

# Algebra 1 Week 1

Dear Parent/Guardian,

During Week 1, we will review and support mastery of the Algebra 1 standards: Seeing Structure in Expressions. Your child will work towards rewriting algebraic expressions in different equivalent forms by recognizing the expression's structure. There are nine topics in this section. It is suggested you complete two topics per day; on day five only one topic is listed. A proposed schedule is included.

Additionally, students can access both Math Nation and the Pearson textbook through ClassLink. Both sites offer instructional support including video lessons, practice quizzes and more.

We also suggest that students have an experience with math each day. Practicing at home will make a HUGE difference in your child's school success! Make math part of your everyday routine. Choose online sites that match your child's interests. Online math games, when played repeatedly, can encourage strategic mathematical thinking, help develop computational fluency, and deepen their understanding of numbers.

Links for additional resources to support students at home are listed below:

<https://www.brainpop.com/games/sortifyangles/>

<https://www.hoodamath.com/games/highschool.html>

<https://www.khanacademy.org/resources/teacher-essentials>

<https://www.mangahigh.com/en-us/games/wrecksfactor>

<http://www.xpmath.com/forums/arcade.php?do=play&gameid=115>

<https://www.purplemath.com/modules/>

<b>Week 1 At A Glance</b>	
Day 1	<b>Section 1 – Expressions</b> <b>Topic 1: Using Expressions to Represent Real-World Situations</b> <b>Topic 2: Understanding Polynomial Expressions</b>
Day 2	<b>Section 1 – Expressions</b> <b>Topic 3: Algebraic Expressions Using the Distributive Property</b> <b>Topic 4: Algebraic Expressions Using the Commutative and Associative Property</b>
Day 3	<b>Section 1 – Expressions</b> <b>Topic 5: Properties of Exponents</b> <b>Topic 6: Radical Expressions and Expressions with Rational Exponents</b>
Day 4	<b>Section 1 – Expressions</b> <b>Topic 7: Adding Expressions with Radicals and Rational Exponents</b> <b>Topic 8: More Operations with Radicals and Rational Exponents</b>
Day 5	<b>Section 1 – Expressions</b> <b>Topic 9: Operations with Rational and Irrational Numbers</b>

## Section 1: Expressions Student Learning Plan

Topic Number	Topic Name	Date Completed	Study Expert(s)	Check Your Understanding Score
1	Using Expressions to Represent Real-World Situations			
2	Understanding Polynomial Expressions			
3	Algebraic Expressions Using the Distributive Property			
4	Algebraic Expressions Using the Commutative and Associative Properties			
5	Properties of Exponents			
6	Radical Expressions and Expressions with Rational Exponents			
7	Adding Expressions with Radicals and Rational Exponents			
8	More Operations with Radicals and Rational Exponents			
9	Operations with Rational and Irrational Numbers			

**What did you learn in this section? What questions do you still have?**

**Who was your favorite Study Expert for this section? Why?**



## Section 1 – Topic 1

### Using Expressions to Represent Real-World Situations

1. Write each phrase as a mathematical expression.

Phrase	Mathematical Expression
nine increased by a number	
fourteen decreased by a number	
seven less than a number	
the product of nine and a number	
thirty-two divided by a number	
five more than twice a number	
the product of a number and six	
seven divided by twice a number	
three times a number decreased by eleven	
withdrawing \$10 every week from an outstanding balance of \$400	

2. Joseph tweets 13 times a day. Define each variable and write an algebraic expression to describe the number of posts after any given number of days.

3. Emanuel has 745 pictures in his phone. His memory is getting full, so he starts deleting 20 pictures every day. Define each variable and write an algebraic expression to describe the number of pictures left on his phone after any given number of days.

4. Ashley posts 17 status updates on her Facebook wall each day. Roberto posts 21 status updates on his Facebook wall each day.

*Part A:* Define each variable and write an algebraic expression to describe the combined number of posts for Ashley and Roberto after any given number of days.

*Part B:* Write an algebraic expression to describe the difference between number of posts for Ashley and Roberto after any given number of days.

5. Tommy posts 11 pictures on Instagram every day. Elizabeth posts 15 pictures on Instagram every day.

*Part A:* Define each variable and write an algebraic expression to describe the combined number of posts for Tommy and Elizabeth after any given number of days.

*Part B:* After 7 days, how many pictures have Tommy and Elizabeth posted altogether? How do you know?



6. Homer and Bart plan to buy one computer for \$499.00 strictly for gaming purposes. Games cost \$49.99 each.

*Part A:* Define each variable and write an algebraic expression to describe how much they will spend before sales tax, based on purchasing the computer and the number of games.

*Part B:* If they purchase one computer and five games, how much do they spend before sales tax?

*Part C:* Homer and Bart have friends. They want to purchase extra controllers. Each controller costs \$24.99. Use an algebraic expression to describe how much they spend in total (before sales tax) when they purchase one computer, when they purchase any number of games, and when they purchase any number of extra controllers.

*Part D:* What would be the total cost, before sales tax, if Homer and Bart purchase one computer, four games, and three extra controllers?

7. Alex and Leandro purchase two matinee movie tickets. A matinee ticket costs \$6.50, a drink costs \$5.50, and a bag of popcorn costs \$6.00. Define each variable and write an algebraic expression to describe how much they spend based on the number of drinks and bags of popcorn they buy. Identify the parts of the expression by underlining the coefficient(s), circling the constant(s), and drawing a box around the variable(s).

8. The local humane society is restocking on cat food to prepare for kitten season. Very young kittens need kitten formula which costs \$3.99 per bottle. Older kittens need wet cat food which costs \$1.50 per can.

*Part A:* Write an algebraic expression to describe how much the humane society will spend preparing for kitten season. Identify the parts of the expression by underlining the coefficient(s), circling the constant(s), and drawing a box around the variable(s).

*Part B:* How much money (before tax) will the humane society spend if they buy 30 bottles of kitten formula and 120 cans of wet cat food?

*Part C:* If you add a 7% sales tax to the purchase of bottles of kitten formula and cans of wet cat food, how would the algebraic expression in parts A and B change?



9. Create a storyline (word problem) using the following algebraic expressions:

Part A:  $\frac{1,000}{r}$

Part B:  $75 - 3m$

Part C:  $30 + 2d$

10. An airplane is flying at 35,000 feet above sea level. The airplane starts to descend at a rate of 2,500 feet per minute. Let  $m$  be the number of minutes. Which of the following expressions describe the height of the airplane after any given number of minutes?

- (A)  $2,500 - 35,000m$
- (B)  $2,500 + 35,000m$
- (C)  $35,000 - 2,500m$
- (D)  $35,000 + 2,500m$

## Section 1 – Topic 2

### Understanding Polynomial Expressions

1. Write  $9x + 3x^2 - 4x^5 + x^3 + 2x^4$  in standard form.
2. Determine the type and degree of each of the following polynomial expressions.

$$9x^4y^9$$

$$x^4 - 3x^2 + 7x^5$$

$$19a^6b^2 + 8ab^3c - 27a^7$$

3. Consider the following polynomial expression:  $4x^5 - 16x^2 + 13x^8$ .

Part A: Write the polynomial expression in standard form.

Part B: What is the degree of the polynomial?

Part C: How many terms are in the polynomial?

Part D: What is the leading term?

Part E: What is the leading coefficient?



4. Match the polynomial in the left column with its descriptive feature in the right column.

- A.  $x^3 + 3x^2 - 2x + 7$
- B.  $3a^3b^6$
- C.  $3x^4 - 9x^3 + 5x^8$
- D.  $7a^3b^2 + 18ab^2c - 9a^3$
- E.  $2x^5 - 9x^3 + 8x^7$
- F.  $4x^8 - 7x^2 + 9$
- G.  $x^2 - 7$

- I. 9<sup>th</sup> degree monomial
- II. Constant term of  $-7$
- III. 7<sup>th</sup> degree polynomial
- IV. Leading coefficient of 4
- V. Four terms
- VI. 5<sup>th</sup> degree polynomial
- VII. Equivalent to  $5x^8 + 3x^4 - 9x^3$

5. Write a binomial expression in standard form that has a degree of 4.

6. Write a trinomial expression in standard form that has a degree of 5.

7. Janae wrote the following polynomial expression:  $2x^5 - 4x^3 + 6x^8$ . Janae claimed it was a trinomial with a leading coefficient of 2. Justin argued back claiming that it was a trinomial with a leading coefficient of 6. Who is correct? Explain.

8. Ladarius wrote the following monomial expression:  $5x^8y^3$ . Ladarius said the monomial had a degree of 11. Ayla said the monomial had a degree of 8. Who is correct? Explain.

### Section 1 – Topic 3

### Algebraic Expressions Using the Distributive Property

1. Match each expression in the left column to its equivalent expression in the right column. Use the table below to write the letters that correspond to each of the numbers.

_____	$7(12)$	A. $5(1 + 3a)$
_____	$3(15)$	B. $3(a + 3)$
_____	$3a + 9$	C. $3(x + y + z)$
_____	$9a + 3$	D. $7(8 + 4)$
_____	$5 + 15a$	E. $3(x + 2y + 3z)$
_____	$10 + 5a$	F. $5(2 + a)$
_____	$3x + 6y + 9z$	G. $3(3a + 1)$
_____	$3x + 3y + 3z$	H. $(2 + 1)(15)$

2. Write an equivalent expression for  $4(a + 5)$  by modeling and by using the distributive property.



3. Write an equivalent expression for  $5(2x + y - 3z)$  by modeling and by using the distributive property.

4. Write an equivalent expression for  $(x - 6)(x - 3)$  by using the distributive property and by modeling.

5. Write an equivalent expression for  $(2m + 3)(m - 1)$ .

6. The recommended heart rate for weight management exercise and improving cardio fitness, in beats per minute, depends on a person's age and can be represented by the expression  $0.7(220 - a)$ .

*Part A:* What does the variable in the expression represent?

*Part B:* Rewrite the expression using the distributive property.

*Part C:* What is the recommended heart rate for a 20-year-old person?

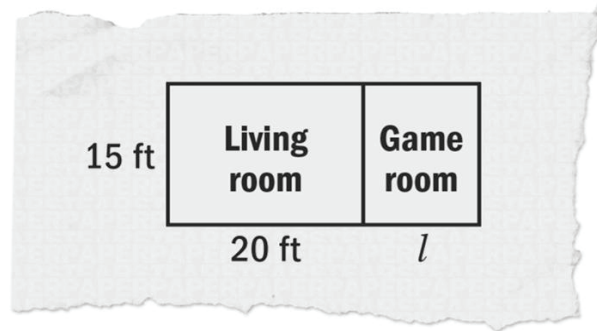
7. Coach Smith is buying equipment for his soccer team. He has 11 players and each player needs three uniforms, two shin guards, one ball, and two pairs of cleats.

*Part A:* Write an algebraic expression to represent this situation.

*Part B:* If each uniform costs \$48.00, each shin guard costs \$5.00, each ball costs \$17.00, and each pair of cleats costs \$89.00, determine how much Coach Smith will spend, before taxes, on equipment for his soccer team.



8. Logan is building a game room adjacent to his living room so that both rooms will have the same width. He created a model on a piece of paper, shown below.



*Part A:* Write an expression for the total area of both rooms by using the distributive property.

*Part B:* If the length of the game room is 15 feet, what is the total square footage of the two rooms?

9. The state of Maine encourages recycling by giving refunds for certain recycled items. When you recycle a glass bottle, you get back \$0.05, when you recycle an aluminum can, you get back \$0.10, and when you recycle a plastic bottle, you get back \$0.15.

*Part A:* Drinks in a glass bottle cost \$2.00, drinks in an aluminum can cost \$0.50, and drinks in a plastic bottle cost \$1.50. You plan to purchase two of each. Use the distributive property to write an expression that represents the amount of money you will spend.

*Part B:* You plan to recycle all of the items you purchased. Use the distributive property to write an expression to represent the amount of refund you will receive.

*Part C:* After receiving the refund, how much was your net cost for the items?  
*Hint:* Net cost is equal to the total cost minus the amount of your refund.

10. Suppose you are building a rectangular pen for your goats. You use 400 feet of fencing for the pen. Let  $l$  represent the pen's length (in feet).

*Part A:* Which of the following expressions could represent the width of the pen?

- (A)  $2l + 400$
- (B)  $400 - 2l$
- (C)  $2l - 400$
- (D)  $400(2l)$

*Part B:* Find the width of the pen if you make the pen 80 feet long.

*Part C:* Find the width and the area of the pen if the length is 90 feet.



## Section 1 – Topic 4

### Algebraic Expressions Using the Commutative and Associative Properties

1. Identify the property used to find the equivalent expression.

$$[4 + (-2)] + 1 = 4 + [(-2) + 1] \qquad (9 \cdot 3) \cdot 6 = 6 \cdot (9 \cdot 3)$$

$$(a \times 3) \times b = b \times (a \times 3) \qquad x + (y + z) = (x + y) + z$$

$$2 \times (p \times q) = (q \times p) \times 2 \qquad (8 + 17) + 18 = 18 + (17 + 8)$$

2. The following is a proof that shows  $(5p)(4q)$  is equivalent to  $20pq$ . Fill in each blank with either "Commutative Property" or "Associative Property" to indicate the property being used.

$$\begin{aligned} (5p)(4q) &= 5(p \cdot 4)q \quad \underline{\hspace{2cm}} \\ &= 5(4 \cdot p)q \quad \underline{\hspace{2cm}} \\ &= (5 \cdot 4)(p \cdot q) \quad \underline{\hspace{2cm}} \\ &= 20pq \end{aligned}$$

3. Write a mathematical proof to show  $(3x)(5y)(7z)$  is equivalent to  $105xyz$ .

4. Identify which of the following properties are being used in each step below.

Associative Property	Commutative Property	Distributive Property
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$$\begin{aligned} (4 + 7)(m^2 + n^2) &= 4(m^2 + n^2) + 7(m^2 + n^2) \quad \underline{\hspace{2cm}} \\ &= 4m^2 + 4n^2 + 7m^2 + 7n^2 \quad \underline{\hspace{2cm}} \\ &= 4m^2 + 7m^2 + 4n^2 + 7n^2 \quad \underline{\hspace{2cm}} \\ &= 11m^2 + 11n^2 \end{aligned}$$

5. Write an equivalent expression using the given property.

Part A: Commutative property of multiplication

$$3xy =$$

Part B: Associative property of addition

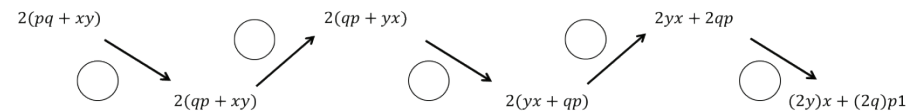
$$x + y + z =$$

Part C: Distributive property

$$3x(y - 2) =$$

6. Use these abbreviations for the properties of real numbers and complete the flow diagram.

$C_+$  for the commutative property of addition  
 $C_\times$  for the commutative property of multiplication  
 $A_+$  for the associative property of addition  
 $A_\times$  for the associative property of multiplication  
 $D$  for the distributive property



7. If  $pq = 23$  and  $uv = \frac{1}{23}$ , find the value of  $u \cdot q \cdot v \cdot p$ . Explain which properties you used.

8. Consider the expressions  $ab^2$  and  $a^2b^2$ . Are the two expressions equivalent? Which properties did you use to prove or disprove equivalency?

## Section 1 – Topic 5 Properties of Exponents

1. Simplify the following expressions.

Part A:  $\frac{2x^3y^3}{4y^2} =$

Part B:  $\left(\frac{x^{-8}}{y^{11}}\right)^{-2} =$

Part C:  $\frac{(2x^3)(x^4)^2}{8x^{11}} =$

2. Your neighbor has a square-shaped pool with side lengths of  $3a^5$ . What is the area of the pool?
3. Bojangles has a rectangular-shaped roof with a width of  $6x^2$  feet and a length  $12x^3$ . What is the area of the roof?



4. Consider each equation. Find the value of  $m$  in each equation below. Justify your answer.

Part A:  $(x^m \cdot x^2)^3(k^3)^5 = x^{21}k^{15}$

Part B:  $x^3 \cdot y^2 \left( \frac{x^2 \cdot y^3 \cdot z^m}{z^{-5}} \right) = x^5 y^5 z$

Part C:  $\left( \frac{x^8}{yz^5} \right)^m = 1$

5. John buys a water tank from a company that likes to use exponents as dimensions. The tank he buys has the dimensions  $b^2$  by  $b^4$  by  $4c^3$ . Which of the following expressions represent the volume of the water tank?

- (A)  $4b^8c^3$
- (B)  $4b^6c^3$
- (C)  $12b^8c^3$
- (D)  $2b^6c^3$

6. The dimensions of Peyton and Parker's sandbox are  $t^2$  m by  $t^5$  m by  $3v^2$  m. One cubic meter of the sandbox contains  $3s^{21}$  grains of sand. Which of the following expressions represent the number of grains of sand in the sandbox?

- (A)  $27t^{10}v^2s^{21}$
- (B)  $t^{10}v^2s^{21}$
- (C)  $3t^7v^2s^{21}$
- (D)  $9t^7v^2s^{21}$

7. Consider the equation  $a^{-3} = \left(\frac{1}{a}\right)^5$ . What value(s) of  $a$  make the equation true?

8. Harry, Louis, and Niall are working with exponents. Harry claims  $4^2 \cdot 4^5 = 4^{10}$ . Louis claims  $4^2 \cdot 4^5 = 4^7$ . Niall claims  $4^2 \cdot 4^5 = 16^7$ . Which student has the correct answer? Explain why.

9. Raymond and Rose were working with exponents.

Part A: Raymond claims that  $5^5 * 5^2 = 5^3$ . Rose argues that  $5^5 * 5^2 = 5^7$ . Which one of them is correct? Use the properties of exponents to justify your answer.

Part B: Raymond claims that  $\frac{7^9}{7^5} = 7^4$ . Rose argues that  $\frac{7^9}{7^5} = 7^{45}$ . Which one of them is correct? Use the properties of exponents to justify your answer.



## Section 1 – Topic 6

### Radical Expressions and Expressions with Rational Exponents

1. The following expression shows a simplification of a radical with a missing index.

$$\sqrt[n]{54 \cdot x^6 \cdot y^{12}} = 3x^2y^4\sqrt[n]{2}$$

What is the index  $n$  for this expression?

- (A) 2  
(B) 3  
(C) 6  
(D) 9
2. Simplify the expression,  $\left(\left(p^{-2} + \frac{1}{p}\right)^1\right)^p$ , when  $p = \frac{3}{4}$ , in both radical and rational exponents forms.

Radical form:

Rational exponent form:

3. Write an equivalent expression in rational exponent form.

Part A:  $\sqrt[8]{5^6}$

Part B:  $\sqrt[4]{x^{\frac{2}{3}}}$

Part C:  $\sqrt[3]{8(\sqrt{8^2 + 8^2})}$

4. Determine the value of  $n$  such that  $\sqrt[4]{64^{\frac{1}{3}}} = 64^{\frac{1}{n}}$ .



5. Determine whether each expression is equivalent to  $x^{\frac{7}{4}}$ .

Expression	Yes	No
$\sqrt[7]{x^4}$	<input type="radio"/>	<input type="radio"/>
$\sqrt[4]{x^7}$	<input type="radio"/>	<input type="radio"/>
$(\sqrt[4]{x})^7$	<input type="radio"/>	<input type="radio"/>
$\sqrt{x^{\frac{7}{4}}}$	<input type="radio"/>	<input type="radio"/>
$\sqrt[4]{x^5} \cdot \sqrt[4]{x^2}$	<input type="radio"/>	<input type="radio"/>
$\sqrt[5]{x^4} \cdot \sqrt[2]{x^4}$	<input type="radio"/>	<input type="radio"/>
$\frac{(\sqrt[4]{x})^7}{(\sqrt{x})^0}$	<input type="radio"/>	<input type="radio"/>

6. Write an equivalent expression to  $3^{\frac{2}{3}} \cdot \sqrt[8]{3^4}$ .

7. Prove that  $\left(\frac{\sqrt[3]{512x^6y^9}}{\sqrt{16x^4y^6}}\right)^{\frac{1}{2}} = \sqrt{2}$ .

## Section 1 – Topic 7

### Adding Expressions with Radicals and Rational Exponents

1. Perform the following operations and write the answers in radical form.

Part A:  $\sqrt{7} + \sqrt{3} + \sqrt{98} - \sqrt{18}$

Part B:  $3\sqrt{5} - 3\sqrt{11} + 2\sqrt{121} - 3\sqrt{90}$

2. Perform the following operations and write the answers in radical form.

Part A:  $8^{\frac{1}{2}} + 16^{\frac{1}{4}} - 12^{\frac{1}{2}} + 81^{\frac{1}{4}}$

Part B:  $8 \cdot 2^{\frac{1}{2}} - 24^{\frac{1}{4}} - 3^{\frac{1}{2}} + 128^{\frac{1}{4}}$

3. Which of the following expressions are equivalent to  $7\sqrt{5}$ ?

- $14^{\frac{1}{2}} \cdot 25^{\frac{1}{2}}$
- $49^{\frac{1}{2}} \cdot 5^{\frac{1}{2}}$
- $\sqrt{70}$
- $\sqrt{155}$
- $\sqrt{7} \cdot \sqrt{5}$
- $\frac{\sqrt{196} \cdot \sqrt{5}}{2}$
- $\frac{\sqrt{49 + \sqrt{25}}}{5}$

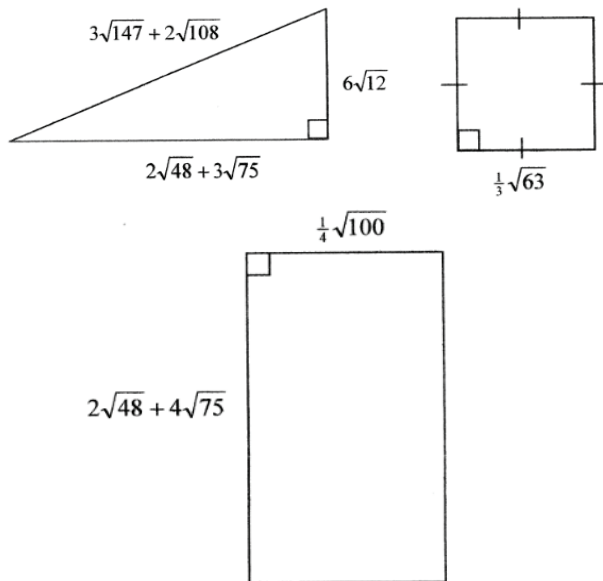


4. Which of the following expressions are equivalent to  $4\sqrt{3}$ ?

- $4^{\frac{1}{3}} + 3^{\frac{1}{3}}$
- $27^{\frac{1}{2}} + 3^{\frac{1}{2}}$
- $\sqrt{32}$
- $\sqrt{48}$
- $2\sqrt{12}$
- $2\sqrt{18}$
- $\sqrt{27} + \sqrt{3}$

5. Prove that  $\sqrt{8} + \sqrt{2} = 3 \cdot 2^{\frac{1}{2}}$

6. Find the perimeter of the following figures and circle the figure with the greatest perimeter.



## Section 1 – Topic 8

### More Operations with Radicals and Rational Exponents

1. Perform the following operations and write the answers in radical form.

Part A:  $(2\sqrt{7} + \sqrt{27})(\sqrt{28} - 3\sqrt{3})$

Part B:  $\frac{\sqrt{12}(2\sqrt{48})}{7\sqrt{3}}$

2. Perform the following operations and write the answers in radical form.

Part A:  $12^{\frac{1}{2}}(2^{\frac{1}{2}} + 3^{\frac{1}{2}})(2^{\frac{1}{2}} - 3^{\frac{1}{2}})$

Part B:  $\frac{12 \cdot 2^{\frac{1}{2}}}{27^{\frac{1}{3}}}$

3. Find the value of  $x$  if  $9^{\frac{1}{2}} \cdot 9^{\frac{1}{2}} = \sqrt[x]{81}$ .



4. Find the value of  $z$  if  $z^{\frac{1}{2}} \cdot 16^{\frac{1}{4}} = \frac{2\sqrt{8}\sqrt{49}}{2\sqrt{2}}$ .

5. Prove that  $\sqrt{8} \cdot \sqrt{2} = 10 - 3 \cdot 4^{\frac{1}{2}}$ .

6. What is the area of a rectangle that measures  $3\sqrt{5} - 4\sqrt{2}$  by  $\sqrt{125}$ ?

7. The area of a parallelogram is  $8\sqrt{90}$  and the base is  $2\sqrt{5}$ . What is the height of the parallelogram?

## Section 1 - Topic 9

### Operations with Rational and Irrational Numbers

1. Describe in your own words what it means to say that integers are closed under addition.

2. Describe in your own words what it means to say that integers are not closed under division.

3. Under which of the following operations are integers closed?

- Addition
- Subtraction
- Multiplication
- Division



4. Complete the following proof to show that the sum of two rational numbers is a rational number.

Let  $a, b, c$  and  $d$  be integers. Let  $x$  and  $y$  be rational numbers.

Statements	Reasons
1. $a, b, c$ and $d$ are integers, and $x$ and $y$ are rational numbers.	1. Given
2. $x = \frac{a}{b}$ and $y = \frac{c}{d}$	2.
3. $x + y = x + y$	3.
4. $x + y = \frac{a}{b} + \frac{c}{d}$	4.
5.	5. Use rules for addition of fractions (common denominator, add numerators) to write equivalent expression for $\frac{a}{b} + \frac{c}{d}$ .
6. $ad + cb$ is an _____.	6. Integers are closed under addition and multiplication.
7. $bd$ is an integer.	7.
8. $\frac{ad+cb}{bd}$ is a _____ number.	8. Definition of rational number.
9. $x + y =$ a rational number.	9.

5. Write an algebraic proof to show that the product of two rational numbers is a rational number.

Given:  $x$  and  $y$  are rational numbers.

Statements	Reasons





6. Complete the following proof by contradiction to show that the sum of a rational number and an irrational number is irrational.

Given:  $x$  is a rational number and  $y$  is an irrational number.

Assume that the sum of a rational number and an irrational number is rational.

Statements	Reasons
1. $x$ is a rational number and $y$ is an irrational number.	1. Given
2. $x + y = z$ , where $z$ is a rational number.	2. Assumption
3. $x = \frac{a}{b}$ and $z = \frac{c}{d}$ , where $a, b, c$ , and $d$ are integers.	3.
4. $\frac{a}{b} + y = \frac{c}{d}$ ,	4.
5. $y = \frac{c}{d} - \frac{a}{b}$	5.
6.	6. Used rules adding fractions to write equivalent expression for $\frac{c}{d} - \frac{a}{b}$ .
7.	7.
8. $cb - ad$ is an _____.	8. Integers are closed under multiplication and subtraction.
9. $db$ is an integer.	9.
10. $\frac{ay - xb}{by}$ is a _____ number.	10.

We have proven that our assumption is \_\_\_\_\_. Therefore, the sum of a rational and irrational number must be \_\_\_\_\_.

7. Write a proof by contradiction to show that the product of a rational number and irrational number is irrational.

Given:  $x$  is a rational number and  $y$  is an irrational number.

Statements	Reasons



8. Based on the previous information, conjecture whether each statement is ALWAYS true, SOMETIMES true, or NEVER true. Circle the correct answer below each statement.

i. The sum of a rational number and a rational number is rational.

ALWAYS                      SOMETIMES                      NEVER

ii. The sum of a rational number and an irrational number is irrational.

ALWAYS                      SOMETIMES                      NEVER

iii. The sum of an irrational number and an irrational number is irrational.

ALWAYS                      SOMETIMES                      NEVER

iv. The product of a rational number and a rational number is rational.

ALWAYS                      SOMETIMES                      NEVER

v. The product of a rational number and an irrational number is irrational.

ALWAYS                      SOMETIMES                      NEVER

vi. The product of an irrational number and an irrational number is irrational.

ALWAYS                      SOMETIMES                      NEVER

9. Does either item below contradict the statement: "The sum of two rational numbers is a rational number"?

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

Item 2:  $\frac{1}{2} + \frac{3}{2} = 2$

- (A) Item I contradicts the statement. Item II is an example when the statement is true.
- (B) Item II contradicts the statement. Item I is an example when the statement is true.
- (C) Both Item I and Item II contradict the given statement.
- (D) Neither Item I nor Item II contradicts the given statement.

10. Select all of the following expressions that result in rational number.

- $\sqrt{49} - \sqrt{16}$
- $\sqrt{5} + \sqrt{6} + \sqrt{7} + \sqrt{8}$
- $10\pi - \pi\sqrt{100}$
- $(\pi - \sqrt{3})(\pi + \sqrt{3})$
- $\sqrt{11} - 4$
- $\pi^2 + 5$
- $r + s$ , where  $r$  and  $s$  are irrational numbers

11. Thomas argues that  $\frac{\sqrt{27}}{\sqrt{3}}$  is rational. Mateo argues that the quotient between  $\sqrt{27}$  and  $\sqrt{3}$  is irrational. Prove who is right. Make sure you justify your answer.

12. The traffic warning sign below has a triangle shape with base of 18 inches.



The value of the area of the triangle (half base times altitude), in square inches, is an irrational number. The number that represents the altitude of the triangle must be \_\_\_\_\_. Select the best answer to fill in the blank.

- (A) A whole number
- (B) A rational number
- (C) An irrational number
- (D) A non-real complex number

Explain your answer.