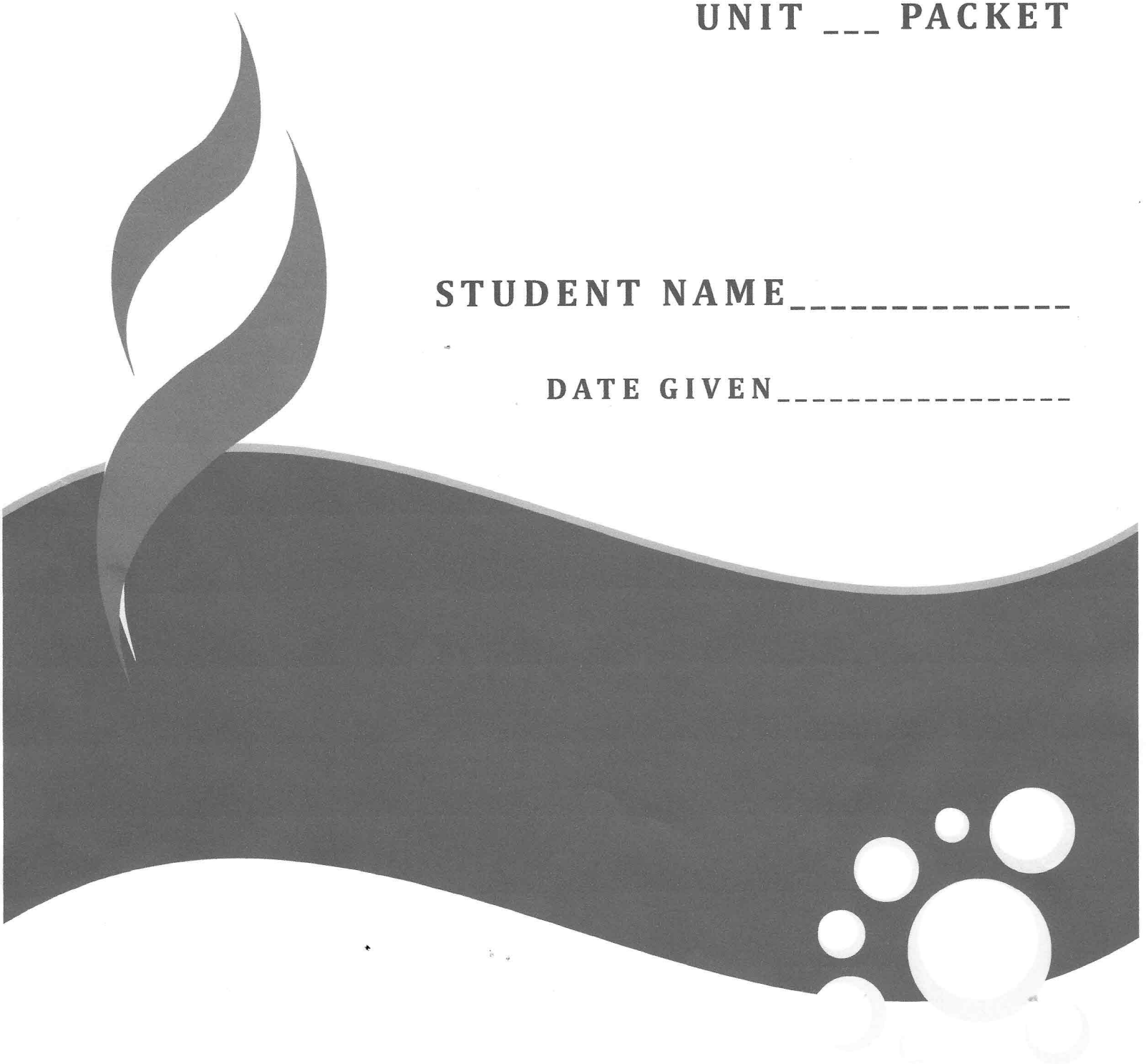
RJHS

MATH CLASS-SMOOT

UNIT ___ PACKET



STUDENT NAME_____

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Math 8
Unit 1—Solving

Essential Learning Outcomes
a) Solve any one-variable linear equation.
b) Solve single-variable absolute value equations.
c) Solve any one-variable linear inequality.

Concepts and Skills to Master
-I can identify and provide examples of equations that have one solution, infinitely many solutions or no solutions.
-I can solve multi-step linear equations with rational coefficients and variables on both sides.
-I can solve absolute value equations and understand why there are either zero, one, or two solutions.

Academic Vocabulary

solve	variable	order of operations
solution	like terms	distributive property
absolute value		

Examples:

a) $\frac{2x}{2} = \frac{4}{2}$

$\boxed{x = 2}$

$2 \cdot 2 = 4$ ✓

$3x + 6 = -18$

$-6 \quad -6$

$\frac{3x}{3} = \frac{-24}{3}$

$\boxed{x = -8}$

$3 \cdot -8 + 6 = -18$ ✓

1- Identify Variable
2- Perform Inverse operation to get variable alone
3- Be sure to keep equation Balanced (what you do on one side you must do to the other side)
4- check answer

b) $|-2| = 2$

$|-2|x = 4$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

* Absolute value is distance from $\varnothing$ so always positive

c) $3x + 7 \leq 19$

$-7 \quad -7$

$\frac{3x}{3} = \frac{12}{3}$

$x = 4$

Check $3 \cdot 4 + 7 \leq 19$

$12 + 7 \leq 19$

$19 \leq 19$

True ✓

Exponents and Roots **Review of Exponents and Introduction to Roots**

1. Use the definition of exponents to rewrite each expression as a product of powers.

a. $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$ b. $(-4)(-4)xxxxx$ c. $10 \cdot 10 \cdot 5 \cdot 5 \cdot 5 \cdot 7$

d. $1.5 \cdot 1.5 \cdot 1.5 \cdot 1.5 \cdot 1.5$ e. $(17x)(17x)(17x)$ f. $aaabccccccdd$

2. Rewrite each power as a product. Evaluate each power.

a. 5^3 b. 6^4 c. 2^{10} d. 3^6

e. 11^2 f. 7^7 g. $(-8)^4$ h. $(-12)^3$

3. Rewrite each expression using the definition of exponents. Then rewrite as a single power.

a. $4^4 \cdot 4^3$ b. $\frac{c^4}{c^2}$ c. $7^7 \cdot 7^0$

d. $(-3)^3(-3)^2$ e. $(x^3)^4$ f. $h \cdot h^2 \cdot h^3 \cdot h^4$

4. Rewrite each power so that there are no negative exponents. Do not evaluate.

a. 5^{-8} b. $(-10)^{-4}$ c. $\frac{1}{2^{-6}}$ d. 11^{-2}

5. Evaluate each using a calculator. Round to the nearest tenth, if necessary.

a. $\sqrt{31}$ b. $\sqrt[3]{729}$ c. $\sqrt{1444}$ d. $\sqrt[3]{25}$

6. A rectangle has a length of $\sqrt{12}$ inches and a width of $\sqrt{3}$ Inches. Use a calculator to approximate the length and width to the nearest hundredth. Then determine the area of the rectangle rounded to the nearest tenth.

Length: _____*inches* Width: _____*inches* Area: _____*square inches*

7. Evaluate each without a calculator.

a. $\sqrt{81}$ b. $\sqrt{4}$ c. $\sqrt{64}$ d. $\sqrt[3]{27}$

8. Put the following expression in order from least to greatest value.

a.

3^7 7^3 9^2 2^9 12^5

b.

$\sqrt{1000}$ $\sqrt{850}$ 31^2 $\sqrt[3]{900}$ 30^2

What success looks like for this open resource assessment.
• I can use the definition of exponents to rewrite expressions. • I can use a calculator to estimate a square root and a cube root. • I can explain what square roots and cube roots are.

Equation.1 **One Step Solving Review**

1. Solve each equation. Check your solution.

a. $x + 12 = 7$

b. $0.7 + y = -1.34$

c. $x - 8\pi = \pi$

d. $\frac{5}{6} = \frac{1}{3} + d$

e. $190 - x = 71$

f. $7x = 35$

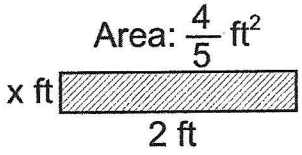
g. $\frac{m}{\pi} = 7.3$

h. $\frac{2}{3}b = 18$

i. $-4.3g = 25.8$

2. Write an equation for each situation. Then solve the equation to answer the question.

a. Determine the missing side length x of the rectangle:

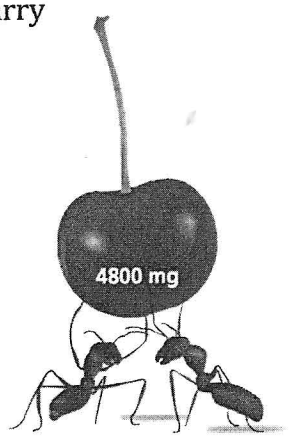


b. Eggs are packaged in a carton in groups of 12. How many cartons are needed to package 156 eggs?

c. Joe is 5 years older than his sister Julianne. Julianne is 13 years old. How old is Joe?

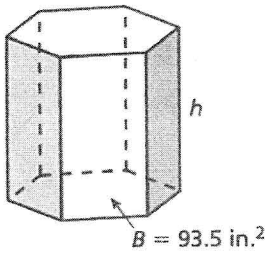
d. Two angles in a triangle are 50° and 27°. What is the measure of the third angle.

3. ANTS Some ant species can carry 50 times their body weight. It takes 32 ants to carry the cherry. About how much does each ant weigh?



4. Simplify each of the following:
   a. $2(x + 5) + 9x$ b. $13x + 4y - 15x$ c. $\frac{1}{4}f + 6f - \frac{2}{3}$

5. PARK You clean a community park for 6.5 hours. You earn \$42.25. How much do you earn per hour?



6. VOLUME The volume V of the prism is 1122 cubic inches. Use the formula $V = Bh$ to find the height h of the prism.

7. A neighbor paid you and two friends \$90 to paint her garage. You divide the money three ways in the ratio 2 : 3 : 5.
   a. How much does each person receive?

   b. What is one possible reason that the money is note divided evenly?

8. Write a subtraction equation and a division equation so that each has a solution of -2.
   Subtraction Equation: Division Equation:

Equation.2 **Solve with Variable on One Side**

1. Solve each equation. Check your solution.

a. $10x + 2 = -8$

b. $\frac{2}{3}d - \frac{1}{3} = 7$

c. $5(t + 13) - 2t = -1$

d. $\frac{w}{3} - 18 = -7$

e. $2x - 5 = 23$

f. $-15 = \frac{x}{4} - 22$

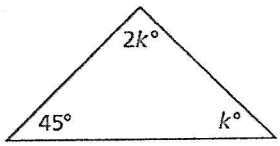
g. $\frac{1}{2}z + (-14) = 8$

h. $19 = 3y - 1 + 8 - 5y$

i. $-5k - (-22) = 82$

2. Write an equation for each situation. Then solve the equation to answer the question.

a. What is the value of k?



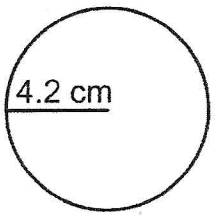
Sum of angle measures: 180°

b. WATCHES The cost C (in dollars) of making n watches is represented by $C = 15n + 85$. How many watches are made when the cost is $385?

c. Franklin scored 5 less than twice as many points as Kyle in a Ping-Pong game. Kyle scored 8 points. How many points did Franklin earn?

d. Three-fourths of a box of pens are left in one box and $\frac{1}{3}$ of the pens remain in another box. If the two boxes have a total of 39 pens left, then how many pens belong in one full box?

3. Find the area of this circle. Round answer to the nearest tenth.



4. What number is 14% of 500?

5. Evaluate each of the following expressions containing absolute value brackets.

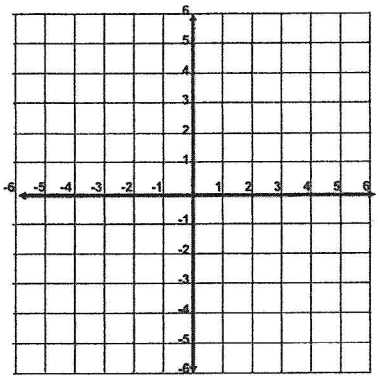
a. $|3 - 7(2)| - 2^3$

b. $|19 - 23| + 4$

c. $\frac{|-4|}{8} - \left|-\frac{3}{8}\right|$

6. Plot each point on the grid provided. Label each point with the indicated letter.

$A(3,4)$ $B(-2,0)$ $C(4,-7)$ $D(-3,6)$ $E(-1,-3)$



7. Create a situation to go with the equation $3(x + 1) = 12$. Then solve the equation and interpret your answer.

8. Each of the following situation problems have missing information. Tell what information is needed to solve the problem.

a. A taxi charges an initial fee plus \$1.80 per mile. How far can you ride for \$12?

b. Nathan bought 6 pizzas for \$8 each. How much money does he have left?

c. The population of Russia is 8 million more than twice the population of the United Kingdom. What is the population of Russia?

d. A species of cicadas spawns every 17 years. In how many years will this species of cicada spawn next.

Equation.3 **Solve Absolute Value Equations I**

1. Solve each equation. Report your answers as a solution set. Check solutions.

a. $|x| = 41$

b. $|x + 1| = 4$

c. $|x - 3| = 14$

d. $|x| + 1 = 4$

e. $x - |3| = -12$

f. $|-x + 1| = 2.5$

g. $|2p - 1| - \frac{1}{2} = \frac{9}{2}$

h. $|3c| = 1$

i. $|r - 1| = 3$

2. Write an equation for each situation. Then solve the equation to answer the question.

a. Mike is at mile marker 113 on Highway 16. He is exactly 37 miles from his destination. At what mile marker is his destination?

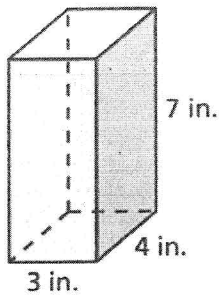
b. Kim tunes pianos. She starts by checking the frequency of A-440 (which should be 440 hertz). She measures that A-440 is off by 35 hertz but she doesn't remember if the frequency was too high or too low. What are the possible frequencies of the key before she tunes it?

3. Solve $3(x + 17) - 4(2x - 4) = 117$

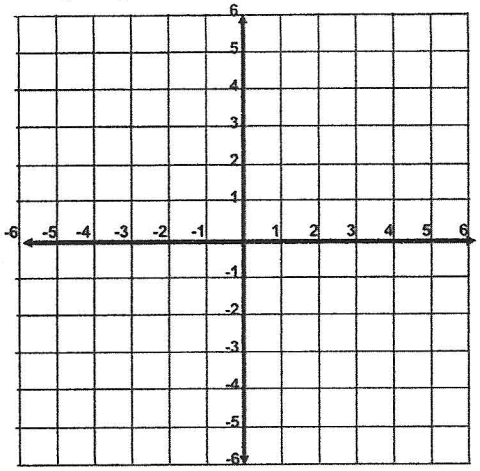
4. Use the distributive of multiplication over addition to simplify each expression.

a. $2(x + 4y + 5)$ b. $(2 + t)(-3)$ c. $5(3 + 2y) - 2(3y - 10)$

5. Find the surface area of the prism



6. Draw ΔABC with $A(-2, -2), B(6, -2)$, and $C(2, 4)$. Determine the area of ΔABC.



7. Solve $||x| - 10| = 5$. Check all solutions. (Hint: there are four solutions).

8. Use two of the given numbers to fill in the blanks to create an absolute value equation with the solution set: $\{0, 4\}$.

$|x + \_\_\_\_ | = \_\_\_\_$

	0
-1	1
-2	2
-3	3
-4	4
-5	5
-6	6
-7	7
-8	8
-9	9

Equation.4 **Solve Equations with the Variable on Both Sides**
Part I

1. Solve each equation. Check your solution.

a. $x + 3 = 2x - 7$

b. $x = 3x + 11$

c. $3(x - 7) = -2(x - 2)$

d. $4x = 10x$

e. $37x = 33x + 18$

f. $10d + 7 = 7d + 10$

g. $\frac{1}{6}f + \frac{2}{3} = \frac{1}{4}(f - 2)$

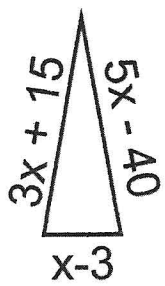
h. $2(z - 1) = 3(z + 2)$

i. $2(n - 3) = 4n + 1$

2. Write an equation for each situation. Then solve the equation to answer the question.

a. NUTRITION One serving of oatmeal provides 16% of the fiber you need daily. You must get the remaining 21 grams of fiber from other sources. How many grams of fiber should you consume daily?

b. The given triangle is an isosceles triangle. Determine the value of x.



3. Solve $|x + 113| = 256$

4. Evaluate each expression.

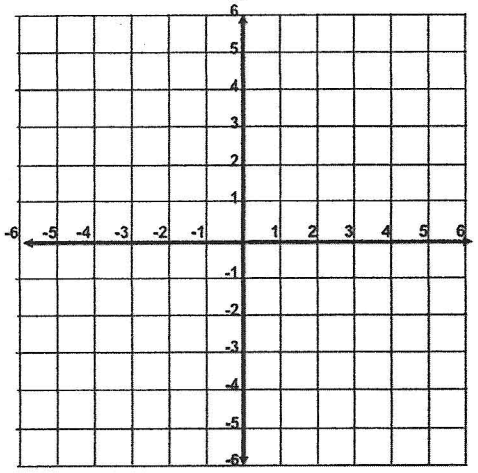
a. $\left|-\frac{1}{2}\right|+\frac{3}{4}-\frac{3}{8}+\frac{3}{8}$

b. $\frac{3}{5}\left(\frac{9}{7}\bullet\frac{35}{21}\right)$

c. $\frac{2}{3}\left(5-\frac{7}{2}\right)$

5. UNIT RATES If Morgan travels on her bike at 16 feet per second then how long would she require to travel from one goal line to the other on a football field (goal lines are 100 yards apart).

6. Draw a rectangle with area of 20 square units.



7. CARS Write and solve an equation to find the number of miles you must drive to have the same cost for each of the car rentals.

$15 plus $0.50 per mile

$25 plus $0.25 per mile

8. The equation $Ax + A = 5x - 1$ has the solution $x = \{-4\}$. Determine the value of A.

Equation.5 **Solve Equations with the Variable on Both Sides Part II**

1. Solve each equation. Check your solution, if possible.

a. $x + 6 = x$

b. $3x - 1 = 1 - 3x$

c. $\frac{1}{3}(9x + 3) = 3x + 1$

d. $5x - 7 = 4x - 1$

e. $2x + 4 = -(-7x + 6)$

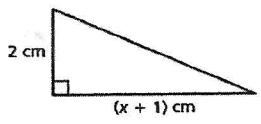
f. $6(7x + 7) = 7(6x + 6)$

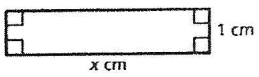
g. $10x - \frac{8}{3} - 4x = 6x$

h. $3x + 15 = 3(x + 15)$

i. $3x + 15 = 3(x + 5)$

2. Each example describes a situation in which either there is no solution or there are infinitely many solutions. Write an equation and demonstrate why there is no solution or there are infinitely many solutions.





a. GEOMETRY Are there any values of x for which the areas of the figures are the same? Explain.

b. PIZZA CRUST Pepe's Pizza makes 52 pizza crusts the first week and 180 pizza crusts each subsequent week. Dianne's Delicatessen make 26 pizza crusts the first week and 90 pizza crusts each subsequent week. In how many weeks will the total number of pizza crusts made by Pepe's Pizza equal twice the total number of pizza crusts made by Dianne's Delicatessen?

3. Solve both absolute value equations. Check your solutions.

a. $|2x + 3| = -5$

b. $3 = |x - 3|$

4. Evaluate each expression using the standard algorithms.

a. $\begin{array}{r} 5.66 \\ \times 1.03 \\ \hline \end{array}$

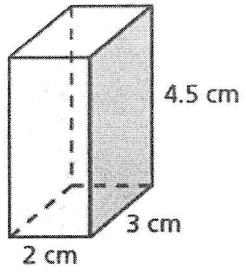
b. $\begin{array}{r} 13.0573 \\ -9.5721 \\ \hline \end{array}$

c. $5.1\overline{)19.686}$

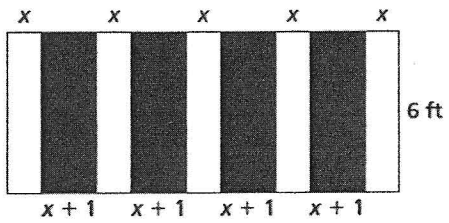
5. UNIT RATES The ice on a lake goes from half an inch thick to 3 inches thick in 2 weeks.
   a. Determine the percent of increase in ice thickness.

   b. Determine the unit rate (measured in inches per week).

6. Determine the volume of the prism.



7. A 6-foot-wide hallway is painted as shown. Using equal amounts of white and black paint.
   a. How long is the hallway?



   b. Can this same hallway be painted with the same pattern, but using twice as much black paints as white paint? Explain.

8. Fill in the blanks with integers to create both an equation that has no solution and an equation that has infinitely many solutions. Explain why each has no solution or infinitely many solutions.

No Solution Equation:

$2x + \_\_\_\_ = 5 + \_\_\_\_x$

Infinitely Many Solutions Equation:

$2x + \_\_\_\_ = 5 + \_\_\_\_x$

Equation.6 **Solve Absolute Value Equations II**

1. Solve each equation. Report your answers as a solution set. Check solutions.

a. $|x| = x + 1$

b. $3 - |x + 1| = 4$

c. $|2x + 5| = 3x$

d. $|2x + 1| + \frac{1}{3} = \frac{10}{3}$

e. $|h + 5| + 1 = -3$

f. $|2x + 1| = x + 1$

g. $|4 - k| + k = 3$

h. $2|w - 3| = 11$

i. $|3x + 2| = -8$

2. Determine what values of a and b will make each statement true.

a. $|x - a| = b$ has no solution

b. $|x - a| = b$ has one solution

c. $|x - a| = b$ has two solutions

3. Solve $\frac{1}{3}(3x + 15) - \frac{2}{5}(5x - 15) = 31$

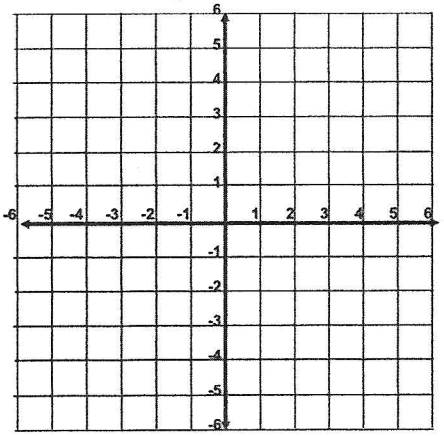
4. Use the greatest common factor to factor each expression.

Example: $2x + 4 \rightarrow (GCF\ is\ 2) \rightarrow \boxed{2(x + 2)}$

a. $3d + 15$ b. $8y - 32 + 48x$ c. $24x + 18xy$

5. Solve $107x + 93 = -1191$

6. Draw a triangle with an area of *10 units²*.



7. Solve $|2x| + 2 = |x + 2|$. Check all solutions.

8. In solving $|x| + |x + 1| + |x + 2| = 3$ eight equations are ultimately produced giving the solutions: $\{-6, -4, -2, 0, 2, 4, 6\}$, where $x = 0$ was produced as a solution twice. Determine the solution set for $|x| + |x + 1| + |x + 2| = 3$ by checking all solutions and eliminating extraneous solutions.

Equation.7 **Solving and Using Formulas**

1. Solve each equation for the indicated variable.

a. $d = r\check{t}$ b. $3\check{x} + 2y = 12$ c. $3x + 2\check{y} = 12$

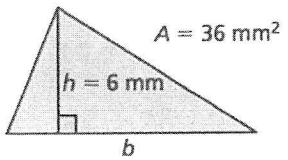
d. $F = m\check{a}$ e. $P = a + \check{b} + c$ f. $x = 3\check{y}$

g. $A = B\check{h}$ h. $R - \check{C} = P$ i. $3\check{y} = x + 6$

2. GEOMETRY Solve for the specified variable then answer the question.

a. The volume of a rectangular prism can be determined with the formula $V = \ell wh$, where $\ell, w,$ and h are the length, width, and height respectively. A given rectangular prism has a volume of 1200 cm^3 and a length of 12cm and a width of 10cm. What is the height?

b. The area of a triangle is $A = \frac{bh}{2}$. What is the length of the base of this triangle?



3. Solve and Graph $2p + 1 < 9p - 41$

4. Solve $\frac{1}{2}n + 2 = 19$

5. Simplify each expression

a. $11f + 13g - 3(f - g)$

b. $3(e + e) + 3(e + 3) + e(3 + 3)$

6. Evaluate each when the given information

a. $3x + y$; if $(x, y) = (2, -6)$

b. $5ab + 2$; if $(a, b) = (0, 5)$

c. πr^2; if $r = 5$

7. TEMPERATURE Solve the given formula for F (Fahrenheit) and then answer each question.

a. The formula $C = \frac{5}{9}(F - 32)$ can be used to convert temperatures measured in Fahrenheit to temperatures measured in Celsius. The highest recorded temperature was in Death Valley on July 10, 1913. The temperature was $56.7°C$. What was the temperature in Fahrenheit?

b. The Formula $K = \frac{5}{9}(F - 32) + 273.15$ can be used the covert temperatures measured in Fahrenheit to temperatures measured in Kelvin. The coldest recorded temperature in the contiguous United States was in Rogers Pass, Montana on Jan 20, 1954. The Recorded temperature was 216.15 Kelvin. What was the temperature in Fahrenheit?

8. In problem 6 above, substitution is used to replace variables with numbers. Substitution can also be used to replace variables with expressions. Examine the given example and then complete the given problem.

EXAMPLE

Simplify $3x + 5y$, if $x = y + 2$

$3x + 5y$	*given expression*
$3(y + 2) + 5y$	*substitution:* $x \rightarrow y + 2$
$3y + 6 + 5y$	*Distribute*
$\boxed{8y + 6}$	*add like terms*

PROBLEM

Simplify $9x - 2y$, if $y = 2x - 3$

Inequalites.1 **Solve Linear Inequalities**

1. Solve each inequality. Graph your solution.

a. $3x + 7 \leq 19$

<-+-+-+-+-+-+-+-+-+-+-+-+-+->

b. $4x < 3x$

<-+-+-+-+-+-+-+-+-+-+-+-+-+->

c. $\frac{2}{3}x + 7 < \frac{1}{3}x - 7$

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d. $5 - 3d < -40$

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e. $3(x + 7) - 11x \geq -x + 7$

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f. $-2 > \frac{m}{6} - 7$

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g. $-3x < 9x + 72$

<-+-+-+-+-+-+-+-+-+-+-+-+-+->

h. $3x + 1 \geq 3x - 1$

<-+-+-+-+-+-+-+-+-+-+-+-+-+->

i. $3x + 1 < 3x - 1$

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2. Write an inequality for each situation. Solve and graph your solution.

a. Kaleb's sister will be twice his age in 4 years. She will also be able to drive (she'll be at least 16). What are the possible ages for Kaleb right now?

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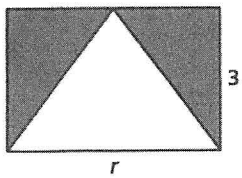
b. For what values of r will the area of the shaded region be greater than or equal to 12 square units?



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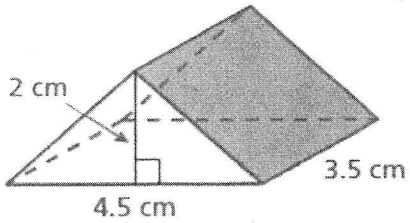
3. Solve $1{,}200x + 13{,}500 = 900x + 180{,}000$

4. Evaluate each expression using the indicated values for the variables.
   a. $\boldsymbol{Bh}$ if $B = 14$ and $h = 7$ b. $\boldsymbol{3xy + x^2}$ if $(x, y) = (2, 0)$ c. $\boldsymbol{3a + bc}$ if $a = b = c = 4$

5. Solve $|5x - 13| = 12$. Check your solutions.

6. Determine the volume of the prism.



7. Circle all numbers in the set below that satisfy both inequalities.

$$3x + 8 \leq 80 \quad \text{and} \quad -5x < -25$$

4	18	40	−3	−6	5	−18	91	−15	21	31	9

8. Solve the inequality $6x + 19 \leq 4x - 51$ two ways. The first steps are indicated. Use these two examples to explain why the sign direction of an inequality is changed when multiplying by a negative on both sides.

$$\begin{array}{rr} 6x + 19 \leq 4x - 51 & \qquad 6x + 19 \leq 4x - 51 \\ -6x \quad -6x & \qquad -4x \quad -4x \end{array}$$