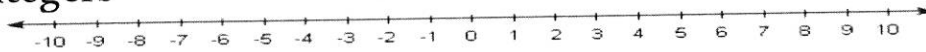


Incoming 8<sup>th</sup> Grade  
Math Packet

# Topic: Integers



## Examples:

Addition	Subtraction	Multiplication	Division
<p><i>Same signs:</i> Add &amp; keep sign</p> $+6 + +5 = +11$ $-8 + -2 = -10$	<p><i>Keep-Change-Opposite</i></p> $+10 - -8 = +10 + +8 = 18$ $-5 - +12 = -5 + -12$	<p><i>Same signs:</i> Positive product</p> $(+7)(+8) = +56$ $(-2)(-6) = +12$	<p><i>Same signs:</i> Positive quotient</p> $+42 \div +6 = +7$ $-24 \div -8 = +3$
<p><i>Different signs:</i> Subtract &amp; take sign of larger value</p> $+9 + -5 = +4$ $-6 + +1 = -5$	$-20 - -8 = -20 + +8 = -12$	<p><i>Different signs:</i> Negative product</p> $(+3)(-9) = -27$ $(-5)(+4) = -20$	<p><i>Different signs:</i> Negative quotient</p> $+56 \div -7 = -8$ $-50 \div +2 = -25$

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.

Answers:

1.  $-12 + (-7) = \underline{\hspace{2cm}}$

2.  $-25 + 18 = \underline{\hspace{2cm}}$

1.                     

3.  $2 + (-25) = \underline{\hspace{2cm}}$

4.  $-28 - (-8) = \underline{\hspace{2cm}}$

2.                     

5.  $11 - (-5) = \underline{\hspace{2cm}}$

6.  $-21 - 4 = \underline{\hspace{2cm}}$

3.                     

7.  $(-9)(-8) = \underline{\hspace{2cm}}$

8.  $(2)(-12) = \underline{\hspace{2cm}}$

4.                     

9.  $\frac{-35}{-7} = \underline{\hspace{2cm}}$

10.  $\frac{-48}{8} = \underline{\hspace{2cm}}$

5.                     

6.                     

7.                     

8.                     

9.                     

10.                    

11.                    

11.  $(-2)(+6)(-5) = \underline{\hspace{2cm}}$

12.  $-30 + \frac{24}{6} \cdot (-2) = \underline{\hspace{2cm}}$

12.                    

13.                    

14.                    

13.  $\frac{16}{4} + 2 \cdot (-8) = \underline{\hspace{2cm}}$

14.  $-3(1 - 8) + 2^3 = \underline{\hspace{2cm}}$

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

Answers:

1. \_\_\_\_\_

2. \_\_\_\_\_

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

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

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

3. \_\_\_\_\_

4. \_\_\_\_\_

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

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

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

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

## Topic: Inequalities

$<$	$>$	$\leq$	$\geq$
<ul style="list-style-type: none"> <li>• is less than</li> <li>• is fewer than</li> </ul>	<ul style="list-style-type: none"> <li>• is greater than</li> <li>• is more than</li> <li>• exceeds</li> </ul>	<ul style="list-style-type: none"> <li>• is less than or equal to</li> <li>• is no more than</li> <li>• is at most</li> </ul>	<ul style="list-style-type: none"> <li>• is greater than or equal to</li> <li>• is no less than</li> <li>• is at least</li> </ul>

### Graphing Inequalities on a Number Line



*REMEMBER the mosquito rule:*

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

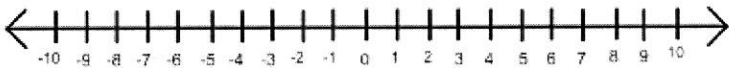
If you multiply or divide each side of an inequality by a negative values, you need to switch the direction of the inequality to keep the statement true.

### 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:
- $2x + 9x = (2 + 9)x = 11x$
  - $12y - 7y = (12 - 7)y = 5y$
  - $5x + 8 - 2x + 7 = 3x + 15$

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

Simplify each expression by combining like terms.

1.  $8y + 2y$

2.  $10 - 6y + 4y + 9 =$

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

4.  $8n - 7y - 12n + 5 - 3y =$

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

5.  $7(x - 4) =$

6.  $5(4n - 3) =$

7.  $-6(3y + 5) =$

8.  $-4(8 - 9x) =$

9.  $8(3n + 7) - 10n =$

10.  $-4(5 + 7y) + 6(2y - 9) =$

Answers:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

**Topic: Algebra**

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

Check the solution.

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

$$- 5 = -5$$

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

$$x = 8$$

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

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

$$4 + 5 = 9$$

$$9 = 9$$

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

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

$$-4x - 6 = -14$$

$$+ 6 + 6$$

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

$$x = 2$$

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

$$4 \cdot n = 28$$

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

$$n = 7$$

Addition: sum, more than  
Multiplication: product

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

$$n = 45$$

Subtraction: difference, less than  
Division: quotient

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

1.  $2x - 5 = 17$

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

3.  $5x + 8 = -12$

Check:

Check:

Check:

$$4. -4x + 8 = 32$$

Check:

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

Check:

Apply the distributive property first.

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

Check:

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

Check:

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

Check:

Apply the distributive property first.

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

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.

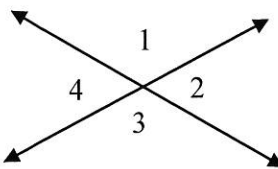
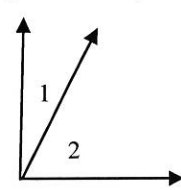
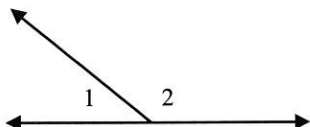
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13. 16 increased by twice a number is -24.

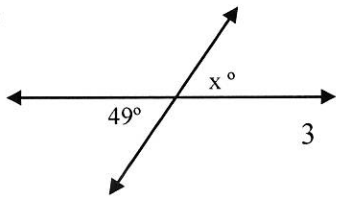
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Topic: Angle Relationships... and Algebra		
<p><b>Notation:</b> <math>m\angle</math> means the "measure of angle"  <math>\cong</math> means congruent or equal in measure</p>		
<p><b>Vertical Angles</b></p>  <p>Angles that are opposite each other across two intersecting lines.</p> <p><math>m\angle 1 \cong m\angle 3</math> and  <math>m\angle 2 \cong m\angle 4</math></p>	<p><b>Complementary Angles</b></p>  <p>Two angles whose sum is <math>90^\circ</math>.</p> <p><math>m\angle 1 + m\angle 2 = 90^\circ</math></p>	<p><b>Supplementary Angles</b></p>  <p>Two angles whose sum is <math>180^\circ</math>.</p> <p><math>m\angle 1 + m\angle 2 = 180^\circ</math></p>

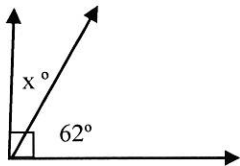
State how the angle labeled  $x$  is related to the angle with the given measurement. Find the value of  $x$  in each figure.

1)



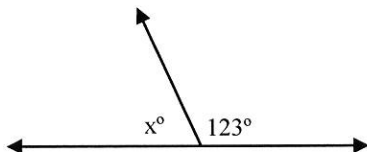
1) \_\_\_\_\_  
 $x =$  \_\_\_\_\_

2)



2) \_\_\_\_\_  
 $x =$  \_\_\_\_\_

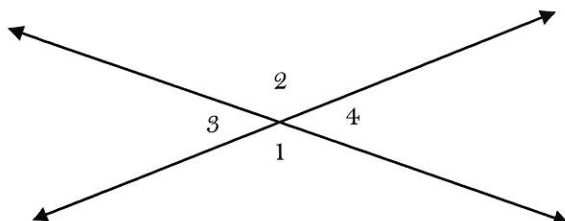
3)



3) \_\_\_\_\_  
 $x =$  \_\_\_\_\_



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



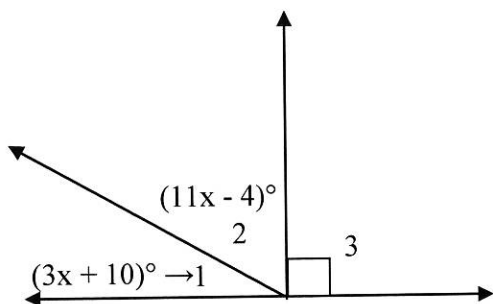
Given:  $\angle 4 = 50^\circ$   
 Find each angle and **write your reasoning**.

$\angle 1 =$

$\angle 2 =$

$\angle 3 =$

5)



5)

Relationship \_\_\_\_\_

$x =$  \_\_\_\_\_

$m \angle 1 =$  \_\_\_\_\_

$m \angle 2 =$  \_\_\_\_\_

$m \angle 3 =$  \_\_\_\_\_

## 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:  $P = s_1 + s_2 + s_3$

$$A = \frac{1}{2}bh$$

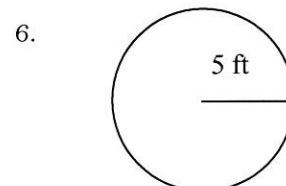
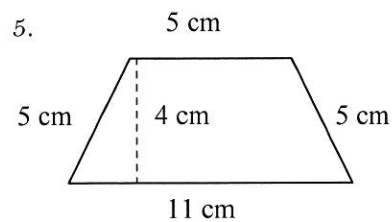
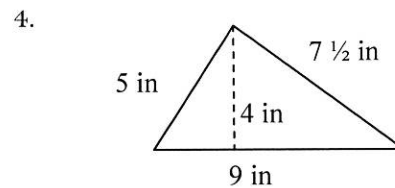
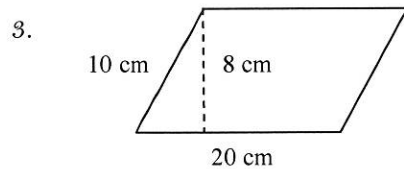
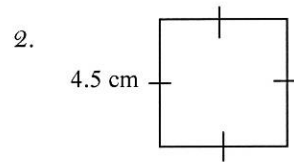
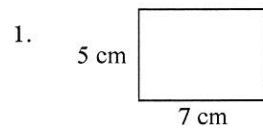
Trapezoid:  $P = s_1 + s_2 + s_3 + s_4$

$$A = \frac{1}{2}(b_1 + b_2)h$$

Circle: Circumference =  $\pi d$

$$A = \pi r^2$$

Find the perimeter/circumference and area of each figure. Express #6 in terms of pi ( $\pi$ ).



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

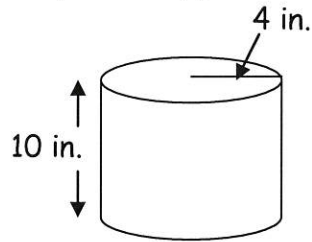
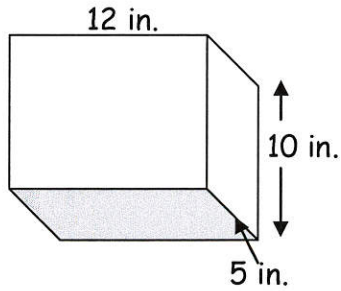
a) Name: \_\_\_\_\_

b) Name: \_\_\_\_\_

Volume: \_\_\_\_\_

Surface Area: \_\_\_\_\_

(in terms of pi)



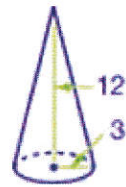
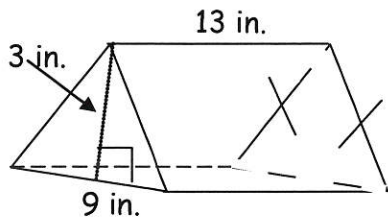
c) Name: \_\_\_\_\_

d) Name: \_\_\_\_\_

Volume: \_\_\_\_\_

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 & Proportion

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.

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

**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  $t$ .

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

$$24 \times 12 = 3 \times t \quad \text{Write the factors of the cross products.}$$

$$288 = 3t \quad \text{Multiply to find the cross products.}$$

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

$$96 = t \quad \text{Solve for } t.$$

**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?

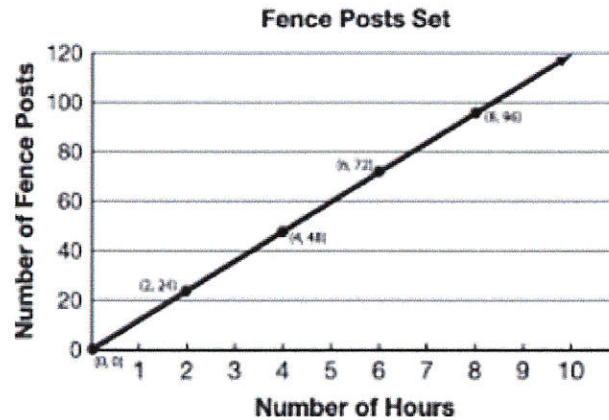
A.  $\frac{\$3.48}{4 \text{ pounds}}$

B.  $\frac{\$3.67}{4 \text{ pounds}}$

C.  $\frac{\$4.45}{5 \text{ pounds}}$

D.  $\frac{\$4.57}{5 \text{ pounds}}$

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


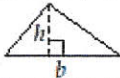
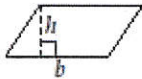
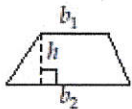
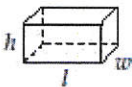
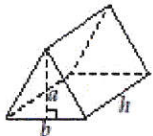
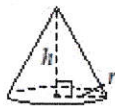

5) The equation  $y = 6.50x$  relates the number of tickets purchased for the school play and the total cost, in dollars. Use the equation to complete the table below.

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 = $\pi r^2$ 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 = $\frac{1}{3}\pi r^2h$
	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