HARRISBURG
CHRISTIAN SCHOOL

Summer Math

for students entering

Algebra II

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

2.6 Adding and Subtracting Expressions

◆ **Skill A** Simplifying expressions with like terms

Recall Like terms can be combined by using the Distributive Property.

◆ **Example 1**

Simplify $(-3x + 2) + (8x - 15)$.

◆ **Solution**

The terms $-3x$ and $8x$ are like terms, and 2 and -15 are like terms.
Rearrange the like terms and then simplify.

$$\begin{aligned}(-3x + 2) + (8x - 15) &= (-3x + 8x) + (2 - 15)\\ &= (-3 + 8)x + (2 - 15)\\ &= 5x + (-13), \text{ or } 5x - 13\end{aligned}$$

Thus, $(-3x + 2) + (8x - 15) = 5x - 13$.

◆ **Example 2**

Simplify $2(-2p + 3q) + (5p + 2q)$.

◆ **Solution**

Apply the Distributive Property, group the like terms, and then simplify.

$$\begin{aligned}2(-2p + 3q) + (5p + 2q) &= 2(-2p) + 2(3q) + (5p + 2q)\\ &= (-4p + 6q) + (5p + 2q)\\ &= (-4p + 5p) + (6q + 2q)\\ &= p + 8q\end{aligned}$$

$-4p$ and $5q$ are like terms. $6q$ and $2q$ are like terms.

Thus, $2(-2p + 3q) + (5p + 2q) = p + 8q$.

Simplify the following expressions:

1. $(x + 6) + (3x + 3)$ ____________
2. $(2m + 4) + (5m - 6)$ ____________
3. $(12 - 7y) + (4y + 10)$ ____________
4. $(2a + 6b) + (-6a - b)$ ____________
5. $(-8x - 13) + (2x - 9)$ ____________
6. $(4n + 5) + (3n + 6m)$ ____________
7. $(7x - 15) + (23 - 4x)$ ____________
8. $(3m + 17) + (-m - 19)$ ____________
9. $(4p + 6q - 11r) + (-8p + 6q - 3r)$ ____________
10. $(3x - 3y) + (12x - 2y) + (11x - y)$ ____________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching
2.7 Multiplying and Dividing Expressions

◆ **Skill A** Multiplying expressions

Recall In the expression x^3, x is called the base, and 3 is called the exponent. The exponent tells how many times the base appears as a factor.
For example, $x^3 = (x)(x)(x)$, $x^1 = x$, and $x^0 = 1$.

◆ **Example 1**
Simplify the expression $3x \cdot (-5x)$.

◆ **Solution**

$$\begin{aligned} 3x \cdot (-5x) &= (3x)(-5x) \\ &= (3)(-5)(x)(x) \\ &= -15x^2 \end{aligned}$$

Thus, $3x \cdot (-5x) = -15x^2$.

◆ **Example 2**
Simplify the expression $4x(2x - 3)$.

◆ **Solution**
Use the Distributive Property.

$$\begin{aligned} 4x(2x - 3) &= (4x)(2x) - (4x)(3) \\ &= 8x^2 - 12x \end{aligned}$$

Thus, $4x(2x - 3) = 8x^2 - 12x$.

◆ **Example 3**
Simplify the expression $8x^2 - 3x(x + 1)$.

◆ **Solution**
Use the definition of subtraction and then use the Distributive Property.

$$\begin{aligned} 8x^2 - 3x(x + 1) &= 8x^2 + (-3x)(x + 1) \\ &= 8x^2 + (-3x)(x) + (-3x)(1) \\ &= 8x^2 + (-3x^2) + (-3x) \\ &= 5x^2 - 3x \end{aligned}$$

Thus, $8x^2 - 3x(x + 1) = 5x^2 - 3x$.

Simplify the following expressions. Use the Distributive Property if needed.

1. $(-2x)(11x)$ ______________

2. $5(4x^2) - 2(3x^2)$ ______________

3. $-2(x^2 + x)$ ______________

4. $(2x - 3x^2)6$ ______________

5. $x(x + 4)$ ______________

6. 6. $3x(x - 8)$ ______________

7. $(2x + 10)(5x)$ ______________

8. $-7x(5 - x)$ ______________

9. $6x^2 - x(8x + 2)$ ______________

10. $-3x^2 - 4x(2 - x)$ ______________

NAME ______________________ CLASS __________ DATE __________

Reteaching
3.3 Solving Two-Step Equations

◆ **Skill A** Solving two-step equations

Recall To solve equations, use addition, subtraction, multiplication, or division to isolate the variables.

◆ **Example 1**

Solve $3x + 2 = 17$.

◆ **Solution**

$3x + 2 = 17$

$3x + 2 - 2 = 17 - 2$ Subtract 2 from each side of the equation.

$\frac{3x}{3} = \frac{15}{3}$ Divide each side of the resulting equation by 3.

$x = 5$

◆ **Example 2**

Solve $\frac{x}{3} - 4 = 1$.

◆ **Solution**

$\frac{x}{3} - 4 = 1$

$\frac{x}{3} - 4 + 4 = 1 + 4$ Add 4 to each side of the equation.

$(3)\frac{x}{3} = 5(3)$ Multiply each side of the resulting equation by 3.

$x = 15$

Solve each equation.

1. $3x + 2 = 8$ __________

2. $2t - 4 = 8$ __________

3. $5y + 10 = 30$ __________

4. $7x + 2 = 37$ __________

5. $-2 + 7x = 33$ __________

6. $-2 + \frac{z}{2} = 1$ __________

7. $\frac{s}{4} + 2 = 6$ __________

8. $9w - 4 = 77$ __________

9. $20 + 2f = 2$ __________

10. $10 + 6c = 52$ __________

11. $8x - 5 = 43$ __________

12. $2 - \frac{t}{9} = 11$ __________

13. $32x + \frac{1}{2} = 16.5$ __________

14. $16x - \frac{1}{4} = 63.75$ __________

15. $-72 + 14j = -2$ __________

16. $-4 + 6k = -34$ __________

NAME ______________________ CLASS __________ DATE __________

Reteaching

3.4 Solving Multistep Equations

◆ **Skill A** Solve multistep equations with variables on both sides

Recall To solve an equation with variables on both sides, you must isolate the variable.

◆ **Example**

Solve $4x - 3 = 2x + 5$.

◆ **Solution**

$4x - 3 = 2x + 5$

$4x - 3 - 2x = 2x + 5 - 2x$ Get all the terms with x on the left side of the equation.

$2x - 3 = 5$

$2x = 8$ Solve as a two-step equation.

$x = 4$

Solve and check each equation.

1. $2x + 1 = 5x - 2$ ______________________

2. $8y - 7 = 7y - 15$ ______________________

3. $4a + 2 = 8a + 18$ ______________________

4. $9x + 6 = 26 - x$ ______________________

5. $12t - 19 = 15t + 8$ ______________________

6. $13 - 6x = 6x + 1$ ______________________

7. $4y - 11 = 9 - 4y$ ______________________

8. $15b + 14 = 5b + 4$ ______________________

9. $30w - 50 = 12w - 14$ ______________________

10. $7p - 10 = 12 - 4p$ ______________________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

3.5 Using the Distributive Property

◆ **Skill A** Solving multistep equations with variables inside parentheses

Recall Use the Distributive Property to help simplify the equation by removing the parentheses.
Distributive Property: $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$

◆ **Example 1**
Solve $2(6x + 4) = 68$.

◆ **Solution**

$2(6x + 4) = 68$	Given
$2(6x) + 2(4) = 68$	Distributive Property
$12x + 8 = 68$	Simplify.
$12x = 60$	Subtraction Property of Equality
$x = 5$	Division Property of Equality

◆ **Example 2**
Solve $9t - 3(2t - 5) = 45$.

◆ **Solution**

$9t - 3(2t - 5) = 45$	Given
$9t - [3(2t) - 3(5)] = 45$	Distributive Property
$9t - 6t + 15 = 45$	Simplify.
$3t + 15 = 45$	Combine like terms.
$3t = 30$	Subtraction Property of Equality
$t = 10$	Division Property of Equality

Solve each equation.

1. $6(x + 2) = -24$ ____________
2. $3(2t + 4) = 42$ ____________
3. $9(z + 2) = 45$ ____________
4. $8(k + 20) = 52$ ____________
5. $2(x + 2) + 4 = 16$ ____________
6. $6(3m - 2) = 24$ ____________
7. $2h + 2(2h + 4) = 26$ ____________
8. $7(2n + 3) = 91$ ____________
9. $8(3t + 2) - 60 = 28$ ____________
10. $-4(8c + 2) - 52 = 100$ ____________
11. $4(2f - 3) + 3 = 39$ ____________
12. $5(3y + 2) + 10 = 105$ ____________

NAME ____________________ CLASS __________ DATE __________

Reteaching
5.4 The Slope-Intercept Form

◆ Skill A Writing an equation of a line in slope-intercept form

Recall The slope-intercept form of a line is $y = mx + b$.

m ↑ slope, b ↑ y-intercept

◆ Example

Write an equation for each line.

a. containing (0, 1) and with a slope of −2

b. containing (3, −4) and (9, 0)

◆ Solution

a. The slope, m, is given as −2. The line contains (0, 1), so this point is the y-intercept, or b is 1. Substituting these numbers into the equation gives $y = -2x + 1$.

b. First find the slope. $m = \frac{-4-0}{3-9} = \frac{-4}{-6} = \frac{2}{3}$

Then subtitute the coordinates of one of the given points into the equation and solve for b.

For the point (9, 0): $0 = \frac{2}{3}(9) + b$

$0 = 6 + b$

$b = -6$

Substituting this number for b and $\frac{2}{3}$ for m into the equation $y = mx + b$ gives the equation $y = \frac{2}{3}x - 6$.

For each equation, find the slope and the y-intercept.

1. $y = 3x - 1$ __________ **2.** $y = \frac{1}{2}x + 2$ __________ **3.** $y = -x + \frac{1}{2}$ __________

Write an equation in slope-intercept form for each line.

4. with a slope of 2 and a y-intercept of −1 __________

5. containing (0, −3) and with a slope of $\frac{1}{3}$ __________

Write an equation in slope-intercept form for the line that contains each pair of points.

6. (1, 1) and (3, 5) __________ **7.** (2, −4) and (−1, 5) __________

8. (2, 4) and (−4, 1) __________ **9.** (1, 0) and (3, 2) __________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching
5.6 Parallel and Perpendicular Lines

◆ **Skill A** Writing an equation of a line that is parallel to a given line

Recall If two different lines have the same slope, the lines are parallel.
If two different lines are parallel, they have the same slope.
All vertical lines and all horizontal lines are parallel.

◆ **Example**
Write an equation for a line that contains the point (3, 5) and that is parallel to $2x - y = 3$.

◆ **Solution**

Step 1 To find the slope of the given equation, write an equation in the form $y = mx + b$.

$2x - y = 3$
$-y = -2x + 3$ Subtract $2x$ from each side.
$y = 2x + 3$ Multiply each side by -1.

The slope is 2. The slope of a parallel line must also be 2.

Step 2 Use the point-slope form for the equation of a line.

$y - y_1 = m(x - x_1)$
$y - 5 = 2(x - 3)$ Substitute the slope and the point (3, 5) into the equation.

Find the slope of a line that is parallel to the following lines:

1. $y = -\frac{1}{2}x + 1$ ____________
2. $3x + y = 5$ ____________
3. $12 = 2x - 3y$ ____________
4. $x + \frac{1}{4}y = 1$ ____________

Write an equation in point-slope form for each line according to the given information. Show your work.

5. containing $(-1, -4)$ and parallel to $y = 3x + 2$ ____________

6. containing $(2, -4)$ and parallel to $x - 2y = 5$ ____________

7. containing $(-2, 3)$ and parallel to $x = 1$ ____________

8. containing (4, 15) and parallel to $-x + \frac{2}{3}y = 6$ ____________

9. containing $(-1, -6)$ and parallel to $y = -1$ ____________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

6.5 *Absolute-Value Equations and Inequalities*

◆ **Skill A** Solving absolute-value equations

Recall To solve absolute-value equations, you must consider two cases.
Case 1: Consider the quantity within the absolute-value sign as positive.
Case 2: Consider the quantity within the absolute-value sign as negative.

◆ **Example 1**
Solve $|x + 1| = 4$.

◆ **Solution**

Case 1: when $(x + 1)$ is positive

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

Case 2: when $(x + 1)$ is negative

$$-(x + 1) = 4$$
$$-x - 1 = 4$$
$$-x = 5$$
$$x = -5$$

Thus, $x = 3$ or $x = -5$.

◆ **Example 2**
Solve $|5x + 7| = 42$.

◆ **Solution**

Case 1: when $(5x + 7)$ is positive

$$5x + 7 = 42$$
$$5x = 35$$
$$x = 7$$

Case 2: when $(5x + 7)$ is negative

$$-(5x + 7) = 42$$
$$-5x - 7 = 42$$
$$-5x = 49$$
$$x = -9.8$$

Thus, $x = 7$ or $x = -9.8$.

Solve each equation if possible. Check your answers.

1. $|x + 2| = 10$ ____________ **2.** $|x - 9| = 5$ ____________

3. $|3 - x| = 2$ ____________ **4.** $|x - 12| = 3$ ____________

5. $|5 - x| = 1$ ____________ **6.** $|x + 7| = 18$ ____________

7. $|2x - 1| = 11$ ____________ **8.** $|8 - 3x| = 1$ ____________

9. $|6x + 3| = 27$ ____________ **10.** $|\frac{1}{2}x + 4| = 5$ ____________

11. $|5x - 8| = 12$ ____________ **12.** $|-1 - 4x| = 11$ ____________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

7.3 The Elimination Method

◆ **Skill A** Solving a system of equations by using addition or subtraction

Recall If the x- or y-terms in the two equations are opposites, you can eliminate the variable by using the Addition Property of Equality. If they have the same coefficients, you can eliminate the variable by using the Subtraction Property of Equality.

◆ **Example**

Solve by elimination.

$$\begin{cases} x - y = 8 \\ x + y = 2 \end{cases}$$

◆ **Solution**

Since y and $-y$ are opposites, use the Addition Property of Equality to combine equations. Then solve the resulting equation for x.

$$\begin{aligned} x - y &= 8 \\ x + y &= 2 \\ 2x &= 10 \\ x &= 5 \end{aligned}$$

Given $x = 5$, solve for y in either equation.

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

Thus, the solution is $(5, -3)$.

Check the solution in both of the original equations in order to make sure that your answer is correct.

Solve each system of equations by elimination, and check your solution.

1. $\begin{cases} 2x - 2y = -10 \\ 2x + 2y = 50 \end{cases}$ ______________________

2. $\begin{cases} x + 3y = 5 \\ x + 2y = 3 \end{cases}$ ______________________

3. $\begin{cases} 5x + y = 9 \\ -5x + y = 7 \end{cases}$ ______________________

4. $\begin{cases} 3x - 12y = 18 \\ 9x + 12y = 30 \end{cases}$ ______________________

5. $\begin{cases} 3x + 4y = 2 \\ 4x - 4y = 12 \end{cases}$ ______________________

6. $\begin{cases} \frac{1}{2}x + y = 5 \\ \frac{3}{2}x - y = 30 \end{cases}$ ______________________

NAME ________________________ CLASS ____________ DATE ____________

Reteaching

7.5 *Systems of Inequalities*

◆ Skill A Graphing systems of linear inequalities

Recall A system of linear inequalities is graphed in much the same way as a system of equations. Solve each inequality for y and then graph the inequalities as solid or dotted lines on the same coordinate plane. Shade the region that contains the solutions to both inequalities.

◆ Example

Graph. $\begin{cases} 3x + y > 8 \\ x + y \leq 4 \end{cases}$

◆ Solution

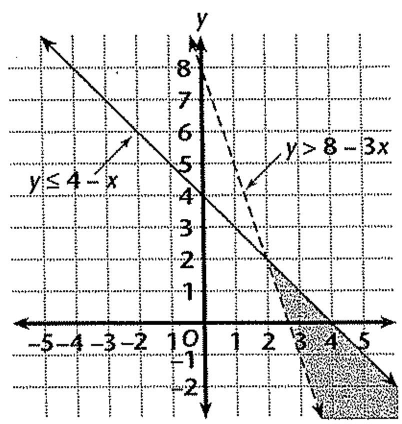
Solve both inequalities for y.

$3x - 3x + y > 8 - 3x$	Subtraction Property of Equality
$y > 8 - 3x$	Simplify.
$x - x + y \leq 4 - x$	Subtraction Property of Equality
$y \leq 4 - x$	Simplify.

Graph both inequalities on the same coordinate plane.

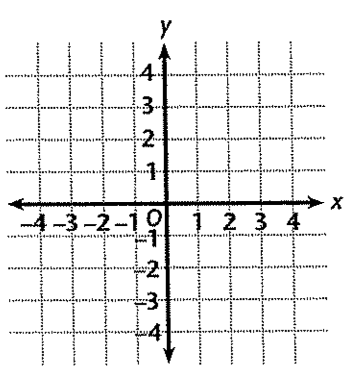
The first line, $y > 8 - 3x$, is dotted because the solutions do not include the line. The other line, $y \leq 4 - x$, is solid because it is included in the solution.

The solutions lie in the shaded region between the two lines and below the point of intersection.

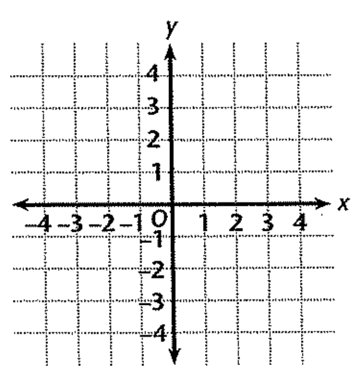


Graph each system of inequalities on the grid provided.

1. $\begin{cases} y < 8x - 4 \\ y > x - 2 \end{cases}$



2. $\begin{cases} y - 2x \geq 3 \\ 2y + x \geq -5 \end{cases}$



NAME ______________________ CLASS __________ DATE __________

◆ Skill B Using the Product-of-Powers Property to simplify expressions

Recall If x is any number and m and n are any positive integers, then: $x^m \cdot x^n = x^{m+n}$.

◆ Example

Simplify.

◆ Solution

$2^3 \cdot 2^4 = 2^{3+4}$

$= 2^7$

Thus, $2^3 \cdot 2^4 = 2^7$.

Simplify each product. Then find the value of the expression.

11. $3^5 \cdot 3^4$ __________ **12.** $2^5 \cdot 2^2$ __________

13. $10^5 \cdot 10^3$ __________ **14.** $5^6 \cdot 5^1$ __________

15. $8^4 \cdot 8^6$ __________ **16.** $4^3 \cdot 4^4$ __________

◆ Skill C Using the Product-of-Powers Property to multiply monomials

Recall To multiply two monomials, multiply the constants and multiply the variables with the same base.

◆ Example

Simplify $(3m^4n)(-2m^2n)$.

◆ Solution

$(3m^4n)(-2m^2n) = (3 \cdot -2)(m^4 \cdot m^2)(n \cdot n)$

$= -6m^6n^2$

Simplify each product.

17. $(5a^2)(3a^3)$ __________ **18.** $(-7cd^2)(3c^2)$ __________

19. $(-s^3t)(-5t^4)$ __________ **20.** $(6p^5)(4p^2q^3)$ __________

21. $(m^3n^2)(4m^2n^2)$ __________ **22.** $(a^2b^3)(2b^2c^2)(3a^4)$ __________

◆ Skill B Raising a monomial to a power

Recall When a monomial is raised to a power, raise each term to that power. $(ab)^2$ means $(ab)(ab)$. Thus, $(ab)^2 = ab \cdot ab = (a \cdot a)(b \cdot b) = a^2b^2$.

If x and y are any numbers and n is a positive integer, then $(xy)^n = x^ny^n$.

◆ **Example**
Simplify $(3b^2c^3)^2$.

◆ **Solution**
$(3b^2c^3)^2 = (3^2)(b^2)^2(c^3)^2 = 9b^4c^6$

Simplify each expression.

9. $(10^3)^2$ ____________

10. $(2y^3)^5$ ____________

11. $(6x^4)^3$ ____________

12. $(8q^3)^3$ ____________

13. $(c^2d^2)^4$ ____________

14. $(9mn^5)^2$ ____________

15. $4(e^4f)^3$ ____________

16. $(2p^5r^3)^4$ ____________

◆ Skill C Finding powers of −1

Recall All even powers of -1 are equal to 1.
All odd powers of -1 are equal to -1.

◆ **Example**
Simplify each of the following:
a. $(-c)^3$ **b.** $(-2p)^4$

◆ **Solution**
a. $(-c)^3 = (-1 \cdot c)^3 = (-1)^3(c)^3 = -1(c^3) = -c^3$
b. $(-2p)^4 = (-2)^4(p)^4 = 16p^4$

Simplify each expression.

17. $(-3y^3)^2$ ____________

18. $(-gh^4)^5$ ____________

19. $(ab^2)^3(-ab^3)$ ____________

20. $(-2c^2d^3)^4(-3cd^2)^3$ ____________

NAME ______________________ CLASS ____________ DATE ____________

◆ Skill B Finding the quotient of monomials

Recall To divide monomials, divide the constants and the variables with the same base.

◆ **Example**

Simplify $\frac{12a^6b^4}{-3a^4b^3}$.

◆ **Solution**

$$\frac{12a^6b^4}{-3a^4b^3} = \left(\frac{12}{-3}\right)(a^{6-4})(b^{4-3}) = -4a^2b$$

Simplify each expression.

9. $\frac{x^2y^5}{xy^3}$ ____________

10. $\frac{p^7q^5r^2}{p^3q^4}$ ____________

11. $\frac{-30g^9h^8}{5g^3h^6}$ ____________

12. $\frac{24y^8z^5}{-32y^6z}$ ____________

13. $\frac{-9s^{12}t^9}{-3s^8t^6}$ ____________

14. $\frac{8.4(b^2c^3)^3}{2b^3c^4}$ ____________

◆ Skill C Finding the power of a fraction

Recall If n is a positive number and a and b are numbers, where $b \neq 0$, then $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.

◆ **Example**

Simplify $\left(\frac{25d^4e^6}{5d^2f}\right)^3$.

◆ **Solution**

$$\left(\frac{25d^4e^6}{5d^2f}\right)^3 = \left(\frac{5d^2e^6}{f}\right) = \frac{125d^6e^{18}}{f^3}$$

Simplify each expression.

15. $\left(\frac{2r^3}{n}\right)$ ____________

16. $\left(\frac{-35c^2m}{5}\right)^3$ ____________

17. $\left(\frac{-20c^3}{(-2c)^2}\right)$ ____________

18. $\left(\frac{d^9e^{12}}{(d^2e^3)^2}\right)^2$ ____________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

8.4 Negative and Zero Exponents

◆ Skill A Understanding negative and zero exponents

Recall There is a pattern between exponents and powers of the same base.

As the exponents decrease by 1, the value of the power decreases by a factor of $\frac{1}{2}$.

2^4	2^3	2^2	2^1
16	8	4	2

◆ Example 1

What is the value of 2^0?

◆ Solution

Add 2^0 to the table above and complete the pattern.

2^4	2^3	2^2	2^1	2^0
16	8	4	2	?

The value of the power decreases by a factor of $\frac{1}{2}$, so $2^0 = 1$.

This pattern will hold true for any base that is a nonzero number, x, or $x^0 = 1$.

◆ Example 2

What is the value of 2^{-1}?

◆ Solution

Add 2^{-1} to the table above and complete the pattern.

2^4	2^3	2^2	2^1	2^0	2^{-1}
16	8	4	2	1	?

The value of the power decreases by a factor of $\frac{1}{2}$, so $2^{-1} = \frac{1}{2}$.

If x is any number except zero and n is any integer, then $x^{-n} = \frac{1}{x^n}$.

Evaluate each expression.

1. 4^0 ______________________ **2.** 5^{-2} ______________________

3. 8^0 ______________________ **4.** 4^{-1} ______________________

5. 3^{-3} ______________________ **6.** 1^{-2} ______________________

7. 5^{-3} ______________________ **8.** 4^{-3} ______________________

NAME ______________________ CLASS __________ DATE __________

◆ Skill B Simplifying expressions containing negative and zero exponents

Recall To add two integers with the same sign, add their absolute values and keep the common sign. To add two integers with different signs, subtract their absolute values and use the sign of the number with the greater absolute value. Subtraction is the same as adding the opposite.

◆ **Example 1**
Simplify the expression $y^{-5} \cdot y^3$.

◆ **Solution**
To multiply powers of the same base, add the exponents.
$y^{-5} \cdot y^3 = y^{-5+3} = y^{-2}$

◆ **Example 2**
Simplify the expression $\frac{m^4}{m^7}$.

◆ **Solution**
To divide powers of the same base, subtract the exponents.
$\frac{m^4}{m^7} = m^{4-7} = m^{-3}$

◆ **Example 3**
Simplify the expression $c^{-3} \cdot c^0$.

◆ **Solution**
This expression represents a product of powers of the same base, so the product is found by adding the exponents. Thus, $c^{-3} \cdot c^0 = c^{-3+0} = c^{-3}$. Alternatively, $c^0 = 1$ because any base to the zero power equals 1. A factor multiplied by 1 is itself. Thus, $c^{-3} \cdot c^0 = c^{-3} \cdot 1 = c^{-3}$.

Simplify each expression.

9. $a^3 \cdot a^{-5}$ ______________

10. $c^2 \cdot c^{-7}$ ______________

11. $\frac{y^3}{y^6}$ ______________

12. $\frac{m^{-3}}{m^6}$ ______________

13. $p^8 \cdot p^0$ ______________

14. $q^0 \cdot q^{-5}$ ______________

15. $x^{-8} \cdot x^{-3}$ ______________

16. $z^{-5} \cdot z^8$ ______________

17. $\frac{t^{-5}}{t^{-10}}$ ______________

18. $5^{-3} \cdot 5^8$ ______________

19. $x^5 \cdot x^{-3} \cdot x^{-7}$ ______________

20. $3^3 \cdot 3^{-10} \cdot 3^6$ ______________

21. $\frac{t^{-5} \cdot t^5}{t^3}$ ______________

22. $\frac{4^7}{4^{-3}}$ ______________

23. $5^3 \cdot 5^0 \cdot 5^{-1}$ ______________

24. $a^2 \cdot a^{-5}$ ______________

25. $\frac{r^{10} \cdot r^{-2}}{r^5}$ ______________

26. $\frac{2^{10} \cdot 2^{-10}}{2^{10}}$ ______________

NAME ______________________ CLASS __________ DATE __________

Reteaching
9.1 Adding and Subtracting Polynomials

◆ **Skill A** Adding polynomials

Recall To add two polynomials, add the coefficients of like terms.

◆ **Example 1**
Add the polynomials horizontally.
$3a^3 + 2a^2 + a + 5$ and $2a^3 + 4a - 6$

◆ **Solution**
Group like terms.
$(3a^3 + 2a^2 + a + 5) + (2a^3 + 4a - 6)$
$= (3a^3 + 2a^3) + 2a^2 + (a + 4a) + (5 - 6)$
$= 5a^3 + 2a^2 + 5a - 1$
The sum of $3a^3 + 2a^2 + a + 5$ and $2a^3 + 4a - 6$ is $5a^3 + 2a^2 + 5a - 1$.

◆ **Example 2**
Add the same two polynomials vertically.

◆ **Solution**
Line up the variables. Use zero for the coefficient of any missing variable.

$$\begin{array}{r} 3a^3 + 2a^2 + 1a + 5 \\ \underline{+\ 2a^3 + 0a^2 + 4a - 6} \\ 5a^3 + 2a^2 + 5a - 1 \end{array}$$

The sum of $3a^3 + 2a^2 + a + 5$ and $2a^3 + 4a - 6$ is $5a^3 + 2a^2 + 5a - 1$.

Find each sum.

1. $(5b^2 + 3b) + (b^2 - 2b)$ ______
2. $(8c^2 - 2c) + (2c^2 + 3c)$ ______
3. $(b^3 + 2b^2 + 3b) + (4b^3 - 5b^2 + 4b)$ ______
4. $(3y^3 + 3y - 1) + (2y^3 + 5y^2 + 3y)$ ______
5. $(5r^2 + 3r + 6) + (2r^3 + r^2 + 4r)$ ______
6. $(4m^3 - 5m^2 - m) + (3m^3 - 3m - 5)$ ______
7. $(2x^2 + 3x + 4) + (-5x^2 + x - 7)$ ______
8. $(x^2 - x + 6) + (3x^2 - x + 3)$ ______
9. $(2x^2 + 3x + 6) + (-2x^2 - 7)$ ______
10. $(4x^3 - 5x + 4) + (3x^3 + 5x - 3)$ ______

NAME ______________________ CLASS __________ DATE __________

Reteaching

9.3 Multiplying Binomials

◆ **Skill A** Multiplying monomials and binomials

Recall The Distributive Property can be used to find the product of a monomial and a binomial.

◆ **Example**
Use the Distributive Property to find the product $x(x - 4)$.

◆ **Solution**
$x(x - 4) = x(x) - x(4)$
$= x^2 - 4x$
The product $x(x - 4)$ is $x^2 - 4x$.

Use the Distributive Property to find each product.

1. $4(x + 5)$ ______________ **2.** $5(x - 2)$ ______________

3. $x(2x - 2)$ ______________ **4.** $2x(3x + 1)$ ______________

5. $-5x(x - 6)$ ______________ **6.** $-3x(-x - 3)$ ______________

◆ **Skill B** Multiplying two binomials

Recall The Distributive Property can also be used to multiply two binomials.

◆ **Example**
Use the Distributive Property to find the product $(x + 2)(x + 5)$.

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

Use the Distributive Property to find each product.

7. $(x + 1)(x + 4)$ ______________ **8.** $(x + 3)(x + 2)$ ______________ **9.** $(x + 5)(x - 3)$ ______________

10. $(2x + 3)(x + 2)$ ______________ **11.** $(x - 5)(3x - 3)$ ______________ **12.** $(3x - 4)(4x - 3)$ ______________

NAME ________________ CLASS ________ DATE ________

Reteaching

9.5 Common Factors

◆ **Skill A** Listing prime numbers

Recall A positive integer is a prime number if it has exactly two factors: 1 and itself. The number 3 is prime because it has exactly two factors: 1 and 3. The number 4 is not prime because it has three factors: 1, 2, and 4.

◆ **Example**

Which of the following whole numbers are prime?

a. 1 **b.** 37 **c.** 87

◆ **Solution**

a. 1 is not prime because it has only one factor, itself.
b. 37 is prime because it has exactly two factors: 1 and 37.
c. 87 is not prime because it has more than two factors: 1, 3, 29, and 87.

List the factors of each whole number. Tell whether each number is prime.

1. 12 ________ **2.** 35 ________ **3.** 47 ________

4. 57 ________ **5.** 77 ________ **6.** 97 ________

◆ **Skill B** Factoring out a common monomial

Recall The product of x and $x + 3$ is $x^2 + 3x$. To factor an expression such as $x^2 + 3x$ means to factor out the greatest common factor (GCF) of each term. The Distributive Property is used to rewrite the expression as the product $x(x + 3)$. Some expressions cannot be factored. The greatest common factor of $x^2 - 3$ is 1, so $x^2 - 3$ is considered prime.

◆ **Example**

Factor each polynomial.

a. $4b^3 - 6b^2 + 10b$ **b.** $5y^3 - 15x^2 + 18xy$

◆ **Solution**

a. The GCF is $2b$.
$4b^3 - 6b^2 + 10b = 2b(2b^2 - 3b + 5)$

b. The GCF is 1.
$5y^3 - 15x^2 + 18xy$ is prime.

Factor each polynomial.

7. $3m^2 - 21m$ ________ **8.** $8t^2 + 15t$ ________

9. $18p^2 + 21p + 9$ ________ **10.** $4d^3 - 20d^2 + 8d$ ________

NAME ______________________ CLASS __________ DATE __________

◆ **Skill B** Factoring trinomials by choosing factor pairs of the constant

Recall Another way to factor a trinomial, such as $x^2 - 5x - 6$, is to first make a list of the pairs of factors of the constant. Then choose the right combination to complete the factors of the trinomial.

◆ **Example**

Use the constant's factor pairs to factor $x^2 - 5x - 6$.

◆ **Solution**

List each pair of factors of -6 along with their sum.

Factors of -6	Sum of the factors
6 and -1	5
3 and -2	1
2 and -3	-1
1 and -6	-5

The sum of 1 and -6 is -5. Use the combination of 1 and -6 to form the factors.
Thus, $x^2 - 5x - 6 = (x + 1)(x - 6)$.

Factor each trinomial. If the trinomial cannot be factored, write *prime*.

7. $x^2 - x - 2$ ____________

8. $x^2 + 3x - 4$ ____________

9. $x^2 + 4x + 3$ ____________

10. $x^2 - 4x + 3$ ____________

11. $x^2 + 2x - 8$ ____________

12. $x^2 + x - 20$ ____________

13. $x^2 + 2x - 15$ ____________

14. $x^2 - 3x + 10$ ____________

15. $x^2 - x - 12$ ____________

16. $x^2 + 6x + 8$ ____________

17. $x^2 - 20x + 36$ ____________

18. $x^2 + 2x - 24$ ____________

NAME ______________________ CLASS __________ DATE __________

◆ **Skill B** Find the zeros of a polynomial function by factoring

Recall The zeros of a function are the values of x that make y equal to 0.

◆ **Example 1**

Find the zeros of the function $y = (x - 2)(x + 5)$.

◆ **Solution**

Let $y = 0$. Then use the Zero-Product Property to solve for x.

$(x - 2)(x + 5) = 0$

$(x - 2) = 0$ or $(x + 5) = 0$

$x = 2$ or $x = -5$

The zeros of $y = (x - 2)(x + 5)$ are 2 and -5.

Recall A quadratic polynomial can be factored into two binomials.

◆ **Example 2**

Solve the equation $x^2 - x - 6 = 0$.

◆ **Solution**

Since $x^2 - x - 6$ can be factored into $(x + 2)(x - 3)$, you can rewrite $x^2 - x - 6 = 0$ as $(x + 2)(x - 3) = 0$. Solve the equation $(x + 2)(x - 3) = 0$.

$x + 2 = 0$ or $x - 3 = 0$

$x = -2$ or $x = 3$

The solutions to $x^2 - x - 6 = 0$ are -2 and 3.

Solve by factoring.

11. $x^2 - 4x - 12 = 0$ ______________________

12. $x^2 - 6x + 9 = 0$ ______________________

13. $x^2 - 9x + 14 = 0$ ______________________

14. $x^2 + 6x + 5 = 0$ ______________________

15. $x^2 - 7x + 10 = 0$ ______________________

16. $x^2 - 36 = 0$ ______________________

17. $x^2 + 8x + 16 = 0$ ______________________

18. $x^2 - x - 12 = 0$ ______________________

19. $9x^2 - 1 = 0$ ______________________

20. $4x^2 + 4x + 1 = 0$ ______________________

NAME ____________________ CLASS __________ DATE __________

Reteaching

10.5 The Quadratic Formula

◆ **Skill A** Using the quadratic formula to solve equations

Recall The solutions for a quadratic equation written in the form $ax^2 + bx + c = 0$, where $a \neq 0$, can be found by using the quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

◆ **Example**

Use the quadratic formula to solve $x^2 - 8x + 15 = 0$ for x.

◆ **Solution**

For $x^2 - 8x + 15 = 0$, a is 1; b is −8, and c is 15. Substitute these values in the quadratic formula.

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - (4)(1)(15)}}{(2)(1)}$$

$$= \frac{8 \pm \sqrt{64 - 60}}{2}$$

$$= \frac{8 \pm \sqrt{4}}{2}$$

$$= \frac{8 \pm 2}{2}$$

$x = 3$ or $x = 5$

The solutions are 3 and 5.

Use the quadratic formula to solve each equation.

1. $x^2 - 5x + 4 = 0$

2. $x^2 - 2x - 24 = 0$

3. $x^2 + 6x + 9 = 0$

4. $x^2 + 3x - 10 = 0$

5. $2x^2 - x - 6 = 0$

6. $2x^2 + x - 4 = 0$

NAME ________________ CLASS ________ DATE ________

Reteaching 11.3 Simplifying Rational Expressions

◆ **Skill A** Factoring out monomials

Recall A rational expression is an expression of the form $\frac{P}{Q}$, where P and Q are polynomials and $Q \neq 0$. A rational expression is in simplest form when the numerator and denominator have no common factors other than 1 or −1. Be sure to check for undefined terms before simplifying the expression.

◆ **Example 1**

Simplify the rational expression $\frac{6c - 9}{12c}$.

◆ **Solution**

First factor the numerator and denominator.

$$\frac{6c - 9}{12c} = \frac{3(2c - 3)}{(2)(2)(3)c}$$

Rewrite to show any fractions equal to 1.

$$= \frac{3}{3} \cdot \frac{2c - 3}{4c}$$

Thus, the simplified form is $\frac{2c - 3}{4c}$, where $c \neq 0$.

◆ **Example 2**

Simplify the rational expression $\frac{5m^2}{5m + 10m^2}$.

◆ **Solution**

First factor the numerator and denominator.

$$\frac{5m^2}{5m + 10m^2} = \frac{5 \cdot m \cdot m}{5 \cdot m \cdot (1 + 2m)}$$

Rewrite to show any fractions equal to 1.

$$= \frac{5m}{5m} \cdot \frac{m}{2m + 1}$$

Thus, the simplified form is $\frac{m}{2m + 1}$, where $m \neq 0$ and $m \neq -\frac{1}{2}$.

Simplify each expression and state any restrictions on the variables.

1. $\frac{14t}{7t - 7}$ ________

2. $\frac{3m + 9}{6m - 12}$ ________

3. $\frac{4m^2}{8m + 12m^2}$ ________

4. $\frac{3y + 6}{y^2 + 4y + 2}$ ________

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

6. $\frac{4r - 12}{r^2 - 6r + 9}$ ________

NAME ______________________ CLASS ____________ DATE ____________

Reteaching

11.4 Operations with Rational Expressions

◆ Skill A Multiplying rational expressions

Recall To multiply two rational expressions, multiply the numerators and multiply the denominators. Then simplify the results. List any restrictions.

◆ Example

Find the product $\frac{3a + 3}{a} \cdot \frac{a - 3}{a + 1}$.

◆ Solution

Multiply numerators and denominators. $\frac{3a + 3}{a} \cdot \frac{a - 3}{a + 1} = \frac{(3a + 3)(a - 3)}{a(a + 1)}$

Factor all expressions. $= \frac{3(a + 1)(a - 3)}{a(a + 1)}$

Rewrite to show any fractions equal to 1. $= \frac{a + 1}{a + 1} \cdot \frac{3(a - 3)}{a}$

Simplify and note any restrictions. $= \frac{3(a - 3)}{a}$, where $a \neq 0$ and $a \neq -1$

Find each product.

1. $\frac{2t - 2}{t} \cdot \frac{t^2}{t - 1}$ ____________

2. $\frac{12a - 18}{18a} \cdot \frac{2a}{2a - 3}$ ____________

3. $\frac{5}{c + 3} \cdot \frac{c^2 + 6c + 9}{10}$ ____________

4. $\frac{20d}{d^2 + 8d + 15} \cdot \frac{d + 3}{5d}$ ____________

5. $\frac{x^2 - 9}{4} \cdot \frac{8}{x + 3}$ ____________

6. $\frac{y^2 - y - 2}{y + 2} \cdot \frac{y^2 + y - 2}{y - 2}$ ____________

◆ **Skill B** Adding and subtracting rational expressions

Recall Rewrite all rational expressions with common denominators. Add or subtract the numerators. Keep the same denominator. Then simplify the results. List any restrictions.

◆ **Example**

Find the difference $\frac{b}{b+3} - \frac{4}{b+2}$.

◆ **Solution**

Multiply numerators and denominators by fractions that are equal to 1 and that will result in common denominators.

$$\frac{b+2}{b+2} \cdot \frac{b}{b+3} - \frac{b+3}{b+3} \cdot \frac{4}{b+2}$$

Multiply the rational expressions.

$$\frac{b^2+2b}{(b+2)(b+3)} - \frac{4b+12}{(b+2)(b+3)}$$

Subtract the numerators and simplify.

$$\frac{b^2-2b-12}{(b+2)(b-3)}$$

Find each sum or difference.

7. $\frac{x}{4} + \frac{2x}{5}$ ______________

8. $\frac{7}{2b} + \frac{8}{3b}$ ______________

9. $\frac{t}{4t^2} - \frac{5}{6t}$ ______________

10. $\frac{2m}{m-1} + \frac{m}{2m-2}$ ______________

11. $\frac{3c}{3c-12} - \frac{c}{2c-8}$ ______________

12. $\frac{y}{y+2} + \frac{2y}{y-2}$ ______________

NAME ______________________ CLASS __________ DATE __________

Reteaching
11.5 Solving Rational Equations

◆ Skill A Using the common denominator method to solve rational equations

Recall To solve an equation containing rational expressions, first multiply each side of the equality by the common denominator of all the rational expressions. This will clear the equations of fractions. Solve the resulting equation. Check the solutions and the restrictions.

◆ Example

Solve. **a.** $\frac{x}{3} + \frac{x+1}{4} = \frac{17}{12}$ **b.** $\frac{3}{x-1} - 2 = -1$

◆ Solution

a. Multiply each side of the equation by 12.

$$12\left(\frac{x}{3} + \frac{x+1}{4}\right) = 12 \cdot \frac{17}{12}$$

$$4x + 3x + 3 = 17$$

$$7x = 14$$

$$x = 2$$

b. Multiply each side of the equation by $x - 1$.

$$(x-1)\left(\frac{3}{x-1} - 2\right) = (x-1)(-1),$$

where $x \neq 1$

$$(x-1)\left(\frac{3}{x-1}\right) - (x-1)(2) = (x-1)(-1)$$

$$3 - 2x + 2 = -x - 1$$

$$x = 4$$

Solve each rational equation by using the lowest common denominator and state any restrictions on the variable.

1. $\frac{a}{3} - \frac{a}{2} = 1$

____

2. $\frac{5}{d} + \frac{3}{d^2} = \frac{13}{4}$

____

3. $\frac{h-2}{h} - \frac{h-3}{h-6} = \frac{1}{h}$

____

4. $\frac{7}{x-4} - \frac{5}{x-2} = 0$

____