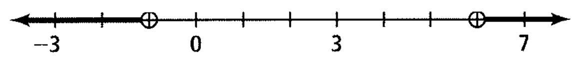
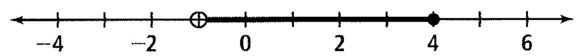
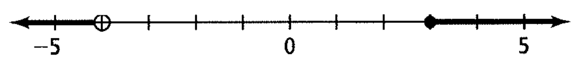
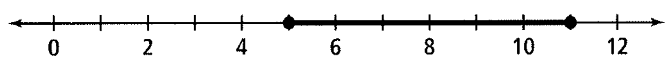
Name ____________________

1-6 Reteach to Build Understanding

Compound Inequalities

A solution of a compound inequality involving *and* includes any number that makes *both* inequalities true. A solution of a compound inequality involving *or* includes any number that makes *one or both* of the inequalities true.

1. Match the inequality with its graph.

Compound Inequality	**Graph**
$x < -4$ or $x \geq 3$	
$x \leq 11$ and $x \geq 5$	
$x \leq 4$ and $x > -1$	
$x < -1$ or $x > 6$	

Fill in the blanks to complete the inequality that represents each phrase.

2. All real numbers that are less than −3 or greater than or equal to 5.

$x <$ ______ $x \geq$ ______

3. A certain recipe calls for a ham to bake between 30 minutes and 40 minutes, inclusive.

30 ______ x ______ 40

Write true or false.

4. −3 is a solution for the compound inequality $b \leq 4$ and $b > -1$.

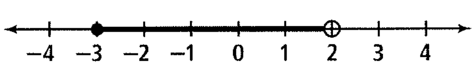
5. 3 is a solution for the compound inequality $-3 < c < 2$

6. Libby solved and graphed $5x + 6 > 16$ or $x - 6 \leq -9$. Describe and correct the error Libby made graphing the solution to the compound inequality.

$5x + 6 > 16$ $\quad x - 6 \leq -9$

$5x > 10$ $\quad x \leq -3$

$x > 2$



1-7 Reteach to Build Understanding

Absolute Value Equations and Inequalities

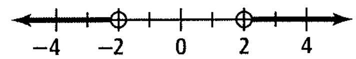
The absolute value is positive.

The absolute value is negative.

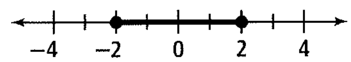
The equation has no solution because no value of x makes the equation true.

The graph of the solutions for an absolute value inequality using $>$ or $\geq$, or a compound inequality using *or*.

The graph of the solutions for an absolute value inequality using $<$ or $\leq$, or a compound inequality using *and*.



$5|x - 3| = 20$
$x - 3 = -4$



$5|x - 3| = 20$
$x - 3 = 4$

$|x + 10| = -9$

1. Complete the solution of the equation $|t - 7| = 8$.

Think: "The value of the quantity $t - 7$ can be 8 or -8."

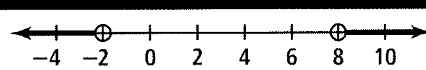
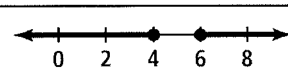
Rewrite $|t - 7| = 8$ as $t - 7 = 8$ or ________.

$t - 7 + 7 = 8 + 7$ or ________ Add 7 to each side to isolate t.

________ or ________ Simplify.

2. Tavon says that for the absolute value inequality $|z| < 6$, you read the inequality as "z is less than 6 away from zero." Marta believes you read the inequality as "z is less than 6." Who is correct? Explain.

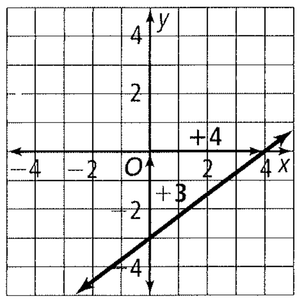
3. Complete the table below for each absolute value inequality.

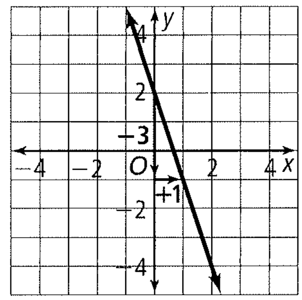
Inequality	Solution	Graph
$\lvert x - 3 \rvert > 5$		
$\lvert n + 1 \rvert \leq 7$	$-8 \leq n \leq 6$	
$\lvert d + 4 \rvert < 3$		
$\lvert f - 5 \rvert \geq 1$	$f \geq 6$ or $f \leq 4$	

2-1 Reteach to Build Understanding

Slope-Intercept Form

1. Draw lines from each statement to the graph it describes. Note the rise and run labeled on each graph.





The line has a slope of –3.

The y-intercept is 2.

The y-intercept is –3.

The line has a slope of $\frac{3}{4}$.

2. Marcus incorrectly identifies two of the key features of the graph $y = 3 - 4x$. Put an X next to any incorrect statements. Correct his errors.

   a. The slope of the line is 3.

   b. The line goes down from left to right.

   c. The y-intercept is –4.

   d. To graph the line, plot the y-intercept. Then plot another point 4 units down and one unit right.

3. What is an equation in slope-intercept form for the line that passes through the points (1, –3) and (3, 1)? Fill in the missing information.

   First, use the two given points to find the slope.

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

   $m = \frac{1 - (-3)}{3 - 1} = \frac{4}{2} =$

   Use the slope and one point to write an equation of the line in slope-intercept form.

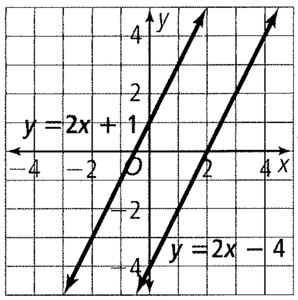
$y = mx + b$	Slope-intercept form of a linear equation.
$= \quad + b$	Substitute (1, –3) for (x_1, y_1) and 2 for m.
$b =$	Solve for b.

   An equation in slope-intercept form is .

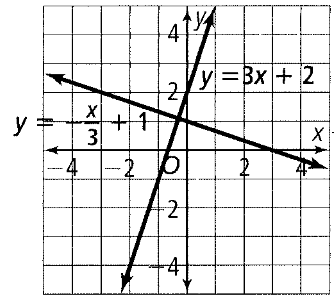
2-4 Reteach to Build Understanding

Parallel and Perpendicular Lines

1. The graphs show a pair of parallel and a pair of perpendicular lines.



Nonvertical lines are parallel if they have the same slope, but different *y*-intercepts. The lines have a slope of 2 and different *y*-intercepts.



Two nonvertical lines are perpendicular if the product of their slopes is −1. The lines have slopes of 3 and $-\frac{1}{3}$.

Determine whether the lines for each pair of equations are *parallel*, *perpendicular* or *neither*. Circle your response.

$y = 2x - 4$ $y = -2x + 5$	Parallel	Perpendicular	Neither
$y = \frac{2}{3}x + 1$ $y = -\frac{3}{2}x - 2$	Parallel	Perpendicular	Neither
$y = -3x - 1$ $y = -3x + 2$	Parallel	Perpendicular	Neither

2. Don says that of $y = \frac{3}{4}x + 2$ is parallel to $y = \frac{3}{4} + 8x$. Is he correct? Why or why not?

3. What is an equation in slope-intercept form of the line that passes through (2, 11) and is perpendicular to the graph of $y = \frac{1}{4}x - 5$? Complete the missing steps.

First, identify the slope of the given line. The slope is $\frac{1}{4}$. The slope of the perpendicular line is the negative reciprocal. The slope of the perpendicular line is ______.

$y - y_1 = m(x - x_1)$ — Point-slope form of a linear equation.

$y -$ ______ $= -4(x -$ ______ $)$ — Substitute (2, 11) for (x_1, y_1) and −4 for m.

$y -$ ______ $= -4x +$ ______ — Apply the Distributive Property and solve for y.

An equation in slope-intercept form is ______________.

3-1 Reteach to Build Understanding

Relations and Functions

1. The domain is the set of *x*-values and the range is the set of *y*-values. A relation is any set of ordered pairs. A relation is a function when each input, or element in the domain, has exactly one unique output, or element in the range.

   a. Draw a circle around the correct domain and range.

x	2	3	4	5	6
y	4	6	8	10	12

Range: {4, 6, 8, 10, 12}   Domain: {4, 6, 8, 10, 12}   Domain: {2, 3, 4, 5, 6}   Range: {2, 3, 4, 5, 6}

   b. Circle the relation that is a function.

x	2	3	4	5	6
y	4	6	8	10	12

x	2	2	4	5	6
y	5	6	7	9	11

x	2	3	4	5	4
y	4	5	6	8	2

2. Pilar is given the following set of ordered pairs. {(2, 4), (4, 6), (6, 8), (8, 10), (12, 8)}. Read her statements. Pilar incorrectly identified two of the key features of relations and functions. Put an X next to any incorrect statements. Correct her errors.

   a. The domain is {2, 4, 6, 8}.

   b. The range is {4, 6, 8, 10}.

   c. The set of ordered pairs is a relation.

   d. The relation is a function because it passes the vertical line test.

   e. The relation is not a function because two inputs go to the same output.

3. Identify the domain and range of each relation. Fill in the correct number(s) in the blanks to identify the domain and range. Then tell whether or not it is a function by circling the correct response.

   a. {(2, 3), (4, 6), (1, 5), (2, 5), (0, 5)}

      Domain: {0, 1, 2, ____ }

      Range: {3, 5, ____ }

      Function   Not a Function

   b. {(3, 4), (5, 4), (7, 4), (8, 4), (10, 4)}

      Domain: {3, 5, 7, ____ , ____ }

      Range: { ____ }

      Function   Not a Function

3-4 Reteach to Build Understanding

Arithmetic Sequences

1. Arithmetic sequences can be written using a recursive formula or an explicit formula. The formulas share some variables, but not others.

Recursive formula	**Explicit formula**
$a_n = a_{n-1} + d$	$a_n = a_1 + (n - 1)d$

Write the variable next to its description.

the nth term of the sequence

the first term of the sequence

the common difference

the previous term of the sequence

the term number in the sequence

2. Susan wrote the recursive formula for the sequence represented by the explicit formula $a_n = 3 + 2n$. Put an X next to any incorrect statements and correct her error(s).

Step 1: Identify the common difference.

The common difference is 3.

Step 2: Find the first term of the sequence.

$a_1 = 3 + 2(1) = 5$

Step 3: Write the recursive formula.

$a_n = a_{n-1} + 3$ and $a_1 = 5$

3. Van needs to enter a formula into a spreadsheet to show the outputs of an arithmetic sequence that starts with 13 and continues to add seven to each output. For now, Van needs to know what the 15th output will be. Complete the steps needed to determine the 15th term in the sequence.

$a_n = a_1 + (n - 1)d$	The explicit formula is $a_1 = 13$, $d = 7$.
$a_n = \qquad + (n - 1)$	Substitute Van's values for a_1 and d.
$a_n =$	Simplify.
$a_n =$	Simplify.
$a_{15} =$	Substitute for n.
$a_{15} =$	Solve for a_{15}.
$a_{15} =$	The 15th term in the sequence will be .

4-2 Reteach to Build Understanding

Solving Systems of Equations by Substitution

1. Circle the correct answer for each statement.

   Solve the system of linear equations $\begin{cases} 4x + 3y = 9 \\ x - 2y = 5 \end{cases}$ using substitution.

   The easiest variable to isolate is (x, y) in the (first, second) equation).

   Rewrite the equation in terms of the variable, $x = 2y + 5$.

   Since x was isolated in the (first, second) equation, substitute that expression for x into the (first, second) equation.

2. Complete the steps for solving the system of linear equations in Exercise 1.

   Substitute $2y + 5$ for x in the first equation.

   $4(\quad\quad) + 3y = 9$

   $8y + \quad\quad + \quad\quad = 9$

   $y =$

   $y =$

   Then, $x = 2(\quad\quad) + 5 = \quad\quad + 5 = \quad\quad$.

   The solution is ________.

3. Joseph solved the system of equations $\begin{cases} 2x + 5y = 3 \\ 3x + y = 11 \end{cases}$ as shown.

   $\begin{cases} 2x + 5y = 3 \\ 3x + y = 11 \rightarrow y = -3x + 11 \end{cases}$

   $3x + (-3x + 11) = 11$

   $11 = 11$

   There are infinitely many solutions.

   What is Joseph's error? Explain.

4-3 Reteach to Build Understanding

Solving Systems of Equations by Elimination

1. Match each system of equations with the method you would use to solve it. Each method matches with two systems.

Substitution
Solve a system of linear equations using substitution when an equation is already solved for one variable, or if it is easy to solve for one variable.

Elimination
Solve a system of linear equations using elimination if you can multiply either equation by a constant to get coefficients that are opposite.

$\begin{cases} y = 4x - 7 \\ 2x - 3y = 1 \end{cases}$ $\begin{cases} 4x + 3y = 8 \\ 5x - 3y = 1 \end{cases}$ $\begin{cases} 4x + 3y = 7 \\ 2x - 7y = 1 \end{cases}$ $\begin{cases} 2y + 1 = x \\ 2x - 3y = 1 \end{cases}$

2. Brad incorrectly solved the system of equations $\begin{cases} 6x - 7y = 5 \\ 3x - 5y = 1 \end{cases}$.

The answers should be integers. Find and correct his error.

$\begin{cases} 6x - 7y = 5 \\ 3x - 5y = 1 \end{cases}$ **Multiply by 2** $\begin{cases} 6x - 7y = 5 \\ 2(3x - 5y) = 2(1) \end{cases}$

Add the new equations to eliminate *x*.

$$\begin{array}{r} 6x - 7y = 5 \\ 6x - 10y = 2 \\ \hline -17y = 7 \\ y = -\frac{7}{17} \end{array}$$

3. Beatrice wanted to solve the system of equations $\begin{cases} 4x - 3y = 9 \\ 3x + 2y = 11 \end{cases}$ by elimination.

To eliminate the *x*-terms, Beatrice could multiply the first equation by ______ and the second equation by ______ and add equations.

To eliminate the *y*-terms, Beatrice could multiply the first equation by ______ and the second equation by ______ and add equations.

Name ______________________________

4-4 Reteach to Build Understanding

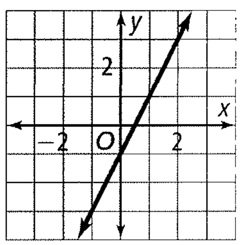
Linear Inequalities in Two Variables

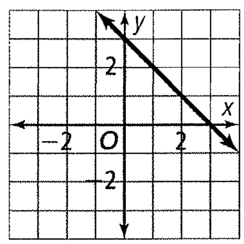
1. Match each inequality with its graph.

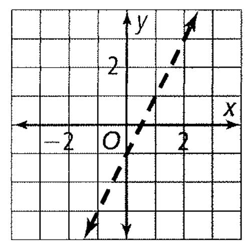
A boundary line that includes the points on the line is solid ($\leq$ or $\geq$).

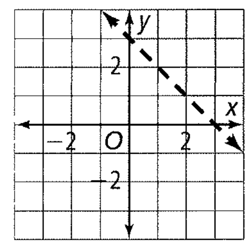
A boundary line that does not include the points on the line is dashed ($<$ or $>$).

$y < 2x - 1$ $\qquad$ $y > -x + 3$ $\qquad$ $y \geq 2x - 1$ $\qquad$ $y \leq -x + 3$

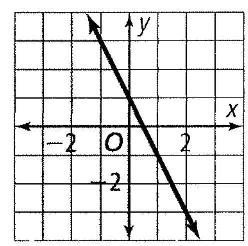




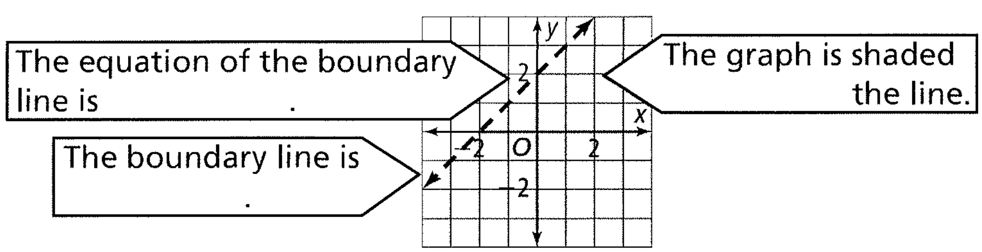




2. Anthony graphed the inequality $y < -2x + 1$ as shown. What error did Anthony make?



3. Use the diagram to complete each statement.



The inequality shown by the graph is ______.

6-1 Reteach to Build Understanding

Rational Exponents and Properties of Exponents

1. Each of the solutions shown uses a different property of exponents. Draw a line from each property to the solution that uses it.

$8^{\frac{1}{3}} \times 8^{\frac{1}{3}} = 8^{\frac{1}{3}+\frac{1}{3}}$	$\frac{27^{\frac{2}{3}}}{27^{\frac{1}{3}}} = 27^{\frac{2}{3}-\frac{1}{3}}$	$(16 \times 25)^{\frac{1}{2}} = 16^{\frac{1}{2}} \times 25^{\frac{1}{2}}$	$\left(9^{\frac{1}{3}}\right)^6 = 9^{\frac{1}{3}\times 6}$
$= 8^{\frac{2}{3}}$	$= 27^{\frac{1}{3}}$	$= 4 \times 5$	$= 9^2$
$= 4$	$= 3$	$= 20$	$= 81$

Power of a Power	Power of a Product	Product of Powers	Quotient of Powers

2. Rob incorrectly simplified the radical expression. Find and correct his error.

$$\sqrt[3]{64^2} = 64^{\frac{3}{2}}$$
$$= \left(64^{\frac{1}{2}}\right)^3$$
$$= 8^3$$
$$= 512$$

3. Complete the steps for solving this equation. Write numbers, variables, or expressions in the blanks.

$81^{x+6} = 243^{2x+5}$

$(3\ \ )^{x+6} = (3\ \ )^{2x+5}$ Write both expressions with a base of 3.

$3^{4(x+6)} = 3$ Use the Power of a Power Property.

$4(x + 6) =$ Write an equation for the exponents.

$4x +$ $= 10x +$ Use the Distributive Property.

$= 6x$

$= x$

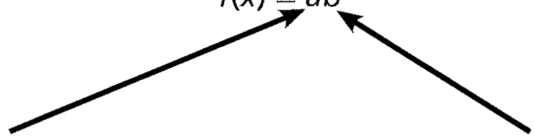
The solution is ______.

6-2 Reteach to Build Understanding

Exponential Functions

1. Label the parts of the exponential function shown.

$$f(x) = ab^x$$



2. Fill in the blanks with numbers or equations to describe the function represented by the table.

x	$f(x)$
0	5
1	10
2	20
3	40
4	80

$10 \div 5 =$

$20 \div 10 =$

$40 \div 20 =$

$80 \div 40 =$

The initial amount is ____________ .

The constant ratio is ____________ .

In $f(x) = ab^x$, substitute ____________ for a and ____________ for b.

The function represented by the table is ____________ .

3. Describe and correct the error that Isabella made when writing an exponential function.

x	$f(x)$
0	2
1	6
2	18
3	54
4	162
5	486

$6 \div 2 = 3$

$18 \div 6 = 3$

$54 \div 18 = 3$

$162 \div 54 = 3$

$486 \div 162 = 3$

starting value $= 2$

constant ratio $= 3$

$f(x) = 2x^3$

6-4 Reteach to Build Understanding

Geometric Sequences

1. Use words to label the parts of the formulas for the geometric sequences shown. Some have been done for you.

Explicit formula

$a_n = a_1(r)^{n-1}$

first term

Recursive formula

Initial condition: $a_1 =$

$a_n = r \cdot a_{(n-1)}$

previous term

2. Gina incorrectly wrote the explicit formula for the geometric sequence 27, 36, 48, 64, $85\frac{1}{3}$, ... Find and correct her error.

The first term is 27. The common ratio is $\frac{3}{4}$.

$a_n = a_1(r)^{n-1}$ $\quad$ $a_n = 27\left(\frac{3}{4}\right)^{n-1}$

The explicit formula is $a_n = 27\left(\frac{3}{4}\right)^{n-1}$.

3. Write the explicit formula for the geometric sequence 1.12, 2.8, 7, 17.5, 43.75, ... Then find the value of the 7th term.

$\frac{2.8}{1.12} = \frac{7}{2.8} = \frac{\quad}{7} = \frac{\quad}{17.5} = -$ $\quad$ Find the common ratio.

The first term is ______. $\quad$ Identify the first term.

$a_n = \quad \left(-\right)^{n-1}$ $\quad$ Substitute the values for a_1 and r.

$a_7 = \quad \left(-\right)^{7-1}$ $\quad$ Find the 7th term.

$a_7 =$ $\quad$ Simplify.

The 7th term in this geometric sequence is ______.

7-1 Reteach to Build Understanding

Adding and Subtracting Polynomials

1. Complete the sentences about each polynomial by writing a number in the first blank in each sentence, and a word in the second blank.

$7x^2 + 2x + 1$

There are ________ terms, so it is a ________.

The highest degree is ________, so it is ________.

$4x - 3$

There are ________ terms, so it is a ________.

The highest degree is ________, so it is ________.

$5x^3$

There is ________ term, so it is a ________.

The highest degree is ________, so it is ________.

2. Samara incorrectly added the polynomials $4x^2 + 2x - 3$ and $5x^3 + 3x^2 + x$. Place an X next to any errors. Explain and correct Samara's error.

$$\begin{array}{r} 4x^2 + 2x - 3 \\ +\ 5x^3 + 3x^2 + x \\ \hline 9x^3 + 5x^2 - 2x \end{array}$$

3. Find the difference $(4x^2 - 6x + 4) - (x^2 + x - 7)$.

$(4x^2 - 6x + 4) - (x^2 + x - 7) = 4x^2 - 6x + 4$

$= (4x^2 + \quad) + (-6x + \quad) + (4 + \quad)$

$= \quad x^2 + \quad x +$

The difference of $(4x^2 - 6x + 4)$ and $(x^2 + x - 7)$ is ________.

7-2 Reteach to Build Understanding

Multiplying Polynomials

1. Complete each product table using monomials. Then write the product for each table as a polynomial in standard form.

$(x + 4)(x - 5)$

	x	4
x		
-5		

The product is ____________________.

$(x + 4)(x^2 + 3x - 1)$

	x	4
x^2		
$3x$		
-1		

The product is ____________________.

2. Xavier said the product of a monomial and a binomial will always be a trinomial. Explain the error in his reasoning.

3. Complete the steps to find the product $(5x + 2)(x - 3)$ by writing expressions or numbers in the blanks.

$(5x + 2)(x - 3) =$ ____________ Distribute ______ and ______ to the second binomial.

$= 5x(\quad) + 5x(\quad) + 2(\quad) + 2(\quad)$ Distribute ______ and ______ to each term in the second binomial.

$=$ ____________ Multiply.

$=$ ____________ Combine like terms.

The product is ____________________.

7-3 Reteach to Build Understanding

Multiplying Special Cases

1. Label each item as *square of a binomial* or *product of a sum and difference.*

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

   $(x + 7)^2 = x^2 + 14x + 49$

   Square of the first term plus twice the product of the first and last terms plus the square of the last term

   $(a - b)^2 = a^2 - 2ab + b^2$

   Results in the difference of two squares

   $(x - 4)(x + 4) = x^2 - 16$

   $(a + b)^2 = a^2 + 2ab + b^2$

2. Brian incorrectly identified two of the features of the product $(x - 5)^2$. Put an X next to any incorrect statements. Correct his errors.

   a. Use the square of a binomial pattern to find the product.

   b. The result is a difference of two squares.

   c. The first term of the product is x^2.

   d. The last term of the product is −25.

   e. The middle term of the product is $-10x$.

3. Find the product of $(2x + 6)$ and $(2x - 6)$.

   Use the Distributive Property to find the product.

   $(2x + 6)(2x - 6) = \quad (2x - 6) + \quad (2x - 6)$

   $=$

   $=$

   The product of $(2x + 6)$ and $(2x - 6)$ is ________.

7-4 Reteach to Build Understanding

Factoring Polynomials

1. For the polynomial, circle the common factors to determine the GCF and write it in the blank. Use the GCF to write the factored form of the polynomial.

$$\mathbf{12x^3y^3 - 8x^2y + 30x}$$

$2 \times 2 \times 3 \times x \times x \times x \times y \times y \times y$ $-1 \times 2 \times 2 \times 2 \times x \times x \times y$ $2 \times 3 \times 5 \times x$

GCF:

Factored polynomial: $(6x^2y^3 - 4xy + 15)$

2. Circle the GCF of the polynomial $15x^2y^3 + 10xy^2 + 5y$.

Use the GCF to write the factored form of the polynomial.

$$\mathbf{15x^2y^3 + 10xy^2 + 5y}$$

$3 \times 5 \times x \times x \times y \times y \times y$ $2 \times 5 \times x \times y \times y$ $5 \times y$

GCF:

Factored polynomial:

3. James incorrectly factored the polynomial. Find and correct his error.

$$\mathbf{14x^3y^2 + 42x^2y^2 - 10xy^2}$$

$2 \times 7 \times x \times x \times x \times y \times y$ $2 \times 3 \times 7 \times x \times x \times y \times y$ $-2 \times 5 \times x \times y \times y$

The greatest common factor is xy^2.

The factored form of the polynomial is $xy^2(14x^2 + 42x - 10)$.

7-5 Reteach to Build Understanding

Factoring $x^2 + bx + c$

1. Match each example of factoring to the appropriate description.

When both b and c are positive, the second terms of the binomials are both positive.

When b is negative and c is positive, the second terms of the binomials are both negative.

When c is negative, the second terms of the binomials have opposite signs.

$x^2 - 7x + 10 =$
$(x - 5)(x - 2)$

$x^2 - 3x - 10 =$
$(x - 5)(x + 2)$

$x^2 + 7x + 10 =$
$(x + 5)(x + 2)$

2. Complete the steps for factoring $x^2 - 10x + 24$ by filling in the blanks with a word or a number. Then write the factored form in the last sentence.

Identify a pair of factors for ________ that have a sum equal to ________.

Because b is ________ and c is ________ in the trinomial $x^2 - 10x + 24$, the second term in both factors will be ________.

The factored form of $x^2 - 10x + 24$ is ________.

3. Shannon said she can find the factored form of a trinomial of the form $x^2 + bx + c$ from the factors of b. The sum of the factors of b will equal c. Explain Shannon's error.

7-6 Reteach to Build Understanding

Factoring $ax^2 + bx + c$

1. Label each item as *factor by grouping* or *factor using substitution.*

To factor a trinomial of the form $ax^2 + bx + c$, find a factor pair of ac that has the sum of b. Rewrite bx as a sum of those factors. Then factor out the GCF from the two groups of terms to write the original trinomial as the product of two binomials.

To factor a trinomial of the form $ax^2 + bx + c$, multiply the trinomial by a. Rewrite the first two terms using ax. Substitute a single variable for ax. Factor the trinomial. Substitute ax back in for the variable. Divide by a.

2. Factor each polynomial.

Factor $2x^2 - 9x - 5$ using substitution.

$(2x^2 - 9x - 5)$

$= (2x)^2 - 9(\quad) -$

$= p^2 - \quad -$

$= (p - \quad)(p + \quad)$

$= (2x - \quad)(2x + \quad)$

$= 2(\quad)(\quad)$

Factor $2x^2 + 11x + 5$ by grouping.

$= 2x^2 + \quad + \quad + 5$

$= 2x(\quad) + 1(\quad)$

$=$

3. Describe and correct the error a student made in factoring $2x^2 + 13x + 21$ using substitution.

$2x^2 + 13x + 21$

$2(2x^2 + 13x + 21)$

$= (2x)^2 + 13(2x) + 42$

$= p^2 + 13p + 42$

$= (p + 6)(p + 7)$

$= (2x + 6)(2x + 7)$

7-7 Reteach to Build Understanding

Factoring Special Cases

1. Label each item as *perfect-square trinomial* or *difference of two squares.*

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

$x^2 - 12x + 36 = (x - 6)^2$

Use this pattern when the first and last terms are perfect squares and the middle term is twice the product of the expressions being squared.

$a^2 - 2ab + b^2 = (a - b)^2$

Use this pattern when a binomial can be written as the square of one number minus the square of another number.

$4x^2 - 49 = (2x - 7)(2x + 7)$

$a^2 + 2ab + b^2 = (a + b)^2$

2. Complete the steps for factoring $2x^3 - 36x^2 + 162x$ by writing words, numbers, or expressions in the blanks.

$2x^3 - 36x^2 + 162x =$	$\_\_\_\_(x^2 - 18x + 81)$	Factor out ____.
$=$	$\_\_\_\_[x^2 - 2(\_\_\_\_)x + (\_\_\_\_)^2]$	Rewrite the trinomial.
$=$	$\_\_\_\_(x - \_\_\_\_)(x - \_\_\_\_)$	Use the ____ pattern.
$=$	$\_\_\_\_(x - \_\_\_\_)^2$	Simplify.

3. Describe and correct the error Teddy made in factoring $x^2 - 49$.

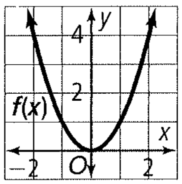
$x^2 - 49 = (x - 7)^2$

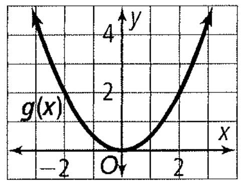
Both terms in the binomial are perfect squares, so use the perfect–square trinomial pattern.

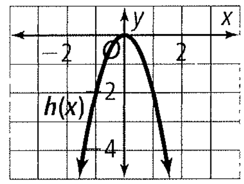
8-1 Reteach to Build Understanding

Key Features of Quadratic Functions

1. Determine whether each statement about the graphs *f*, *g*, and *h* are true or false.







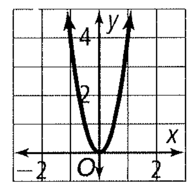
The vertex of each graph is at (0, 0).

Graphs *f* and *h* have a minimum value.

Graph *h* has a negative value for *a*.

Graphs *g* and *h* have the same axis of symmetry.

2. Sasha wrote statements shown at the right and labeled them as true or false. She labeled two statements incorrectly. Identify these two statements and write the correct description or label.



a. Since $a > 0$, the graph opens upward. TRUE

b. Since $|a| > 1$, the shape of the parabola is wider than the quadratic parent function. TRUE

c. The vertex of the parabola is (0, 0). TRUE

d. The axis of symmetry is the line $x = 0$. FALSE

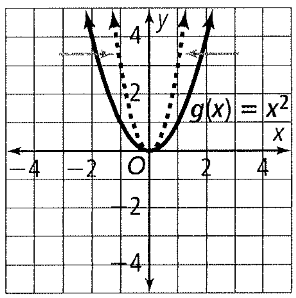
3. Jose wants to graph the functions $f(x) = 0.25x^2$ and $g(x) = 0.25x^2$. Complete Jose's work on identifying key features of these graphs.

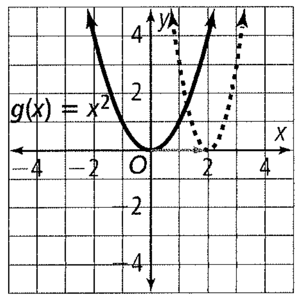
Key Feature	$f(x) = 0.25x^2$	$g(x) = 1.25x^2$
Vertex	(0, 0)	
Axis of Symmetry	$x = 0$	
Direction Parabola Opens	upward	
Narrower or Wider Than $f(x) = x^2$	narrower	
Endpoints Over Interval $2 \le x \le 6$	(2, 1); (6, 9)	
Rate of Change Over Interval $2 \le x \le 6$	$f(x) = \frac{9-1}{6-2} = 2$	

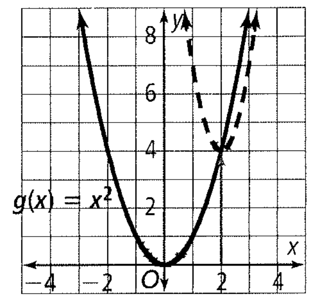
8-2 Reteach to Build Understanding

Vertex Form of a Quadratic Function

1. a. These graphs show how the values of *a*, *h*, and *k* in the function $f(x) = 3(x - 2)^2 + 4$ relates to the parent function $g(x) = x^2$. Draw lines from each statement to the graph it describes.







The value of *k* is 4, so the graph translates 4 units up.	The value of *h* is 2, so the graph translates 2 units right.	The value of *a* is 3, so the parabola is narrower.

b. Write numbers in the blanks to complete each statement about $f(x)$.

The vertex of a parabola is (h, k). The vertex is located at (,   ).

The axis of symmetry is at $x = h$. The axis of symmetry is at $x =$ ____ .

2. Martin incorrectly identified two of the key features of the graph of $f(x) = -6(x + 2)^2 - 4$. Put an X next to any incorrect statements. Correct his errors.

a. The value of *a* is −6, so the graph opens down.

b. The value of *h* is −2, so the graph is translated 2 units left from the graph of the parent function.

c. The value of *k* is 4, so the graph is translated 4 units up from the graph of the parent function.

d. The vertex of $f(x)$ is located at (−2, 4).

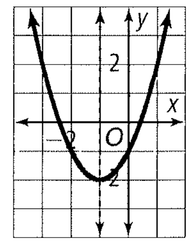
e. The axis of symmetry of $f(x)$ is at $x = -2$.

f. The value of a is −6, so the graph of the function is very narrow.

8-3 Reteach to Build Understanding

Quadratic Functions in Standard Form

1. Fill in the matching part on the graph to the right.



The y-intercept is __________.

The axis of symmetry is __________.

The vertex is __________.

2. Circle the correct answer.

The equation for finding the x-coordinate of the axis of symmetry is:

c $\qquad$ $-\frac{b}{2a}$ $\qquad$ $f(x) = ax^2 + bx + c$

3. For the graph of $f(x) = -3x^2 + 6x - 1$, draw lines from each part of the parabola to the correct answer.

y-intercept	1
axis of symmetry	−1
x-coordinate of the vertex	$x = 1$
y-coordinate of the vertex	(1, 2)
vertex	2

4. Chen predicted that the function $f(x) = 1.5x^2 - 9x + 7$ would have an axis of symmetry at $x = 3$ with the vertex at (3, 7). Do you agree or disagree with Chen? Explain.

5. Fill in the missing spaces in the table below.

Features	$f(x) = -2x^2 + 8x + 1$	$g(x) = 3x^2 + 6x - 4$
y-intercept		(0, −4)
vertex	(−2, ____)	(____, −7)
axis of symmetry	$x = -2$	
maximum or minimum value		minimum
opens upward or downward		upward

9-2 Reteach to Build Understanding

Solve Quadratic Equations by Factoring

1. Match each equation with its factored form. Then match each factored form with its solution.

$x^2 + 2x - 3 = 0$	$(x - 5)(x - 2) = 0$	Solutions: –6 and –4
$x^2 + 10x + 3 = -21$	$(x - 1)(x + 3) = 0$	Solutions: –3 and 1
$x^2 - 7x - 3 = -13$	$(x + 4)(x + 6) = 0$	Solutions: 2 and 5

2. Nora made an incorrect statement when using factoring to solve the equation $x^2 + 2x - 12 = 3$. Put an X next to the incorrect statement. Correct her error.

The standard form of the equation is $x^2 + 2x - 15 = 0$.

The factored form of the equation is $(x - 3)(x + 5) = 0$.

Because $(x - 3)(x + 5) = 0$, you can use the Zero-Product Property to write $(x - 3) = 0$ or $(x + 5) = 0$.

The solutions of the equation are –3 and 5.

The x-coordinate of the vertex of the related function is –1.

3. Write the factored form of the equation $x^2 - 4x + 3 = 15$. Then find the solutions.

Write the equation in standard form. $x^2 - 4x \qquad = 0$

Factor the quadratic equation. $(x \qquad)(x \qquad) = 0$

Determine the solutions. $(x \qquad) = 0$ or $(x \qquad) = 0$

$x = \qquad\qquad x =$

The solutions of the equation $x^2 - 4x + 3 = 15$ are ______ and ______.

9-3 Reteach to Build Understanding

Rewriting Radical Expressions

1. Use the Product Property of Square Roots to simplify each expression. Then match each expression in the left column with an equivalent expression in the right column.

   The **Product Property of Square Roots** states that $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$ when both a and b are greater than or equal to 0.

$\sqrt{28}$	$90\sqrt{5}$
$19\sqrt{24x^3}$	$2\sqrt{7}$
$7\sqrt{5x} \cdot 3\sqrt{15x^2}$	$105x\sqrt{3x}$
$9\sqrt{2} \cdot 5\sqrt{10}$	$38x\sqrt{6x}$

2. Complete the steps for multiplying the expression $5\sqrt{8x^3} \cdot 9\sqrt{20x}$.

$5\sqrt{8x^3} \cdot 9\sqrt{20x} = 5 \cdot 9\sqrt{}$ ← Multiply the constants and use the Product Property of Square Roots to multiply the radicals.

$= 45\sqrt{ x \cdot x \cdot x \cdot x}$

$= 45\sqrt{}\ \sqrt{}\ \sqrt{} \cdot \sqrt{x^2 \cdot x^2}$ ← Group numbers and variables under the radicals to form perfect squares.

$= 45 \cdot$

$=$

3. Addison completed the steps for multiplying the expression $4\sqrt{3x^2} \cdot 3\sqrt{12x}$. Find and correct his error.

$4\sqrt{3x^2} \cdot 3\sqrt{12x} = 4 \cdot 3\sqrt{3x^2 \cdot 12x}$

$= 12\sqrt{3 \cdot 3 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x}$

$= 12\sqrt{3 \cdot 3} \cdot \sqrt{2 \cdot 2} \cdot \sqrt{x^3}$

$= 12 \cdot 3 \cdot 2 \cdot x \cdot \sqrt{x^2}$

$= 72x^2$

9-4 Reteach to Build Understanding

Solving Quadratic Equations Using Square Roots

1. Match each equation with its solution(s).

$x^2 = 9$	no solution
$7x^2 - 6 = 15$	$x = 0$
$4x^2 + 19 = 7$	$x = \pm\sqrt{3}$
$3x^2 + 4 = 4$	$x = \pm 3$

2. A student made an error when solving the quadratic equation. Find and correct the error the student made.

$$-5x^2 + 11 = -14$$
$$-5x^2 + 11 - 11 = -14 - 11$$
$$-5x^2 = -25$$
$$x^2 = 5$$
$$x = \sqrt{5}$$

3. Find the solution of the quadratic equation $9x^2 - 4 = 23$ using square roots. Approximate if necessary.

Write in the form $x^2 = a$, where a is a real number.

$$9x^2 - 4 + 4 = 23 + 4$$
$$9x^2 = 27$$
$$x^2 = 3$$

Take the square root of each side.

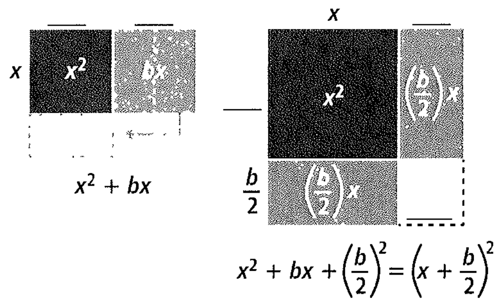
$$\sqrt{x^2} =$$
$$x =$$

The approximate solutions of the quadratic equation $9x^2 - 4 = 23$ would be between ____ and ____, since ____ is between ____ and ____.

9-5 Reteach to Build Understanding

Completing the Square

1. Label each part of the diagram to show how to complete the square.



2. Fill in the blanks to find the solutions of $x^2 - 18x + 15 = 0$ by completing the square.

Write the equation in the form $ax^2 + bx = d$. $x^2 - 18x =$

Complete the square. $x^2 - 18x + \quad = \quad +$

$x^2 - 18x + \quad =$

Write the trinomial as a binomial squared. $(x - \quad)^2 =$

Solve for x. $x - \quad =$

$x = \quad \pm$

3. The side lengths of a rectangle are given as $x + 8$ and $x - 2$. Reece calculated the area of the rectangle by completing the square. Find and correct her error.

$(x + 8)(x - 2) = x^2 + 6x - 16$

$x^2 + 6x = 16$

$x^2 + 6x + 9 = 16 + 9$

$x^2 + 6x + 9 = 25$

$(x + 3)^2 = 25$

$x + 3 - 3 = 25 - 3$

$x = 22$

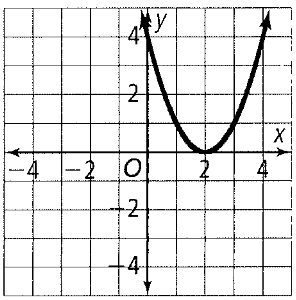
Name ______________________

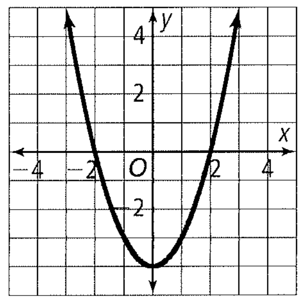
9-6 Reteach to Build Understanding

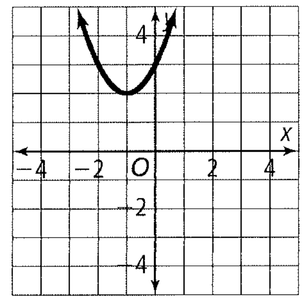
The Quadratic Formula and the Discriminant

1. Fill in the blanks to complete the statements.

For a quadratic equation $ax^2 + bx + c = 0$, the quadratic formula gives the solutions of the equation as $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The discriminant is ________.







When the discriminant is ________, there is one real root.

When the discriminant is ________, there are two real roots.

When the discriminant is ________, there are no real roots.

2. Fill in the blanks with numbers to find the solutions of $x^2 - 5 = 3x$ using the quadratic formula.

Step 1 Write the equation in standard form and identify a, b, and c.

$x^2 - 3x - 5 =$ ____

$a =$ ____ , $b =$ ____ , $c =$ ____

Step 2 Substitute the values for a, b, and c into the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-\underline{\quad} \pm \sqrt{\underline{\quad}^2 - 4(1)(\underline{\quad})}}{2(\underline{\quad})}$$

Step 3 Simplify.

$$x = \frac{\underline{\quad} \pm \sqrt{\underline{\quad}}}{\underline{\quad}}$$

$x = \frac{\underline{\quad} + \sqrt{\underline{\quad}}}{\underline{\quad}} \approx$ ____ or $x = \frac{\underline{\quad} - \sqrt{\underline{\quad}}}{\underline{\quad}} \approx$ ____

The solutions of $x^2 - 5 = 3x$ are $x \approx$ ____ and $x \approx$ ____.

3. A student says that she can use the discriminant to find the solutions of an equation. Explain the error the student made.