RAMAPO-INDIAN HILLS SCHOOL DISTRICT

Dear Ramapo-Indian Hills Student:

Please find attached the summer packet for your upcoming math course. The purpose of the summer packet is to provide you with an opportunity to review prerequisite skills and concepts in preparation for your next year's mathematics course. While you may find some problems in this packet to be easy, you may also find others to be more difficult; therefore, you are not necessarily expected to answer every question correctly. Rather, the expectation is for students to put forth their best effort, and work diligently through each problem.

To that end, you may wish to review notes from prior courses or on-line videos (www.KhanAcademy.com, www.glencoe.com, www.youtube.com) to refresh your memory on how to complete these problems. We recommend you circle any problems that cause you difficulty, and ask your teachers to review the respective questions when you return to school in September. Again, given that math builds on prior concepts, the purpose of this packet is to help prepare you for your upcoming math course by reviewing these prerequisite skills; therefore, the greater effort you put forth on this packet, the greater it will benefit you when you return to school.

Please bring your packet and completed work to the first day of class in September. Teachers will plan to review concepts from the summer packets in class and will also be available to answer questions during their extra help hours after school. Teachers may assess on the material in these summer packets after reviewing with the class.

If there are any questions, please do not hesitate to contact the Math Supervisors at the numbers noted below.

Enjoy your summer!

Ramapo High School
Michael Kaplan
mkaplan@rih.org
201-891-1500 x2255

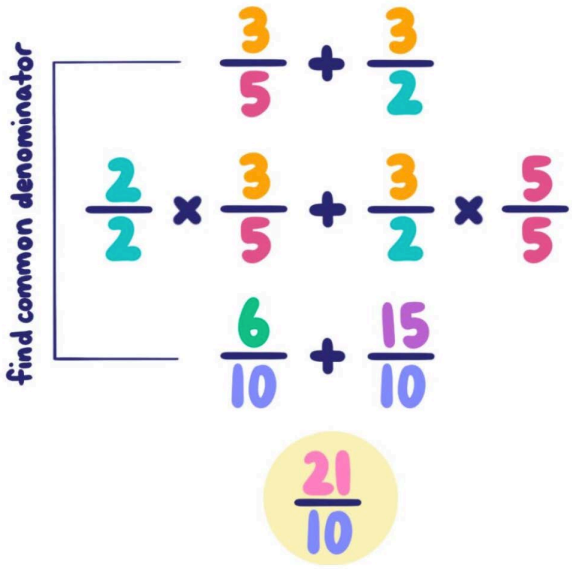
Indian Hills High School
Amanda Zielenkievicz
azielenkievicz@rih.org
201-337-0100 x3355

Adding/Subtracting/Multiplying/Dividing Fractions
Tips and Reminders

Simplifying Fractions

$$\frac{8}{12} \overset{\div 4}{=} \frac{2}{3}$$

Adding/Subtracting Fractions



1. Reduce to lowest terms: $\frac{24}{36}$

$$\frac{24}{36}=\frac{2\times2\times2\times3}{2\times2\times3\times3}=\frac{\cancel{2}\times\cancel{2}\times2\times\cancel{3}}{\cancel{2}\times\cancel{2}\times3\times\cancel{3}}=\frac{2}{3}$$

2. Simplify: $\frac{56}{64}$

$$\frac{56}{64}=\frac{2\times2\times2\times7}{2\times2\times2\times2\times2\times2}=\frac{\cancel{2}\times\cancel{2}\times\cancel{2}\times7}{\cancel{2}\times\cancel{2}\times\cancel{2}\times2\times2\times2}=\frac{7}{8}$$

Multiplying Fractions

RULE:
Whenever multiplying fractions together:

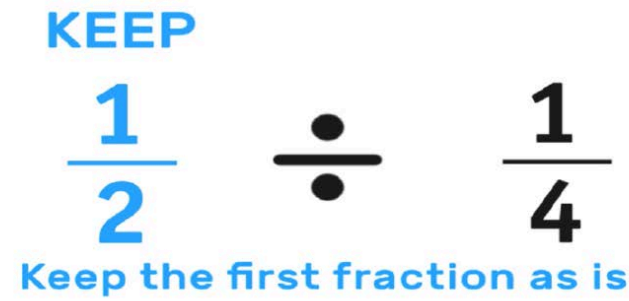
$$\frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}$$

Multiply the numerators together, then multiply the denominators together.

For example, 3/4 x 1/2 can be solved as follows:

$$\frac{3}{4}\times\frac{1}{2}=\frac{3\times1}{4\times2}=\frac{3}{8}$$

Dividing Fractions:



Then multiply and simplify, if necessary to complete the problem.

Adding/Subtracting/Multiplying/Dividing Fractions
No Calculators Permitted. ALL work must be shown!!

1. Convert to a mixed # $\frac{11}{3}$ Answer:_____	**2.** Convert to a mixed # $\frac{25}{13}$ Answer:_____	**3.** Convert to an improper fraction $2\frac{3}{5}$ Answer:_____	**4.** Convert to an improper fraction $4\frac{5}{11}$ Answer:_____

Add the following fractions. Make sure you have a common denominator!

5. $\frac{2}{9}+\frac{5}{9}$ Answer:_____	**6.** $\frac{3}{4}+1\frac{1}{4}$ Answer:_____	**7.** $\frac{2}{5}+\frac{1}{10}$ Answer:_____	**8.** $5+\frac{5}{3}$ Answer:_____

Subtract the following fractions. Make sure you have a common denominator!

9. $\frac{1}{3}-\frac{2}{3}$ Answer:_____	**10.** $\frac{3}{7}-2\frac{1}{7}$ Answer:_____	**11.** $1\frac{2}{3}-\frac{1}{6}$ Answer:_____	**12.** $5-\frac{4}{9}$ Answer:_____	**13.** $\frac{3}{5}-\frac{1}{2}$ Answer:_____

Reduce, Multiply, or Divide the following fractions. Make sure to reduce all answers.

14. $\frac{6}{8}$ Answer:_____	**15.** $\frac{5}{3}\cdot-\frac{3}{16}$ Answer:_____	**16.** $-\frac{4}{9}\div\frac{2}{3}$ Answer:_____	**17.** $-\frac{2}{3}\div-\frac{1}{2}$ Answer:_____	**18.** $3\frac{1}{2}\cdot2\frac{3}{7}$ Answer:_____

Order of Operations

Order of Operations	**Step 1**	Evaluate expressions inside grouping symbols.
	Step 2	Evaluate all powers.
	Step 3	Multiply and/or divide from left to right.
	Step 4	Add and/or subtract from left to right.

Example 1 **Evaluate $[18 - (6 + 4)] \div 2$.**

$$\begin{aligned}[18 - (6 + 4)] \div 2 &= [18 - 10] \div 2 \\ &= 8 \div 2 \\ &= 4\end{aligned}$$

Example 2 **Evaluate $3x^2 + x(y - 5)$ if $x = 3$ and $y = 0.5$.**

Replace each variable with the given value.

$$\begin{aligned}3x^2 + x(y - 5) &= 3 \cdot (3)^2 + 3(0.5 - 5) \\ &= 3 \cdot (9) + 3(-4.5) \\ &= 27 - 13.5 \\ &= 13.5\end{aligned}$$

Order of Operations
No Calculators Permitted. ALL work must be shown!!
**** Make sure all fractions are reduced!**

Use order of operations (PEMDAS) to simplify the following!

19. $102 \div 10 + 8 \times 4$

Answer:_____

20. $-2(5-8)+18 \div 3$

Answer:_____

21. $2^5 - 4^2 \div 2^2$

Answer:_____

22. $-8+6(2+4)^2$

Answer:_____

23. $\left(\dfrac{3(6)}{17-5}\right)^4$

Answer:_____

Evaluate the following when $x = 2, y = -1, z = 3$

24. $12-(z-y)^2$

Answer:_____

25. $\dfrac{y}{z+3y}$

Answer:_____

26. $\dfrac{x^3-7}{}$

Answer:_____

27. $\dfrac{xy}{z}$

Answer:_____

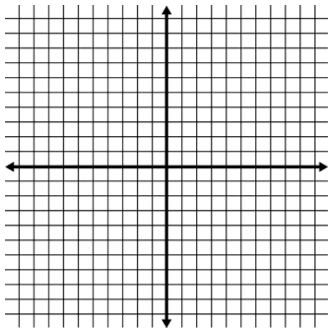
28. $(x-y^2)+3z$

Answer:_____

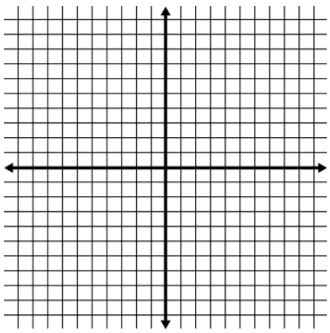
Plotting Points

Plot each ordered pair on the given graph.

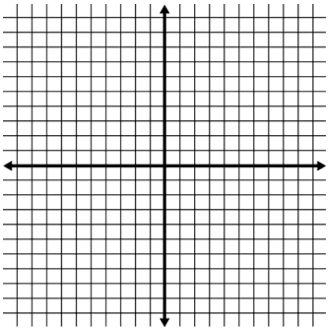
1. $(1, 2)$



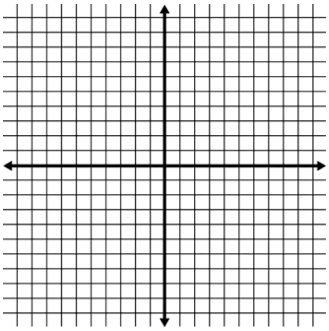
2. $(3, -5)$



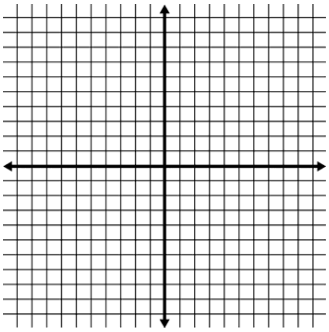
3. $(5,1)$



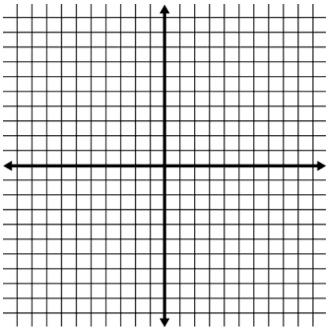
4. $(-1, -1)$



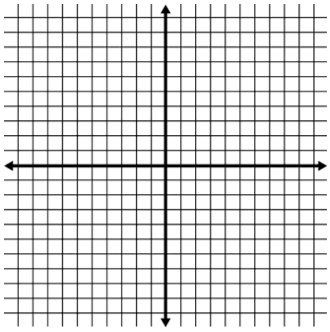
5. $(0, 6)$



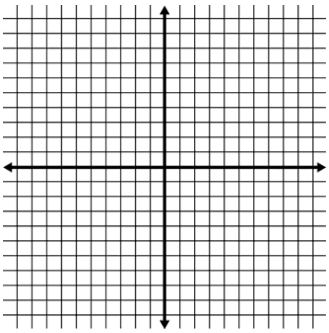
6. $(-1, 3)$



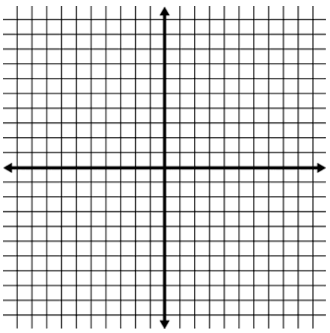
7. $(7, 0)$



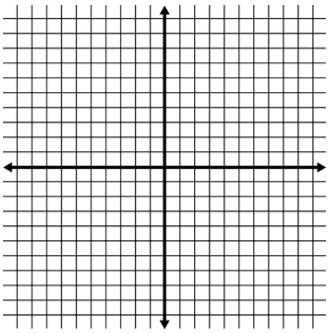
8. $(2, -3)$



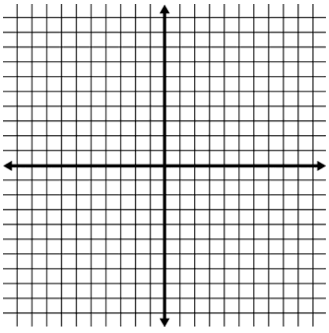
9. $(-5, -7)$



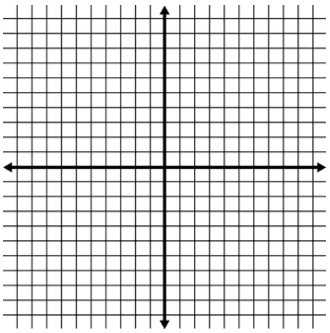
10. $(5, -1)$



11. $(-2, 0)$



12. $(0, 0)$



G. Graphing Lines

I. Finding the Slope of the Line that Contains each Pair of Points.

Given two points with coordinates (x_1, y_1) and (x_2, y_2), the formula for the slope, *m*, of the line containing the points is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

Ex. (2, 5) and (4, 1)

$$m = \frac{1-5}{4-2} = \frac{-4}{2} = -2$$

The slope is -2.

Ex. (-3, 2) and (2, 3)

$$m = \frac{3-2}{2-(-3)} = \frac{1}{5}$$

The slope is $\frac{1}{5}$

PRACTICE SET 8

1. (-1, 4) and (1, -2)

2. (3, 5) and (-3, 1)

3. (1, -3) and (-1, -2)

4. (2, -4) and (6, -4)

5. (2, 1) and (-2, -3)

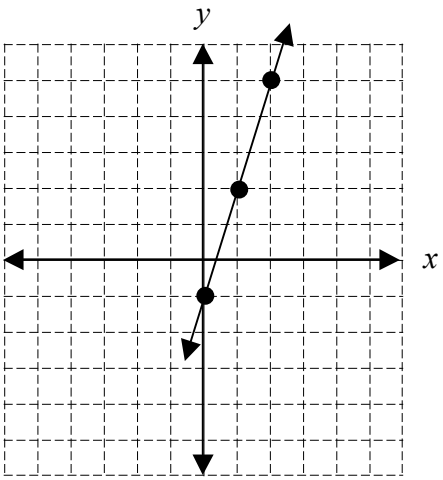
6. (5, -2) and (5, 7)

II. Using the Slope – Intercept Form of the Equation of a Line.

The slope-intercept form for the equation of a line with slope m and y-intercept b is $y = mx + b$.

Ex. $y = 3x - 1$

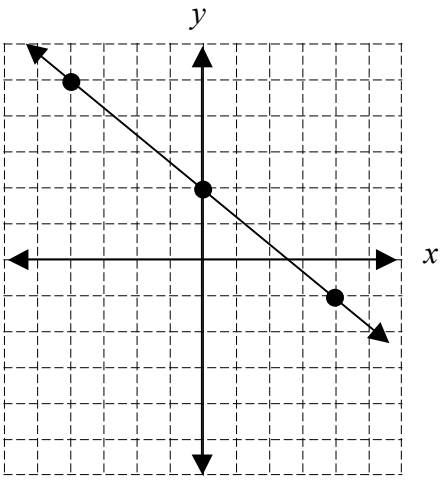
Slope: 3 y-intercept: -1



Place a point on the y-axis at -1.
Slope is 3 or 3/1, so travel up 3 on the y-axis and over 1 to the right.

Ex. $y = -\frac{3}{4}x + 2$

Slope: $-\frac{3}{4}$ y-intercept: 2

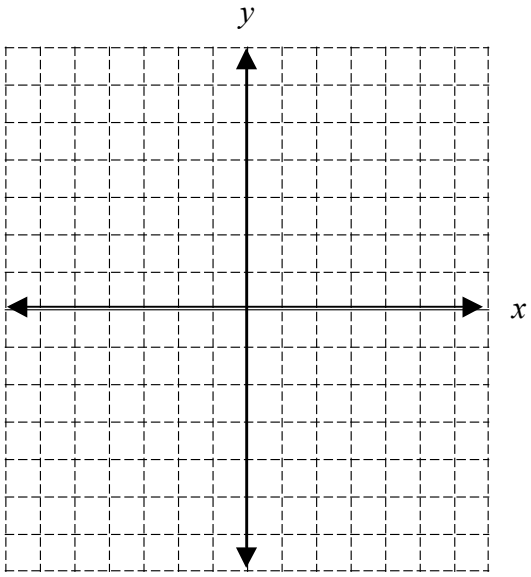


Place a point on the y-axis at 2.
Slope is -3/4 so travel down 3 on the y-axis and over 4 to the right. Or travel up 3 on the y-axis and over 4 to the left.

PRACTICE SET 9

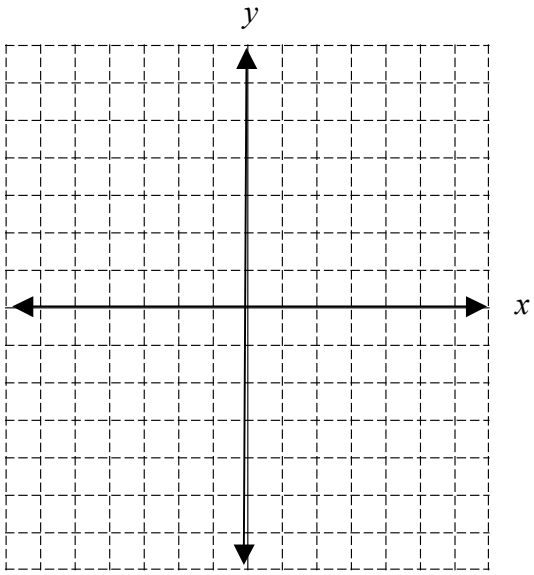
1. $y = 2x + 5$

Slope: _____ y-intercept: _____



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

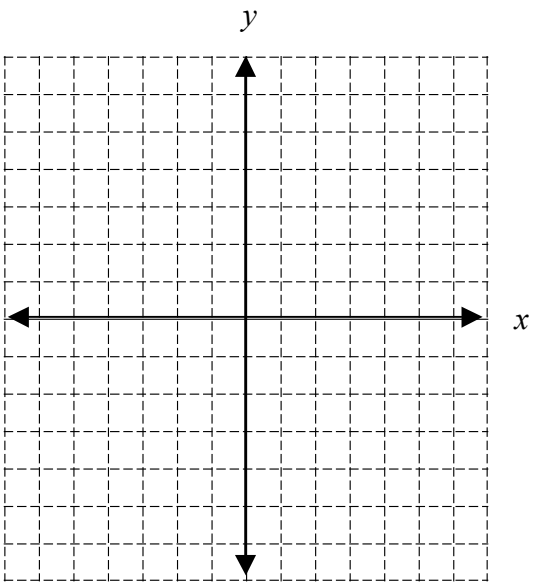
Slope: _____ y-intercept: _____



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

Slope: _____

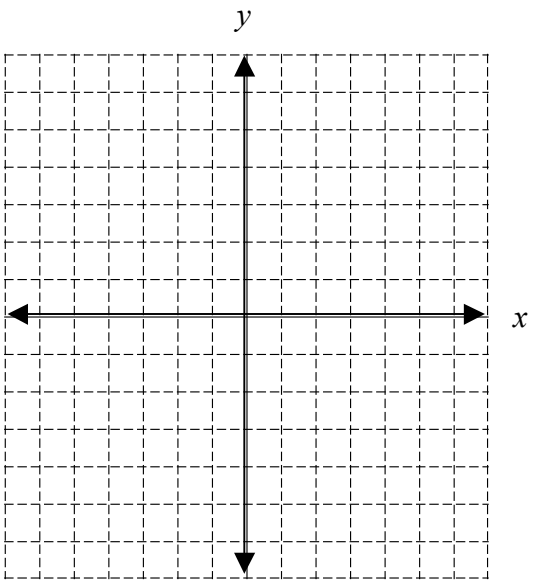
y-intercept: _____



4. $y = -3x$

Slope: _____

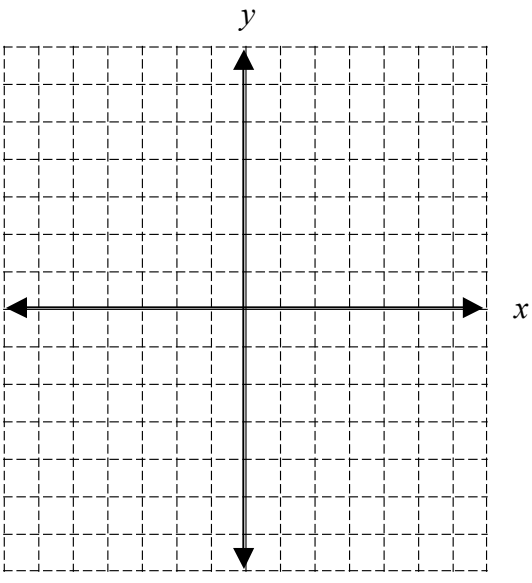
y-intercept _____



5. $y = -x + 2$

Slope: _____

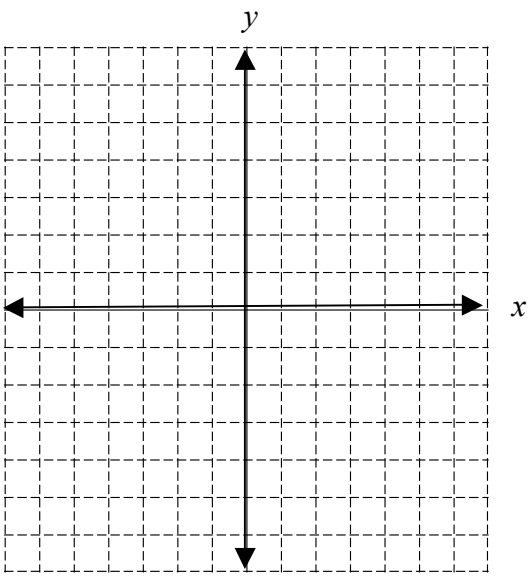
y-intercept: _____



6. $y = x$

Slope: _____

y-intercept _____



A. Simplifying Polynomial Expressions

I. Combining Like Terms

- You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Ex. 1: $5x - 7y + 10x + 3y$

$5x - 7y + 10x + 3y$

$15x - 4y$

Ex. 2: $-8h^2 + 10h^3 - 12h^2 - 15h^3$

$-8h^2 + 10h^3 - 12h^2 - 15h^3$

$-20h^2 - 5h^3$

II. Applying the Distributive Property

- Every term inside the parentheses is multiplied by the term outside of the parentheses.

Ex. 1: $3(9x-4)$

$3 \cdot 9x - 3 \cdot 4$

$27x - 12$

Ex. 2: $4x^2(5x^3 + 6x)$

$4x^2 \cdot 5x^3 + 4x^2 \cdot 6x$

$20x^5 + 24x^3$

III. Combining Like Terms AND the Distributive Property (Problems with a Mix!)

- Sometimes problems will require you to distribute AND combine like terms!!

Ex. 1: $3(4x-2)+13x$

$3 \cdot 4x - 3 \cdot 2 + 13x$

$12x - 6 + 13x$

$25x - 6$

Ex. 2: $3(12x-5) - 9(-7+10x)$

$3 \cdot 12x - 3 \cdot 5 - 9(-7) - 9(10x)$

$36x - 15 + 63 - 90x$

$-54x + 48$

PRACTICE SET 1

Simplify.

1. $8x - 9y + 16x + 12y$

2. $14y + 22 - 15y^2 + 23y$

3. $5n - (3 - 4n)$

4. $-2(11b - 3)$

5. $10q(16x + 11)$

6. $-(5x - 6)$

7. $3(18z - 4w) + 2(10z - 6w)$

8. $(8c + 3) + 12(4c - 10)$

9. $9(6x - 2) - 3(9x^2 - 3)$

10. $-(y - x) + 6(5x + 7)$

B. Solving Equations

I. Solving Two-Step Equations

A couple of hints:

1. To solve an equation, UNDO the order of operations and work in the reverse order.
2. REMEMBER! Addition is "undone" by subtraction, and vice versa. Multiplication is "undone" by division, and vice versa.

$$\begin{aligned} Ex.\,1:\ & 4x-2=30 \\ & +2\ \ +2 \\ & 4x=32 \\ & \div 4\ \ \div 4 \\ & x=8 \end{aligned}$$

$$\begin{aligned} Ex.\,2:\ & 87=-11x+21 \\ & -21\qquad -21 \\ & 66=-11x \\ & \div -11\ \ \div -11 \\ & -6=x \end{aligned}$$

II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

$$\begin{aligned} Ex.\,3:\ & 8x+4=4x+28 \\ & -4\qquad -4 \\ & 8x=4x+24 \\ & -4x\ \ -4x \\ & 4x=24 \\ & \div 4\ \ \div 4 \\ & x=6 \end{aligned}$$

III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

$$\begin{aligned} Ex.\,4:\ & 5(4x-7)=8x+45+2x \\ & 20x-35=10x+45 \\ & -10x\qquad -10x \\ & 10x-35=45 \\ & +35\ \ +35 \\ & 10x=80 \\ & \div 10\ \ \div 10 \\ & x=8 \end{aligned}$$

PRACTICE SET 2

Solve each equation. You must show all work.

1. $5x - 2 = 33$

2. $140 = 4x + 36$

3. $8(3x - 4) = 196$

4. $45x - 720 + 15x = 60$

5. $132 = 4(12x - 9)$

6. $198 = 154 + 7x - 68$

7. $-131 = -5(3x - 8) + 6x$

8. $-7x - 10 = 18 + 3x$

9. $12x + 8 - 15 = -2(3x - 82)$

10. $-(12x - 6) = 12x + 6$

IV. Solving Literal Equations

- A literal equation is an equation that contains more than one variable.
- You can solve a literal equation for one of the variables by getting that variable by itself (isolating the specified variable).

Ex. 1: $3xy = 18$, Solve for x.

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

Ex. 2: $5a - 10b = 20$, Solve for a.

$$+10b = +10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

PRACTICE SET 3

Solve each equation for the specified variable.

1. $Y + V = W$, for V

2. $9wr = 81$, for w

3. $2d - 3f = 9$, for f

4. $dx + t = 10$, for x

5. $P = (g - 9)180$, for g

6. $4x + y - 5h = 10y + u$, for x

D. Binomial Multiplication

I. Reviewing the Distributive Property

The distributive property is used when you want to multiply a single term by an expression.

Ex 1: $8(5x^2 - 9x)$

$8 \cdot 5x^2 + 8 \cdot (-9x)$

$40x^2 - 72x$

II. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with <u>two</u> terms), we use the "FOIL" method. The "FOIL" method uses the distributive property <u>twice</u>!

FOIL is the order in which you will multiply your terms.

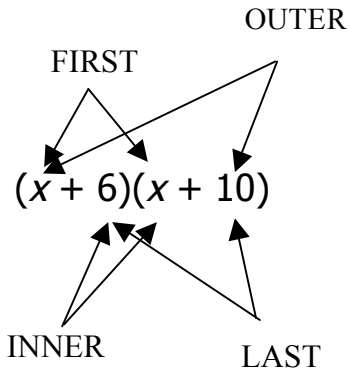
First

Outer

Inner

Last

Ex. 1: (x + 6)(x + 10)



First $x \cdot x$ ------> x^2

Outer $x \cdot 10$ -----> $10x$

Inner $6 \cdot x$ ------> $6x$

Last $6 \cdot 10$ -----> 60

$x^2 + 10x + 6x + 60$

$x^2 + 16x + 60$
(After combining like terms)

Recall: $4^2 = 4 \cdot 4$

$x^2 = x \cdot x$

Ex. $(x + 5)^2$

$(x + 5)^2 = (x + 5)(x+5)$ Now you can use the "FOIL" method to get a simplified expression.

PRACTICE SET 5

Multiply. Write your answer in simplest form.

1. $(x + 10)(x – 9)$

2. $(x + 7)(x – 12)$

3. $(x – 10)(x – 2)$

4. $(x – 8)(x + 81)$

5. $(2x – 1)(4x + 3)$

6. $(-2x + 10)(-9x + 5)$

7. $(-3x – 4)(2x + 4)$

8. $(x + 10)^2$

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

10. $(2x – 3)^2$

Square Roots and Simplifying Radicals

Product Property: For two numbers a and $b \geq 0$, $\sqrt{ab}=\sqrt{a}\cdot\sqrt{b}$
Example: $\sqrt{45} = \sqrt{(3 \cdot 3 \cdot 5)} = \sqrt{(3^2 \cdot 5)}=\mathbf{3\sqrt{5}}$

Quotient Property: For any numbers a and b, where $a \geq 0$ and $b \geq 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Example: $\sqrt{\frac{7}{3}} = \frac{\sqrt{7}}{\sqrt{3}}, \frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{21}}{\sqrt{9}} = \frac{\sqrt{21}}{3}$

Example: Simplify $\sqrt{\frac{56}{45}}$.

$\sqrt{\frac{56}{45}} = \sqrt{\frac{4 \cdot 14}{9 \cdot 5}}$ Factor 56 and 45.

$= \frac{2 \cdot \sqrt{14}}{3 \cdot \sqrt{5}}$ Simplify the numerator and denominator.

$= \frac{2\sqrt{14}}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$ Multiply by $\frac{\sqrt{5}}{\sqrt{5}}$ to rationalize the denominator.

$= \frac{2\sqrt{70}}{15}$ Product Property of Square Roots

1) $\frac{\sqrt{5}}{\sqrt{3}}$

2) $\frac{\sqrt{8}}{\sqrt{12}}$

3) $\frac{\sqrt{2}}{\sqrt{6}}$

4) $\frac{6}{\sqrt{2}}$

5) $\frac{3+\sqrt{2}}{\sqrt{14}}$

6) $\frac{4+\sqrt{3}}{\sqrt{7}}$