

Algebra Common Core Review

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Properties of Real Numbers (SAVE)

True for
Real Numbers



Commutative Property of Addition (“commute = move to new place”)

$$a + b = b + a \qquad 6 + 4 = 4 + 6$$

Commutative Property of Multiplication

$$a \cdot b = b \cdot a \qquad 5 \cdot 7 = 7 \cdot 5$$

Associative Property of Addition (“regroup – elements do not move, they group with a new friend”)

$$(a + b) + c = a + (b + c) \qquad (4 + 3) + 5 = 4 + (3 + 5)$$

Associative Property of Multiplication

$$(a \cdot b) \cdot c = a \cdot (b \cdot c) \qquad (6 \cdot 2) \cdot 3 = 6 \cdot (2 \cdot 3)$$

Distributive Property (“multiplication distributes over addition/subtraction”)

$$a(b + c) = ab + ac \qquad 4(6 + 2) = (4)(6) + (4)(2)$$

$$a(b - c) = ab - ac \qquad 3(6 - 2) = (3)(6) - (3)(2)$$

Additive Identity (Addition Property of Zero) (“a value that returns the input unchanged”)

$$a + 0 = a \quad \text{and} \quad 0 + a = a \qquad 7 + 0 = 7$$

Additive Inverse (“the value bringing you back to the additive identity element”)

$$a + (-a) = 0 \qquad 6 + (-6) = 0$$

Multiplicative Identity (Multiplication Property of One)

$$a \cdot 1 = a \quad \text{and} \quad 1 \cdot a = a \qquad 5 \cdot 1 = 5$$

Multiplicative Inverse (Reciprocals)

$$a \cdot \frac{1}{a} = 1 \qquad 2 \cdot \frac{1}{2} = 1 \qquad 4 \cdot \frac{1}{4} = 1$$

Multiplicative Property of Zero (“zero times any element is 0”)

$$a \cdot 0 = 0 \qquad 4 \cdot 0 = 0$$

Notice that the Commutative Property and the Associative Property apply to Addition and Multiplication. They do NOT apply to **subtraction** or **division**.

NOTE:

$$a - b \neq b - a \text{ for all values of } a \text{ and } b.$$

$$4 - 3 \neq 3 - 4$$

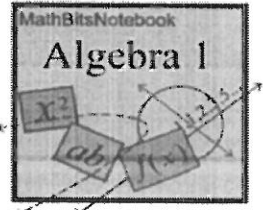
$$1 \neq -1$$

$$(a \div b) \div c \neq a \div (b \div c) \text{ for all values}$$

$$(12 \div 2) \div 3 \neq 12 \div (2 \div 3)$$

$$6 \div 3 \neq 12 \div 2/3$$

$$2 \neq 18$$



Real Number Properties

Name _____

1. Explain why the following statements are equivalent: $4(x + y) = 4x + 4y$
2. Rewrite this expression using the Distributive Property: $6x + 12$
3. Using the Distributive Property, write an expression equivalent to $5(x - 6)$.
4. Rewrite this expression using the Distributive Property: $-5x - 25$
5. Explain why the following statements are equivalent: $a + (b + 4) = a + (4 + b)$
6. Using the Commutative Property, write an equivalent expression for $5 \cdot (7x)$.
7. Explain why the following equation is true: $(x + 4) + (-x + (-4)) = 0$.
8. Simplify this expression and justify your steps: $12 + 3(a + 2b) - 2a - 3b - 9 + b$

(This explanation is one possible solution.)

$$12 + 3(a + 2b) - 2a - 3b - 9 + b \underline{\hspace{10em}}$$

$$12 + 3a + 6b - 2a - 3b - 9 + b \underline{\hspace{10em}}$$

$$12 - 9 + 3a - 2a + 6b - 3b + b \underline{\hspace{10em}}$$

$$(12 - 9) + (3a - 2a) + (6b - 3b + b) \underline{\hspace{10em}}$$

$$(3) + (3a - 2a) + (6b - 3b + b) \underline{\hspace{10em}}$$

$$3 + a(3 - 2) + b(6 - 3 + 1) \underline{\hspace{10em}}$$

$$3 + a(1) + b(4) \underline{\hspace{10em}}$$

$$3 + a + 4b \underline{\hspace{10em}}$$



Thinking About Rationals & Irrationals

Name _____

*Directions: Circle whether the following statements are TRUE or FALSE.
Justify your conclusions. Choose FALSE if the statement is not ALWAYS true.*

- | | | |
|---|------|-------|
| 1. If the sides of a square each measure $\sqrt{7}$, the area of the square is irrational. | TRUE | FALSE |
| 2. If the radius of a circle is $4\frac{1}{3}$, the circumference of this circle is irrational. | TRUE | FALSE |
| 3. If the sides of a rectangle are $(2 + \sqrt{3})$ and $(7 - \sqrt{3})$, the perimeter of this rectangle is rational. | TRUE | FALSE |
| 4. If the sides of a square measure $\sqrt{8}$, the diagonal of this square is irrational. | TRUE | FALSE |
| 5. Since the number $\frac{\sqrt{2}}{3}$ is a fraction, it is a rational number. | TRUE | FALSE |

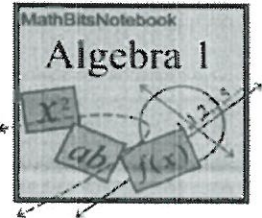
The following statements are more general in nature. Be sure to justify your decisions

- | | | |
|---|------|-------|
| 6. The sum of two rational numbers is rational. | TRUE | FALSE |
| 7. The sum of a rational number and an irrational number is irrational. | TRUE | FALSE |

8. If an expression contains π , the expression is irrational.	TRUE	FALSE
9. The product of two rational numbers is rational.	TRUE	FALSE
10. The circumference of a circle is irrational.	TRUE	FALSE
11. The product of a nonzero rational number and an irrational number is irrational.	TRUE	FALSE
12. The product of two irrational numbers is irrational.	TRUE	FALSE



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Radical Practice

Name _____

Directions: Circle whether each of the following statements are TRUE or FALSE. If the statement is FALSE, indicate (beneath the problem) what is wrong.

1. TRUE or FALSE

a. $\sqrt{75} \stackrel{?}{=} 5\sqrt{3}$ T F

b. $4\sqrt{2} \stackrel{?}{=} 2\sqrt{8}$ T F

c. $2\sqrt{7} \stackrel{?}{=} \sqrt{14}$ T F

d. $\sqrt[3]{8} \stackrel{?}{=} 2$ T F

2. TRUE or FALSE

a. $\sqrt{a^2} \stackrel{?}{=} a$ T F

b. $\sqrt{9x^2} \stackrel{?}{=} 3x\sqrt{x}$ T F

c. $\sqrt{8a} \stackrel{?}{=} \sqrt{8}\sqrt{a}$ T F

d. $\sqrt{12x^3} \stackrel{?}{=} 2x\sqrt{3x}$ T F

3. TRUE or FALSE

a. $\pm\sqrt{36} \stackrel{?}{=} \pm 6$ T F

b. $\sqrt{81} \stackrel{?}{=} \pm 9$ T F

c. $-2\sqrt{3} \stackrel{?}{=} -\sqrt{12}$ T F

d. $\sqrt{-16} \stackrel{?}{=} -4$ T F

Directions: Choose the best answer. Place your answer in the answer column at the right.

4. Simplify $\sqrt{32}$
 [1] 6 [2] $4\sqrt{2}$ [3] $8\sqrt{2}$ [4] $4\sqrt{6}$ 4. _____

5. Which of the following **cannot** be simplified?
 [1] $\sqrt{128}$ [2] $\sqrt{50}$ [3] $\sqrt{115}$ [4] $\sqrt{196}$ 5. _____

6. Which of the following is **not** equivalent to $\sqrt{72}$?
 [1] $6\sqrt{2}$ [2] $\sqrt{36 \cdot 2}$ [3] $3\sqrt{8}$ [4] $\sqrt{6} \cdot \sqrt{2}$ 6. _____

7. Which of the following is true?
 [1] $\sqrt{50} = \pm 5\sqrt{2}$ [2] $-\sqrt{50} = 5\sqrt{2}$
 [3] $\sqrt{50} = 5\sqrt{2}$ [4] All of these are TRUE. 7. _____

8. Simplify $2\sqrt{48}$
 [1] $4\sqrt{3}$ [2] $8\sqrt{3}$ [3] $16\sqrt{3}$ [4] $8\sqrt{6}$ 8. _____

What's My Label?

Name _____

Directions: Solve the problems on the left and find their answers, with the appropriate labels, on the right. Place the "letter" of your answer in front of the question. There will be a hidden message when you are done.
HINT: The message will read from the bottom up.

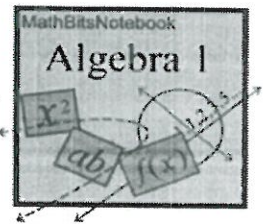


- ___1. Express the speed of a bicycle that can cover 12 miles in two hours.
- ___2. Find the area of a rectangle measuring 2 inches by 3 inches.
- ___3. A 3-foot board is cut into 3 equal parts. Find the length of each piece.
- ___4. Find the perimeter of a rectangle with a length of 2 inches and a width of 1 inch.
- ___5. During obstacle course trials, a dirt bike racer scores speed times of 8 mph, 16 mph, 13 mph and 11 mph. What is the dirt biker's average speed during these trials?
- ___6. Find the volume of a box measuring 2 inches by 3 inches by 2 inches.
- ___7. A public rectangular flower garden measures 3 miles by 2 miles. What is the area of the garden?
- ___8. Traveling at a speed of 55 miles per hour, how long will it take to travel 330 miles?
- ___9. A machine is set to sew 30 inches material every 5 seconds. Express the speed of the machine at this setting.
- ___10. A gift box measures 2 inches by 3 inches by 1 inch. Express the volume of the box.
- ___11. On a hiking trail, it takes one full day to traverse the entire trail. At this rate, how long will it take to traverse half of the trail?
- ___12. A rectangular pasture measures 2.5 miles by 4.8 miles. Find the area.

- There are more answers than questions.*
- K. 6 miles per hour
 - E. 12 miles per hour
 - E. 6 square miles
 - U. 12 square miles
 - B. 6 hours
 - R. 12 hours
 - D. 6 inches
 - A. 12 inches
 - L. 6 cubic inches
 - L. 12 cubic inches
 - O. 6 square inches
 - M. 12 square inches
 - A. 6 inches per second
 - P. 12 inches per second

Error in Measurement

Name _____



Directions: Answer each question by showing justification for your answer.

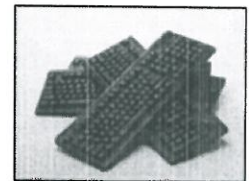
1. A rectangular photograph is measured to be 8.5 inches in length. The actual length of the photograph, however, is 8.1 inches. Find:
 - a. the absolute error in the measured length.
 - b. the relative error in the measured length.
 - c. the percentage error in the measured length.



2. A portable blackboard is rectangular in shape. To the *nearest inch*, the length of the blackboard is 42 inches, and its width to the *nearest inch* is 34 inches. What is the least possible value of the area, in square inches, of the blackboard to the *nearest integer*?



3. The tolerance level of a manufactured keyboard component is stated as 1.24 ± 0.02 cm. State the acceptable range of dimensions for this part?



4. A measurement is taken to be 13.6 in. and the absolute error is 0.05 in. What is the percent of error?



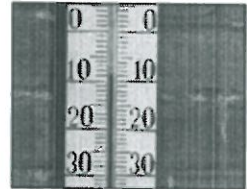
5. A measurement is taken to be 20 ± 0.05 m. What is the absolute error, the relative error and the percent of error?



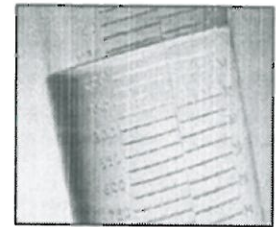
6. Oz, the cat, weighs 15 pounds to the *nearest pound*. Which choice cannot be the actual weight of Oz?
 [1] 15.4 lbs. [2] 14.6 lbs. [3] 15.6 lbs. [4] 14.9 lbs



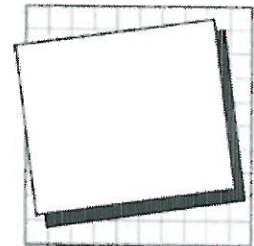
7. A temperature reading is taken to be 9 degrees below zero Fahrenheit, to the *nearest degree*. State the interval in which the actual temperature may be found.



8. By tipping the vile, a student mistakenly measures a liquid to be 35 fluid ounces, when actually the liquid is 37 fluid ounces. What is the student's percent of error on his/her measurement?



9. A student measures the side of a square mosaic piece to be 6 inches, to the *nearest inch*. What is the minimum possible area of the actual square piece?



10. A landscaping team has been asked to reseed the side lawn at a local university. They roughly measure the rectangular space and determine the lawn is 110 feet by 55 feet. The actual measurements of the lawn are 100 feet by 50 feet. Which expression represents the relative error of their area measurement?



[1] $\frac{|(110)(55) - (100)(50)|}{(100)(50)}$

[2] $\frac{|(110)(55) - (100)(50)|}{(110)(55)}$

[3] $\frac{(100)(50)}{(110)(55) - (100)(50)}$

[4] $\frac{(110)(55)}{(110)(55) - (100)(50)}$