Name: _____

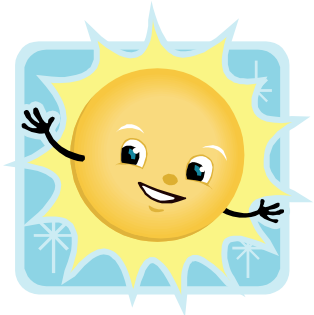
For school year 2014-2015

Eighth Grade Summer Math Packet

- This packet is designed to help you retain the information you learned in 7th grade.
- It would be most helpful if you work on it in August (prior to the school year to help you prepare for 8th grade).
- The packet will be due the third Friday of school in September.
- Feel free to ask your 8th grade Math teacher for help when we get back to school in the fall.
- The most important topics to review for next year are **INTEGERS** (know your rules!) and **ALGEBRA**. You must also know how to **ROUND** to any given place value.
- Use websites to help you strengthen your skills in these areas! (ex. www.math.com or www.algebralab.org or www.mathguide.com/lessons/Integers.html)

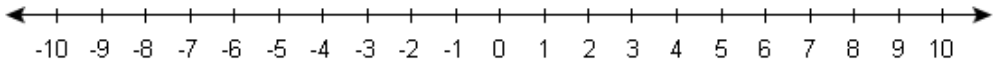
****NOTE: PLEASE CHECK YOUR PRINTED OUT PACKET WITH THE ONE YOU SEE ON YOUR COMPUTER AS SOME SYMBOLS SOMETIMES DO NOT PRINT CORRECTLY (especially on Mac computers). ****

Have a Wonderful Summer!



Your eighth grade teachers look forward to working with you next year.

Topic: Integers



Examples:

Addition	Subtraction	Multiplication	Division
Same signs: *Add & keep sign* $^{+}6 + {}^{+}5 = {}^{+}11$ $^{-}8 + {}^{-}2 = {}^{-}10$	*Keep–Change-Opposite* $^{+}10 - {}^{-}8 = {}^{+}10 + {}^{+}8 = 18$ $^{-}5 - {}^{+}12 = {}^{-}5 + {}^{-}12$ $^{-}20 - {}^{-}8 = {}^{-}20 + {}^{-}8 = {}^{-}12$	*Same signs:* *Positive product* $(^{+}7)(^{+}8) = {}^{+}56$ $(^{-}2)(^{-}6) = {}^{+}12$	*Same signs:* *Positive quotient* $^{+}42 / {}^{+}6 = {}^{+}7$ $^{-}24 / {}^{-}8 = {}^{+}3$
Different signs: *Subtract & take sign of larger value* $^{+}9 + {}^{-}5 = {}^{+}4$ $^{-}6 + {}^{+}1 = {}^{-}5$		*Different signs:* *Negative product* $(^{+}3)(^{-}9) = {}^{-}27$ $(^{-}5)(^{+}4) = {}^{-}20$	*Different signs:* *Negative quotient* $^{+}56 / {}^{-}7 = {}^{-}8$ $^{-}50 / {}^{+}2 = {}^{-}25$

Recall the **order of operations**:
1 – **P**arentheses (or grouping symbols)
2 - **E**xponents
3 - **M**ultiplication / **D**ivision (left to right)
4 - **A**ddition/**S**ubtraction (left to right)

Find each answer.

1. $^{-}12 + (^{-}7) =$ ____

2. $^{-}25 + 18 =$ ____

3. $2 + (^{-}25) =$ ____

4. $^{-}28 - (^{-}8) =$ _____

5. $11 - (^{-}5) =$ ____

6. $^{-}21 - 4 =$ ____

7. $(^{-}9)(^{-}8) =$ _____

8. $(2)(^{-}12) =$ _____

9. $-35 / -7 =$ _____

10. $-48 / +8 =$ _____

11. $(-2)(+6)(-5) =$ _____

12. $-30 + \frac{24}{6} \bullet (-2) =$ _____

13. $\frac{16}{4} + 2 \bullet (-8) =$ _____

14. $-3(1-8) + 2^3 =$ _____

Answers:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

Topic: Rationals

Multiplying Fractions and Mixed Numbers
1) **Change any mixed numbers to improper fractions**
2) *Cross – cancel* ***any*** *numerator with* ***any*** *denominator* by dividing each by a *common factor*
3) Multiply numerator by numerator and denominator by denominator
4) Simplify your answer (make it a mixed number if you can)

Dividing Fractions and Mixed Numbers
1) **Change any mixed numbers to improper fractions**
2) Remember Keep-Change-Flip: keep the first fraction, change the division sign to a multiplication sign, and flip the second fraction
3) Multiply numerator by numerator and denominator by denominator
4) Simplify your answer (make it a mixed number if you can)

Adding and Subtracting Fractions and Mixed Numbers
1) Check to see if the denominators are the same; if not, *find a common denominator*
2) Now add or subtract the fractions – remember, **keep the denominator!**
3) Add or subtract the whole numbers
4) Simplify the fraction
5) Rewrite the sum or difference

1) $3\frac{2}{3}+5\frac{1}{4}=$

2) $8\frac{4}{5}-3\frac{2}{3}=$

3) $5\frac{2}{11}-2\frac{1}{2}=$

4) $12-4\frac{3}{5}=$

5) $-2\frac{1}{3}-5\frac{3}{4}=$

6) $-5\frac{5}{6}+12\frac{3}{8}=$

7) $3\frac{1}{3}\cdot 7\frac{1}{2}=$

8) $\frac{3\frac{1}{5}}{-\frac{5}{6}}=$

9) $\frac{-6\frac{2}{3}}{-3\frac{3}{4}}=$

Answers:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

Topic: Inequalities

$<$	$>$	$\leq$	$\geq$
• is less than • is fewer than	• is greater than • is more than • exceeds	• is less than or equal to • is no more than • is at most	• is greater than or equal to • is no less than • is at least

Graphing Inequalities on a Number Line

REMEMBER the mosquito rule:

You solve inequalities the same way you solve equations, except…

If you multiply or divide each side of an inequality by a negative values, you need to ***switch the direction*** of the inequality to keep the statement true.

Solve and graph

1) $2x-3\leq 5$

2) $-\frac{1}{2}x-5>-8$

3) A waitress earned $7 per hour at her job plus an additional $50 in tips on Friday. She earned more than $99 total. Write an inequality that best represents the situation, where h represents the number of hours she worked on Friday.

4) Sharona's age is at most 3 more than twice Kayla's age. If Sharona is 35 years old, write an inequality that best represents the situation, where a represents Kayla's age.

Topic: Combining Like Terms and Applying the Distributive Property

In algebraic expressions, like terms are terms that contain the same variables raised to the same power. Only the coefficients of like terms may be different.

In order to **combine like terms**, we add or subtract the numerical coefficients of the like terms using the Distributive Property: **ax + bx = (a + b)x .**

Examples:
1. $2x + 9x = (2 + 9)x = 11x$
2. $12y - 7y = (12 - 7)y = 5y$
3. $5x + 8 - 2x + 7 = 3x + 15$ Here, the like terms are: $5x$ and $-2x = 3x$ and: $8 + 7 = 15$

The **Distributive Property** of multiplication over addition/subtraction is frequently used in Algebra:

Examples:
1. $7(2x + 9) = 7 \cdot 2x + 7 \cdot 9 = 14x + 63$
2. $4(6 - 5x) = 4(6) - 4(5x) = 24 - 20x$

Answers:

Simplify each expression by combining like terms.

1. $8y + 2y$ 1. _____
2. $10 - 6y + 4y + 9 =$ 2. _____
3. $3x + 7 - 2x =$ 3. _____
4. $8n - 7y - 12n + 5 - 3y =$ 4. _____

Apply the distributive property and write your answer in simplest form.

5. $7(x - 4) =$ 5. _____
6. $5(4n - 3) =$ 6. _____
7. $-6(3y + 5) =$ 7. _____
8. $-4(8 - 9x) =$ 8. _____
9. $8(3n + 7) - 10n =$ 9. _____
10. $-4(5 + 7y) + 6(2y - 9) =$ 10. _____

Topic: Polynomials (examples taken from www.purplemath.com)

Adding polynomials is just a matter of combining like terms, with some order of operations considerations thrown in. As long as you're careful with the minus signs, and don't confuse addition and multiplication, you should do fine.

There are a couple formats for adding and subtracting, and they hearken back to earlier times, when you were adding and subtracting just plain old numbers. First, you learned addition "horizontally", like this: $6 + 3 = 9$. You can add polynomials in the same way, grouping like terms and then simplifying.

Example: Simplify $(7x^2 – x – 4) + (x^2 – 2x – 3) + (–2x^2 + 3x + 5)$

Adding horizontally:

$$\begin{aligned}(7x^2 – x – 4) + (x^2 – 2x – 3) + (–2x^2 + 3x + 5)\\ &= 7x^2 – x – 4 + x^2 – 2x – 3 + –2x^2 + 3x + 5\\ &= 7x^2 + \mathbf{1}x^2 – 2x^2 – \mathbf{1}x – 2x + 3x – 4 – 3 + 5\\ &= 8x^2 – 2x^2 – 3x + 3x – 7 + 5\\ &= \mathbf{6x^2 – 2}\end{aligned}$$

Adding vertically:

$$\begin{array}{r} 7x^2 - x - 4 \\ x^2 - 2x - 3 \\ \hline -2x^2 + 3x + 5 \\ \hline 6x^2 \quad - 2 \end{array}$$

Subtracting polynomials is quite similar to adding polynomials, but you have that pesky minus sign to deal with. Here are some examples, done both horizontally and vertically:

Example: Simplify $(6x^3 – 2x^2 + 8x) – (4x^3 – 11x + 10)$

Horizontally:

$$\begin{aligned}(6x^3 – 2x^2 + 8x) – (4x^3 – 11x + 10)\\ &= (6x^3 – 2x^2 + 8x) – \mathbf{1}(4x^3 – 11x + 10)\\ &= (6x^3 – 2x^2 + 8x) – \mathbf{1}(4x^3) – \mathbf{1}(–11x) – \mathbf{1}(10)\\ &= 6x^3 – 2x^2 + 8x – 4x^3 + 11x – 10\\ &= 6x^3 – 4x^3 – 2x^2 + 8x + 11x – 10\\ &= \mathbf{2x^3 – 2x^2 + 19x – 10}\end{aligned}$$

Vertically: I'll write out the polynomials, leaving gaps as necessary:

$$\begin{array}{r} 6x^3 - 2x^2 + 8x \\ 4x^3 \quad - 11x + 10 \\ \hline \end{array}$$

Then I'll change the signs in the second line, and add:

$$\begin{array}{r} 6x^3 - 2x^2 + 8x \\ -4x^3 \quad + 11x - 10 \\ \hline 2x^3 - 2x^2 + 19x - 10 \end{array}$$

Either way, I get the answer: $\mathbf{2x^3 – 2x^2 + 19x – 10}$

Add.

1. $(4x^2 - 6x + 7) + (-19x^2 - 15x - 18)$

2. $(-14x^2 - 15x - 17) + (14x^2 + 9x - 17)$

3. $(11x^2 + 5x + 6) + (18x^2 + 17x + 17)$

4. $(9x^6 - 4) + (10x^5 - 15x^4 + 14)$

Subtract.

5. $(6x + 19) - (14x + 5)$

6. $(19x^2 + 9x + 16) - (5x^2 + 12x + 7)$

7. Subtract $4x^4 - 14x^3 + 11$ **from** $-14x^6 - 9x^5 - 12x^2$

8. $(-18x^2 + 4x - 16) - (15x^2 + 4x - 13)$

Answers:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

Topic: Algebra

Solving equations by using the Addition, Subtraction or Multiplication Property of Equality. Check the solution.

Ex 1: $\frac{1}{2}x + 5 = 9$

$-5 \quad = -5$

$\frac{2}{1} \cdot \frac{1}{2}x = 4 \cdot 2$

$x = 8$

Check: $\frac{1}{2}x + 5 = 9$

$\frac{1}{2}(\frac{8}{1}) + 5 = 9$

$4 + 5 = 9$

$9 = 9$

Ex 2: $7x - 6 - 11x = -14$

$7x - 6 - 11x = -14$

$-4x - 6 = -14$

$+6 \quad +6$

$\frac{-4x}{-4} = \frac{-8}{-4}$

$x = 2$

Check:

$7x - 6 - 11x = -14$

$7(2) - 6 - 11(2) = -14$

$14 - 6 - 22 = -14$

$8 - 22 = -14$

$-14 = -14$

Translate and evaluate the following equations.

Ex 3: The product of 4 and a number is 28.

$4 \cdot n = 28$

$\frac{4n}{4} = \frac{28}{4}$

$n = 7$

Addition: sum, more than
Multiplication: product

Ex 4. The quotient of a number and 3 is 15.

$\frac{n}{3} = 15$

$n = 45$

Subtraction: difference, less than
Division: quotient

Solve the following equations. Show your work and check your solution.

1. $2x - 5 = 17$

Check:

2. $\frac{1}{3}x - 9 = -12$

Check:

3. $5x + 8 = -12$

Check:

Apply the distributive property first.

4. $-4x + 8 = 32$

5. $\frac{x}{4} + 8 = 20$

6. $2(x - 7) = 8$

Check:

Check:

Check:

Apply the distributive property first.

7. $8x - 5 - 6x = 7$

8. $3 = 4x - 10x + 15$

9. $6x - (3 + 8x) = -11$

Check:

Check:

Check:

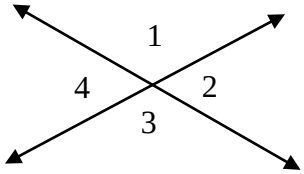
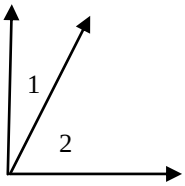
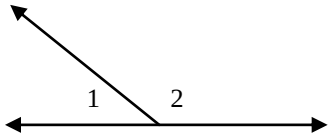
Translate each sentence to an algebraic equation. Then use mental math to find the solution.

	Equation	*Solution*
10. One-half of a number is -12.	_____	_____
11. 6 more than 7 times a number is 41.	_____	_____
12. 5 less than three times a number is 10.	_____	_____
13. 16 increased by twice a number is – 24.	_____	_____

Topic: Angle Relationships… and Algebra

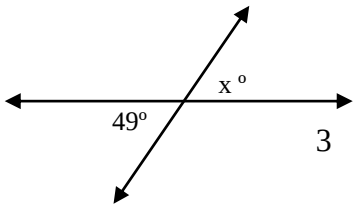
Notation: $m\angle$ *means the "measure of angle"*

$\cong$ *means congruent or equal in measure*

Vertical Angles	**Complementary Angles**	**Supplementary Angles**
		
Angles that are opposite each other across two intersecting lines.	**Two angles whose sum is 90^o.**	**Two angles whose sum is 180^o.**
$m\angle 1 \cong m\angle 3$ *and* $m\angle 2 \cong m\angle 4$	$m\angle 1 + m\angle 2 = 90^0$	$m\angle 1 + m\angle 2 = 180^0$

State how the angle labeled x is related to the angle with the given measurement. Find the value of x in each figure.

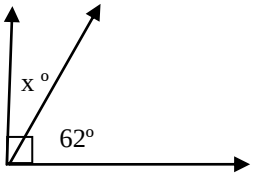
1)



1) _____

x = _____

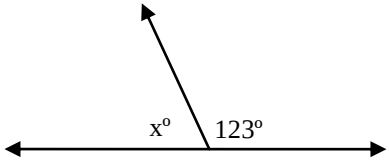
2)



2) _____

x = _____

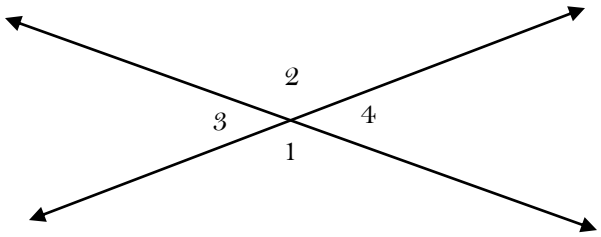
3)



3) _____

x = _____

4) Find the missing angles.
Note: the angles are not drawn to scale.



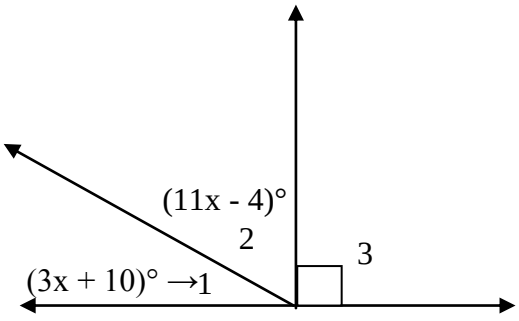
Given: $\angle 4 = 50^\circ$
Find each angle and **write your reasoning**.

$\angle 1 =$

$\angle 2 =$

$\angle 3 =$

5)



5)

Relationship _____

x = _____

m ∠1 = _____

m ∠2 = _____

m ∠3 = _____

Topic: Geometry

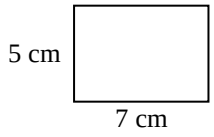
You should know the following formulas and be able to use them to find the area or perimeter of a geometric figure.

Perimeter of a polygon = the sum of the sides

Rectangle:	$P = 2l + 2w$	$A = lw$
Square:	$P = 4s$	$A = s^2$
Parallelogram:	$P = s_1 + s_2 + s_3 + s_4$	$A = bh$
Triangle:	$P = s_1 + s_2 + s_3$	$A = \frac{1}{2}\, bh$
Trapezoid:	$P = s_1 + s_2 + s_3 + s_4$	$A = \frac{1}{2}\,(b_1 + b_2)h$
Circle:	Circumference = πd	$A = \pi r^2$

Find the <u>perimeter/circumference</u> and <u>area</u> of each figure. Express #6 in terms of pi (π). <u>Show your work</u>. (Use and attach a separate work page if space is needed.)

1.



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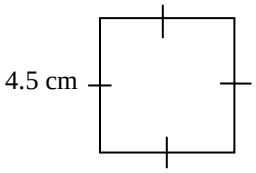

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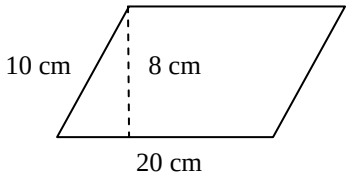

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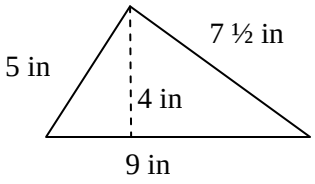

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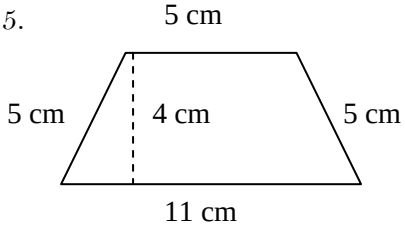
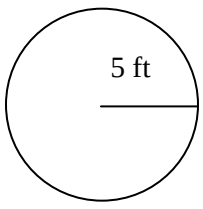


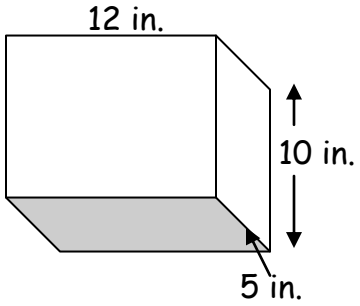
6.



9) Name each figure. Find the volume or surface area of each. (Use the reference sheet at the back!)

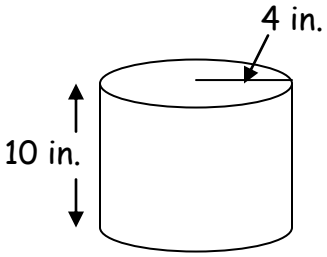
a) Name: _____

Volume: _____



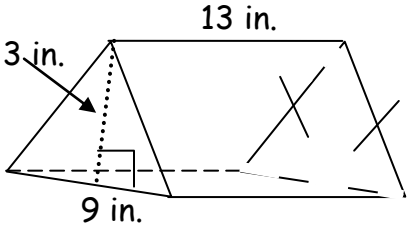
b) Name: _____

Surface Area: _____
(in terms of pi)



c) Name: _____

Volume: _____



d) Name: _____

Volume: _____
(in terms of pi)

10) A storage tank shaped like a rectangular prism is being manufactured to hold 100,000 cubic feet of natural gas. It has a length of 10 feet and a width of 25 feet. Use algebra to find out what height the tank should be.

Topic: Ratio & Proprtion

Derek counted 24 marshmallows in 3 servings of Marshy Morsels. At this rate, how many marshmallows are in 12 servings?

Strategy **Write and solve a proportion.**

Step 1 Set up a proportion.

Write ratios for the number of marshmallows to the number of servings.

$$\frac{\text{number of marshmallows in 3 servings}}{\text{3 servings}} = \frac{\text{number of marshmallows in 12 servings}}{\text{12 servings}}$$

Step 2 Fill in the values in the proportion.

Let t represent the number of marshmallows in 12 servings.

$$\frac{24}{3} = \frac{t}{12}$$

Step 3 Cross multiply and solve for t.

$$\frac{24}{3} = \frac{t}{12}$$

$24 \times 12 = 3 \times t$ Write the factors of the cross products.

$288 = 3t$ Multiply to find the cross products.

$\frac{288}{3} = \frac{3t}{3}$ Divide both sides of the equation by the coefficient 3.

$96 = t$ Solve for t.

Solution **At this rate, there are 96 marshmallows in 12 servings.**

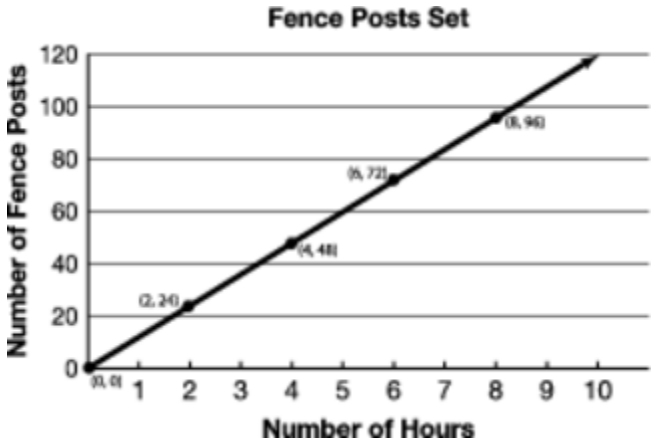
1) Buck drove 220 miles in 5 hours. What was his average rate of speed?

2) Horace read 160 pages in 4 hours. How many pages can he read in 6 hours?

3) Pasha bought 3 pounds of onions for $2.67. Which ratio is proportional to 3 pounds at $2.67?

A. $\frac{\$3.48}{4 pounds}$ B. $\frac{\$3.67}{4 pounds}$ C. $\frac{\$4.45}{5 pounds}$ D. $\frac{\$4.57}{5 pounds}$

4) This graph shows the number of fence posts a company set as a function of time.



What is the rate of setting fence posts?

A. 36 posts per hour B. 24 posts per hour C. 12 posts per hour D. 6 posts per hour

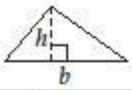
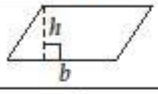
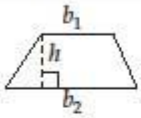
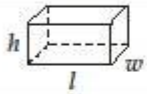
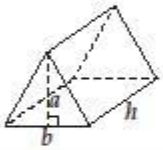
5) The equation $y = 6.50x$ relates the number of tickets purchased for the school play and the total cost, in dollars. Use the equation to complete the table below.

Number of Tickets, x	1	2	3	4	5	6
Total Cost in Dollars, y						

6) Kendall knows that a 45-ounce pitcher can hold enough lemonade for 6 people. At this rate, how many ounces of lemonade will Kendall need to serve 26 people?

Grade 7 Mathematics Reference Sheet

FORMULAS

	**Circle**	Area = πr^2 Circumference = $2\pi r$
	**Triangle**	Area = $\frac{1}{2}bh$
	**Parallelogram**	Area = bh
	**Trapezoid**	Area = $\frac{1}{2}h(b_1 + b_2)$
	**Right Rectangular Prism**	Volume = lwh Volume = Bh
	**Right Triangular Prism**	Volume = $\frac{1}{2}abh$ Volume = Bh
	**Right Circular Cone**	Volume = $\frac{1}{3}Bh$ Volume = $\frac{1}{3}\pi r^2 h$
	**Right Circular Cylinder**	Surface Area = $2\pi rh + 2\pi r^2$

CONVERSIONS

1 centimeter = 10 millimeters
1 meter = 100 centimeters = 1,000 millimeters
1 kilometer = 1,000 meters

1 gram = 1,000 milligrams
1 kilogram = 1,000 grams

1 pound = 16 ounces
1 ton = 2,000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 liter = 1,000 milliliters
1 kiloliter = 1,000 liters

1 mile = 5,280 feet
1 mile = 1,760 yards

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