Name: _____

Advanced Algebra I
Operations with Rational Numbers and Understanding Irrational Numbers

Objectives

- Adding and subtracting integers
- Adding and subtracting rational numbers
- Combining like terms
- Multiplying and dividing integers
- Distributive property
- Multiplying and dividing rational numbers
- Order of operations and evaluating expressions
- Distributive property with combining like terms
- Approximating and graphing irrational #'s

Beaumont Middle School
8th Grade
2018-2019

Objectives: The students will be able to solve problems by adding & subtracting integers.

Adding & Subtracting Integers

Rules for adding integers:

If the signs are the same: _____

_____

If the signs are different: _____

_____

Rule for subtracting integers:

_____

Practice as notes

Simplify.

1. -6 – (-2) _____
2. 5 + -3 _____
3. 3 + -5 _____
4. -2 + -3 _____
5. 5 – (-1) _____
6. -1 + 1 _____
7. 3 + -10 _____
8. -20 + 21 _____
9. -6 – 4 _____
10. 4 – (-3) _____
11. -9 – (-6) _____
12. 5 – 12 _____
13. -4 – 9 _____
14. -2 – 10 + (-4) _____
15. 10 + (-6) – 15 – (-6) _____
16. -2 – 6 + (-1) – (-3) _____

Evaluate if a = 2, b = -6 and c = 10. Substitution must be shown as a separate step.

17. a – b + c
18. c – b – a
19. a – b – 2c

Homework

Simplify.

1. 4 – 50 _____ 2. -4 – (-72) _____ 3. -4 + -85 _____

4. 3 – (-97) _____ 5. 60 – (-6) _____ 6. 5 – 86 _____

7. 3 + 10 _____ 8. -20 + 20 _____ 9. -2 – 60 _____

10. -6 – (-70) _____ 11. -7 – (-52) _____ 12. -8 + (-31) _____

13. -12 – 13 + (-5) _____ 14. 16 + (-8) – 16 – (-3) _____

15. 28 – 3 + (-6) – (-14) _____ 16. -24 + 5 – (-5) – 6 + 15 _____

Evaluate if a = -2, b = 8, c = 10 and d = -10. Substitution must be shown as a separate step.

17. c + d 18. a – d 19. a – b

20. a + b 21. c – d 22. a + d

23. a – b + d 24. d – a + 2b 25. a + c + d

26. a – b + c – d 27. a + c – d 28. a + b – 2c + d

Objectives: The students will be able to solve problems by adding & subtracting fractions.

Adding & Subtracting Rational Numbers (specifically fractions)

When adding or subtracting fractions, do NOT change mixed numbers to improper fractions. You MUST get a common denominator. Some of the fractions include negative numbers. Follow your integer rules.

Practice as notes

Simplify.

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

2) $7\frac{3}{4}-2\frac{1}{2}=$

3) $\frac{2}{12}+\frac{3}{4}=$

4) $4\frac{3}{7}-1\frac{3}{14}=$

5) $-2\frac{3}{4}+\left(-\frac{2}{3}\right)=$

6) $4\frac{3}{4}+\left(-1\frac{1}{5}\right)=$

7) $-6\frac{2}{3}-\left(-3\frac{2}{5}\right)=$

8) $-10\frac{3}{5}-\left(-3\frac{3}{8}\right)=$

Evaluate if a = $1\frac{7}{8}$, b = $-4\frac{1}{2}$ and c = $5\frac{3}{4}$. Substitution must be shown as a separate step.

9. a – b + c

10. c – b – a

Homework

Simplify.

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

2) $3\frac{1}{2}+\left(-8\frac{3}{4}\right)=$

3) $-12\frac{2}{3}+3\frac{1}{5}=$

4) $-\frac{6}{7}-\frac{3}{14}=$

5) $1\frac{1}{10}-\left(-\frac{2}{5}\right)=$

6) $-2\frac{1}{2}-\left(-4\frac{5}{8}\right)=$

7) $-2\frac{2}{3}+\left(-1\frac{3}{4}\right)=$

8) $-\frac{6}{11}-\frac{3}{22}=$

9) $3\frac{5}{7}+\left(-2\frac{2}{3}\right)=$

10) $-5\frac{3}{8}-4\frac{1}{6}=$

11) $-\frac{2}{3}+\left(-\frac{1}{4}\right)=$

12) $-3\frac{2}{3}-\left(-2\frac{1}{4}\right)=$

Evaluate if $a=-12\frac{3}{5}$, $b=8\frac{1}{3}$, $c=-4\frac{7}{10}$, $d=5\frac{5}{9}$, $e=-1\frac{4}{15}$

13. a + b

14. c – d

15. e + d

16. a – b + d

17. d – a + b

18. a + c + e

Objectives: The students will be able to combine like terms to simplify variable expressions.

Combining Like Terms

In an expression, the **terms** are the elements separated by the plus or minus sign. A **coefficient** is the number being multiplied by a variable.

3 is the coefficient

3 a

a is the variable

3a is a term. | b is a term. | -5 is a term.

$3a + b - 5$

-5 is a constant b/c there is no variable beside it.

Like terms have the same variable(s).

2x + 3y + 4x – 5y

2x and 4x are like terms.

3y and -5y are like terms.

You can add like terms by adding their coefficients.

2 x + 4x = 6x and 3y + (-5y) = -2y

So you can simplify 2x + 3y + 4x – 5y = 6x + - 2y

Practice

Problem 1. 2x + 3y + z

a) What number is the coefficient of x? _____

b) What number is the coefficient of y? _____

c) What number is the coefficient of z? _____

Typically, you do not write the coefficients 1 or -1.

1x = x

-1x = -x

Problem 2. 5x – 4y – z (hint: change the subtraction to plus the opposite)

a) What number is the coefficient of x? _____

b) What number is the coefficient of y? _____

c) What number is the coefficient of z? _____

Problem 3. Add like terms.

a) $6x + 2x$ _____ b) $6x - 2x$ _____ c) $5x + x$ _____

d) $5x - x$ _____ e) $-4x + 5x$ _____ f) $4x - 5x$ _____

g) $-5x - 3x$ _____ h) $-x - x$ _____ i) $-7x - (-7x)$ _____

j) $-3x - 4 + 2x + 6$ _____ k) $x - 2 - 4x - 5$ _____

l) $4x + y - 2x + 3z$ _____ m) $3x - y - 8x + 2y$ _____

n) $\frac{3}{5}x + \frac{1}{9}y + \frac{3}{4}x$ _____ o) $\frac{5}{4}p + \frac{2}{3} - \frac{1}{4}p$ _____

p) $-\frac{1}{7}a + \frac{5}{6}a - \frac{2}{3}$ _____ q) $-\frac{2}{3}x - \left(-\frac{1}{5}x\right) + \left(-\frac{7}{9}\right)$ _____

Homework

Identify how many terms are in each expression.

1) $2x + 3z - 5$ _____

2) $3x$ _____

3) $4c - 7g$ _____

4) $10 + 6p - 5y + 4u$ _____

5) $4k - 9$ _____

6) $5d + 8 - 6y + w$ _____

For each expression name the coefficient and the constant.

7) $\mathbf{-4x + 5}$ Coefficient _____ Constant _____

8) $\mathbf{2y}$ Coefficient _____ Constant _____

9) $\mathbf{9h - 6}$ Coefficient _____ Constant _____

10) $\mathbf{-3}$ Coefficient _____ Constant _____

Simplify.

11) $2x + 5y + 9x$ _____

12) $a + 9b + 6a$ _____

13) $2p + 3q - 5p + 2q$ _____

14) $\frac{3}{4}x + z + \frac{1}{4}x$ _____

15) $3j + 4k - 2f + 6k$_____

16) $1.4h - 5 + 3h$ _____

17) $4s + (-7t) - 2t + 3s$ _____

18) $4u - 6 + (-10u) - 2$ _____

19) $a + b - a + b$ _____

20) $2 - 4w + 12w$ _____

21) $x + \frac{3}{8}y - \frac{1}{2}y$ _____

22) $\frac{9}{2}a + \left(-\frac{5}{4}a\right) - \frac{6}{7}b$ _____

23) $\frac{7}{8}x - y - \left(-\frac{2}{3}x\right) + \frac{4}{9}$ _____

24) $-\frac{3}{10}w + \frac{2}{5}y - \frac{2}{5}w + \left(-\frac{2}{5}y\right)$ _____

Objectives: The students will be able to solve problems by multiplying and dividing integers.

Multiplying and Dividing Integers

Rules for multiplying & dividing integers:

If the signs are the same: _____

If the signs are different: _____

Practice

Multiplication answer is a product.
Division answer is a quotient.

Simplify.

1. -6 * (-2) _____
2. 5 * -3 _____
3. 3 * -5 _____
4. -2 * -3 _____
5. 5 ÷ (-1) _____
6. -24 ÷ -3 _____
7. 3 (-10) _____
8. $\frac{-36}{-9}$ _____
9. -6 ▪ 4 _____
10. -2 * 10 * (-4) _____
11. 10 (-6) (-2) (5) _____
12. $\frac{54}{-6}$ _____

Distributive Property

Objectives: The students will be able to use the distributive property to simplify variable expressions.

According to the **Distributive Property,** you **distribute** or "pass out" a multiplication to each part of a sum or difference in parentheses.
In 2(*a* + 3) = 2*a* + 6, we "pass out" the 2 by multiplying it by both the *a* and the *3.*

Multiply $6(x - 9)$
$6(x) - 6(9)$
$6x - 54$

Multiply $-3(h + 2)$
$-3(h) + -3(2)$
$-3h + {}^{-}6$

Arithmetic

Order of Operations

$7(6 - 4)$
$7(2)$
14

Distributive property

$7(6 - 4)$
$7(6) - 7(4)$
$42 - 28$
14

Algebraic

$-2(x + 4)$
$-2(x) + {}^{-}2(4)$
$-2x + {}^{-}8$

Practice
Use the distributive property to simplify.

1. 4 (j+ 10) _____
2. – (4n – 6)_____
3. -2 (- g – 4) _____
4. (4c + 2)3 _____
5. 6 (-2*p* + 7) _____
6. 5 (2r – 4)_____

Homework

Find each product or quotient.

1. 4 * (-12) _____ 2. -24 ÷(-6) _____ 3. 8 (-6) _____

4. $\frac{-15}{5}$ _____ 5. -4 ⋅(-7) _____ 6. -12 ÷2 _____

7. -5 * 8 _____ 8. $\frac{-34}{-34}$ _____ 9. 7⋅(-6) _____

10. -25 ÷ 5 _____ 11. -6 (-15) _____ 12. $\frac{10}{-2}$ _____

13. -7 * -3 _____ 14. 12 ÷ 2 _____ 15. 7 ⋅ -11 _____

16. -80 ÷ (-8) _____ 17. 30 * (-6) _____ 18. $\frac{-50}{5}$ _____

19. -10 * 2 * (-3) _____ 20. -50 ÷10 * (-5) _____

Evaluate if w = -2, x = -10, y = 16, & z = 8.

21. wx 22. wxy 23. $\frac{z}{w}$ 24. xy

Use the distributive property to simplify.

1. 3(x + 4) _____ 2. -7(t – 3) _____

3. -2(y + 8) _____ 4. – (-y + 3) _____

5. 8(-x + 7) _____ 6. 11(4x + 3) _____

7. (x + 4)2 _____ 8. 3(-2b – 8) _____

9. -3(1 – 2k) _____ 10. (-2s + 9)6 _____

Combine like terms to simplify.

14. 6x + 3y + 6y – 2x _____ 15. 18 + 7x – 12 – 7x _____

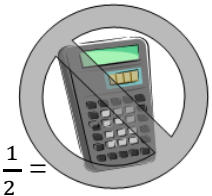
16. 10r + 100s + 50t _____ 17. 3r + 4 – 5 – 2r _____

18. 12 + 2 + 3x – 12 – 5y + 7z – 10x _____

Objectives: The students will be able to solve problems by multiplying and dividing fractions.

Multiplying and Dividing Rational Numbers (specifically fractions)

When multiplying fractions, you MUST change mixed numbers to improper fractions. You do NOT get a common denominator. Cross cancel if at all possible. Some of the fractions include negative numbers. Follow your integer rules.



Simplify. All answers should be in simplest form.

1) $\frac{3}{4} * \frac{1}{6} =$ 2) $-\frac{14}{5} * -\frac{5}{6} =$ 3) $2\frac{2}{9} * 1\frac{3}{4} =$ 4) $1\frac{3}{25} * -7\frac{1}{2} =$

When dividing fractions, you MUST change mixed numbers to improper fractions <u>first</u>. Then change to multiplying by the reciprocal. ONLY then can you cross cancel.

Simplify. All answers should be in simplest form.

1) $\frac{6}{7} \div \frac{2}{3} =$ 2) $-\frac{5}{9} \div \frac{10}{3} =$ 3) $2\frac{5}{8} \div \frac{-3}{4} =$ 4) $-3\frac{3}{5} \div -2\frac{7}{10} =$

Distributive Property with Fractions

1. $\frac{1}{3}(6x + 9) =$ 2. $\frac{1}{4}(8x - 12) =$

3. $-\frac{1}{5}(5x - 10) =$ 4. $\frac{2}{3}(6x + 9) =$

Homework

Simplify. Show all work.

1) $\frac{7}{6} \bullet \frac{9}{14} =$

2) $-6 \bullet \frac{2}{5} =$

3) $-\frac{18}{5} \bullet \frac{25}{27} =$

4) $2\frac{1}{2} \bullet 6 =$

5) $8 \bullet 5\frac{1}{2} =$

6) $(-6\frac{1}{4})(-2\frac{2}{5}) =$

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

8) $-\frac{7}{9} \div -\frac{21}{6} =$

9) $-6\frac{1}{8} \div \frac{7}{9} =$

10) $\frac{3}{5} \div -1\frac{5}{7} =$

11) $1\frac{3}{4} \div 12\frac{1}{4} =$

12) $-3\frac{1}{6} \div -\frac{1}{3} =$

13) $\frac{3}{2}(4x - 2) =$

14) $-\frac{2}{5}(10x + 15) =$

15) $\frac{3}{5}(5x - 20) =$

16) $-\frac{3}{4}(8x - 4) =$

Objectives: The students will be able to solve problems using order of operations.

Order of Operations

Jordan solved the problem 5 + 4 * 2 and got the answer of 18. David solved the same problem and got 13. Can both be correct? Is there only one correct order to perform operations? Who is correct?

Don't forget the different symbols for multiplication:

5*2 5(2) 5x2 5 • 2

5 + 4 * 2
9 * 2
18

5 + 4 * 2
5 + 8
13

P (Level 1) _____

E(Level 2) _____

D & M (Level 3)_____

S & A(Level 4) _____

Practice

Steps must be shown so that each line of work is equal to the line above.

1. $5 * 10 - 6 * -2$

2. $24 \div -6 * 2$

3. $-3 - 5(7 - 5)$

4. $18 - 5 * -3$

5. $\frac{9+7*5}{4}$

6. $2\,[9\,(-6 - 4)] + 4$

7. $30 - 2^3$

8. $3(8 - 14)^2$

9. $25 - (2 + 2) * -3$

10. $\frac{8-(7-1)^2}{-20+9*2}$

11. $-5[4^3 - 2(-9 + 6)]$

12. $9(-15 - 3 + 14)$

Objectives: The students will be able to evaluate expressions and solve problems by evaluating expressions.

Evaluating Expressions

We have learned that, in an algebraic expression, letters can stand for numbers. When we substitute a specific value for each **variable**, and then perform the operations, it's called **evaluating** the expression.

Evaluating a variable expression

Example 1

Evaluate 18 + 2g, for g = 3.

18 + 2g **Replace the variable**

18 + 2*3 **Use the order of operations to solve.**

18 + 6

24

Example 2

Evaluate $2ab - \frac{c}{3}$, for a = 3, b = 4, c = 9

$2ab - \frac{c}{3}$ **Replace the variable**

$2*3*4 - \frac{9}{3}$ **Use the order of operations**

24 – 3

21

Remember that a number beside a variable is multiplied. **2a means 2 * a**

Practice

Evaluate each expression.

1. 63 – 5x, for x = -7

2. 4(t + 3) + 1, for t = 8

3. 6(g + h), for g = -18 & h = 7

4. 2xy – z, for x = 4, y = 3, and z = -1

5. $\frac{r+s}{2}$, for r = -13 and s = -11

6. Becky saves $125 each year since her first birthday.

a. Write an expression for Becky's savings after 3 years. _____

b. Write an expression for Becky's savings after *y* years _____

c. When Becky is 14 years old, how much will she have saved? _____

HOMEWORK

Find the value of each expression. You must show work as demonstrated in class. Each line should equal the line above. A calculator should NOT be used for this assignment.

1. $50 - 4 \cdot -5$

2. $(100 \div -5) - 6 \cdot -3$

3. $9^2 + 2(-8 - 4)$

4. $\frac{16+8}{3+1}$

5. $3(4 - 6)^3$

6. $2[-50 - 8(-2 + -3)]$

7. $20 \div 4 * -5$

8. $14 - 3(-20 - (-18))$

9. $-54 \div 6 - 3 \cdot 2$

10. $-5 + 2(6-4)$

11. $\frac{21+3}{8-6} - 3^2$

12. $[10 - (4 - 1)] \cdot -9$

13. $-48 \div 2^3$

14. $18 - 2(-8) \div 4$

15. $\frac{5*10}{25} + 4 \div 2$

16. $7 + 2(-15 + 6)$

17. $2[-3 * 2^3 - 3(2 + 1)]$

18. $\frac{10+(8-3)^2}{20-5*3}$

HOMEWORK

Evaluate each expression.

1. xy, for x = 3 and y = -5

2. 18a – 9b, for a = -10 and b = -5

3. -24 – 5p, for p = -4

4. 850 – 2h, for h = -215

For #5 – 8, evaluate if a = $\frac{1}{2}$, x = -4, and y = 2.

5. a(10 – x)

6. axy

7. 5x – 3y

8. 4x + 2(x + 3y)

10. A tree grows 5 inches in a year.

a. Write an expression for the tree's height after x years. _____

b. When the tree is 36 years old, how tall will it be? _____

Evaluate each expression.

11. $\frac{ab}{2} + 4c$, for a = 6, b = 5, and c = -3

12. x(y + 5) – z, for x = 3, y = 2, and z = -7

Objectives: The students will be able to use the distributive property and combine like terms to simplify variable expressions.

Distributive Property with Combining Like Terms

We will complete one or two problems from each section for notes.

Use Distributive Property to simplify each expression.

1) $7(1-8n)$

2) $-8(b+3)$

3) $-6(9-9v)$

4) $-(3x-9)$

5) $-9(n+6)$

6) $-10(a+2)$

7) $(5k-10)\cdot -9$

8) $-4(4+3p)$

Use Distributive Property AND Combining Like Terms to simplify each expression. problems.

9) $-6(x+2)-2$

10) $4n-(7-6n)$

11) $-3-7(-3-6v)$

12) $-5(a-6)+2a$

Use Distributive Property AND Combining Like terms to simplify each expression.

13) $7(5n-8)+6(4+6n)$

14) $-(3a+2)-3(5a+7)$

15) $-5(1+2k)-8(-4+5k)$

16) $5(-3p+7)+5(p-1)$

17) $-5(x+2)+5(x-5)$

18) $-4(1-8n)-4(8n+4)$

Use Distributive Property AND Combining Like terms to simplify each expression.

19) $9(m+8)+11(3m+4)$

20) $11(8r+3)-2(-9+6r)$

21) $7(-12x-3)+10(6x+7)$

22) $-9(1-10n)-2(3n+9)$

23) $\frac{1}{3}(9x-12)-(-x+7)$

24) $2(-f+10)-\frac{3}{5}(10f-5)$

25) $\frac{-2}{9}(27x-18)+\frac{5}{6}(12x+36)$

26) $\frac{1}{8}(-16c+64)-\frac{4}{7}(42c-63)$

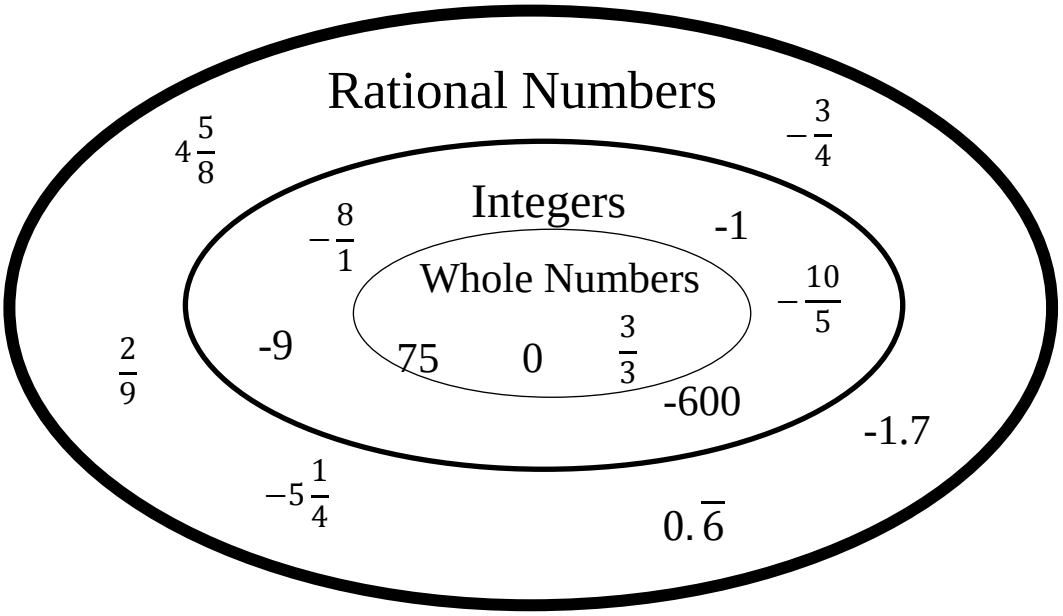
27) $\frac{-11}{5}(40r-15)-\frac{2}{9}(-81+54r)$

28) $-\frac{9}{8}(8-80n)-\frac{2}{7}(21n+63)$

Objectives: I can identify types of rational numbers and express equivalent numbers for comparison.

Rational Numbers

Numbers have different classifications. Some numbers can be classified in multiple ways. A **ratio**nal number is any number that you can write as a ratio, $\frac{a}{b}$ of two integers, where *b* is not zero. The diagram below shows relationships among rational numbers.



Always simplify numbers before classifying them. Every whole number is also an integer and a rational number. Every integer is also a rational number.

Practice

Identify the classification(s) for the following numbers by circling the classification(s) for each.

1)	5.8	Whole Number	Integer	Rational Number
2)	6	Whole Number	Integer	Rational Number
3)	-10	Whole Number	Integer	Rational Number
4)	$0.\overline{6}$	Whole Number	Integer	Rational Number
5)	$\frac{1}{2}$	Whole Number	Integer	Rational Number
6)	$-\frac{2}{3}$	Whole Number	Integer	Rational Number

Express each of the fractions as decimals.

1) $\frac{1}{9}$ = _____ 2) $\frac{2}{9}$ = _____ 3) $\frac{3}{9}$ = _____

4) $\frac{4}{9}$ = _____ 5) $\frac{5}{9}$ = _____ 6) $\frac{6}{9}$ = _____

7) $\frac{7}{9}$ = _____ 8) $\frac{8}{9}$ = _____ 9) $\frac{9}{9}$ = _____

10) What pattern is shown when the denominator is 9? _____

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11) What fraction do you think would be equivalent to $0.\overline{14}$? _____

12) What fraction do you think would be equivalent to $0.\overline{128}$? _____

13) What fraction do you think would be equivalent to $0.\overline{32}$? _____
Check your answers to #11 - 13 by changing your fraction to a decimal.

Write the fraction equivalent to each of the following decimal numbers.

14) -0.$\overline{2}$ = _____ 15) $5.\overline{3}$ = _____ 16) $0.4444444\overline{4}$ = _____

17) -0.$\overline{16}$ = _____ 18) $4.\overline{124}$ = _____ 19) $0.27272727\overline{27}$ = _____

Graph the following sets of numbers on a number line. Then list them in order from least to greatest.

20) {0.6, 0.2, $\frac{2}{9}$, 0.$\overline{4}$}  _____ _____ _____ _____

21) {2.9, $\frac{21}{10}$, 2.$\overline{9}$, 3}  _____ _____ _____ _____

HOMEWORK

Identify the classification(s) for the following numbers by circling the correct answer(s).

1)	-4.5	Whole Number	Integer	Rational Number
2)	-2	Whole Number	Integer	Rational Number
3)	$0.\overline{8}$	Whole Number	Integer	Rational Number
4)	$-0.\overline{2}$	Whole Number	Integer	Rational Number
5)	$-\frac{5}{2}$	Whole Number	Integer	Rational Number
6)	100	Whole Number	Integer	Rational Number

Write the fraction equivalent to each of the following rational numbers.

7) $-6.\overline{1}$ = _____ **8)** $0.\overline{6}$ = _____ **9)** $0.\overline{95}$ = _____

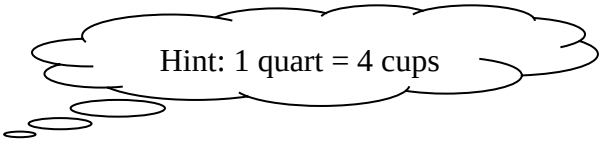
10) $0.2222\overline{2}$ = _____ **11)** $-0.\overline{73}$ = _____ **12)** $5.\overline{824}$ = _____

Graph the following sets of numbers on a number line. Then list them in order from least to greatest.

13) $\{1.2, 1\frac{7}{9}, 1.\overline{2}, 1\frac{1}{2}\}$  _____ _____ _____ _____

14) $\{\frac{31}{5}, 6.\overline{5}, 6, 6\frac{2}{9}\}$  _____ _____ _____ _____

Review of Lessons 1 through 3



Write an expression for each quantity.

15. the number of cups in 6 quarts _____ the number of cups in *q* quarts _____

16. the number of quarts in 8 cups _____ the number of quarts in *c* cups _____

Homework is continued on the next page.

Write a variable expression for each word phrase.

17. 12 less than *h* _____ **18.** The product of 3 and *f* _____

19. twice *z* _____ **20.** 6 more than twice *w* _____

Find the value of each expression. You must show work as demonstrated in class. Each line should equal the line above. A calculator should NOT be used.

21. $25 - 4 \cdot 2$ **22.** $(40 \div 2) - 4 \cdot 3$ **23.** $7^2 + 3(6 - 4)$

Evaluate if a = $\frac{1}{2}$, x = 6, and y = 5. You must show work as demonstrated in class. Each line should equal the line above. A calculator should NOT be used.

24. $a(10 - x)$ **25.** axy **26.** $5x - 3y$

Multiple Choice: Circle the letter beside the correct answer.

27) If $k = 6$, what is the value of $7k - 2$?

A. 30 B. 40 C. 54 D. 65

28) Which expression represents the product of *n* and 25?

A. $25n$ B. $25 - n$

C. $25 + n$ D. $25 \div n$

29) Which statement shows twice as much as 8?

A. $2 + 8$ B. $2 - 8$

C. 2×8 D. $2 \div 8$

30) Rita is moving a pile of 120 rocks by hand to build a rock wall. If *h* represents the number of rocks that she can carry in one load, which expression represents the total number of loads needed to move the entire pile of rocks?

A. $120 + h$ B. $120h$

C. $120 - h$ D. $\frac{120}{h}$

31) Malik has 12 animal books and 26 comic books. Which number sentence is best to use to find out how many *more* comic books he has than animal books?

A. $12 + 26 = \square$ B. $26 - 12 = \square$

C. $12 \times 26 = \square$ D. $26 \div 12 = \square$

Objectives: I can identify types of real numbers and express equivalent or approximate numbers for comparison.

Real Numbers

There are more classifications of numbers beyond rational numbers. Some numbers can't be expressed as the ratio of two integers. If this is the case, they are **irrational numbers**. Rational and irrational numbers together make up real numbers. Irrational numbers do not terminate or repeat when expressed in decimal form. One well known and frequently used irrational number is π. We are going to explore some other irrational numbers.

Complete the tables.

Perfect Squares		
1^2	1*1	1
2^2	2*2	4
3^2		
4^2		
5^2		
6^2		
7^2		
8^2		
9^2		
10^2		
11^2		
12^2		

Perfect Cubes		
1^3	1*1*1	1
2^3	2*2*2	8
3^3		
4^3		
5^3		
6^3		

Note: The square root is used so frequently, the 2 is just left off. So if there isn't a little number to indicate the root, the square root is

You can use the tables from left to right to "undo" the square or cube. This is called taking the square root or cube root of a number.

For example: $\sqrt[2]{16} = 4$ $\sqrt{144} = 12$ $\sqrt[3]{27} = 3$ $\sqrt[3]{\frac{8}{125}} = \frac{2}{5}$

You try:

1) $\sqrt{49}$ = _____ 2) $\sqrt[3]{8}$ = _____ 3) $\sqrt{100}$ = _____ 4) $\sqrt[3]{125}$ = _____ 5) $\sqrt{\frac{4}{9}}$ = _____

Make a conjecture: What if the number isn't on the list? What if you were asked to find $\sqrt{30}$? What if you were asked to find $\sqrt[3]{24}$? (These are examples of irrational numbers.)

Use what you know… $\sqrt{30}$ is between $\sqrt{25}$ and $\sqrt{36}$, therefore $\sqrt{30}$ is between 5 and 6.

… $\sqrt[3]{24}$ is between $\sqrt[3]{8}$ and $\sqrt[3]{27}$, therefore $\sqrt[3]{24}$ is between 2 and 3.

State the two consecutive integers that the following irrational numbers are in between:

Consecutive: in a row or one following another. For example 2, 3, 4, 5 are consecutive whole numbers.

1) $\sqrt{61}$ is between _____ and _____

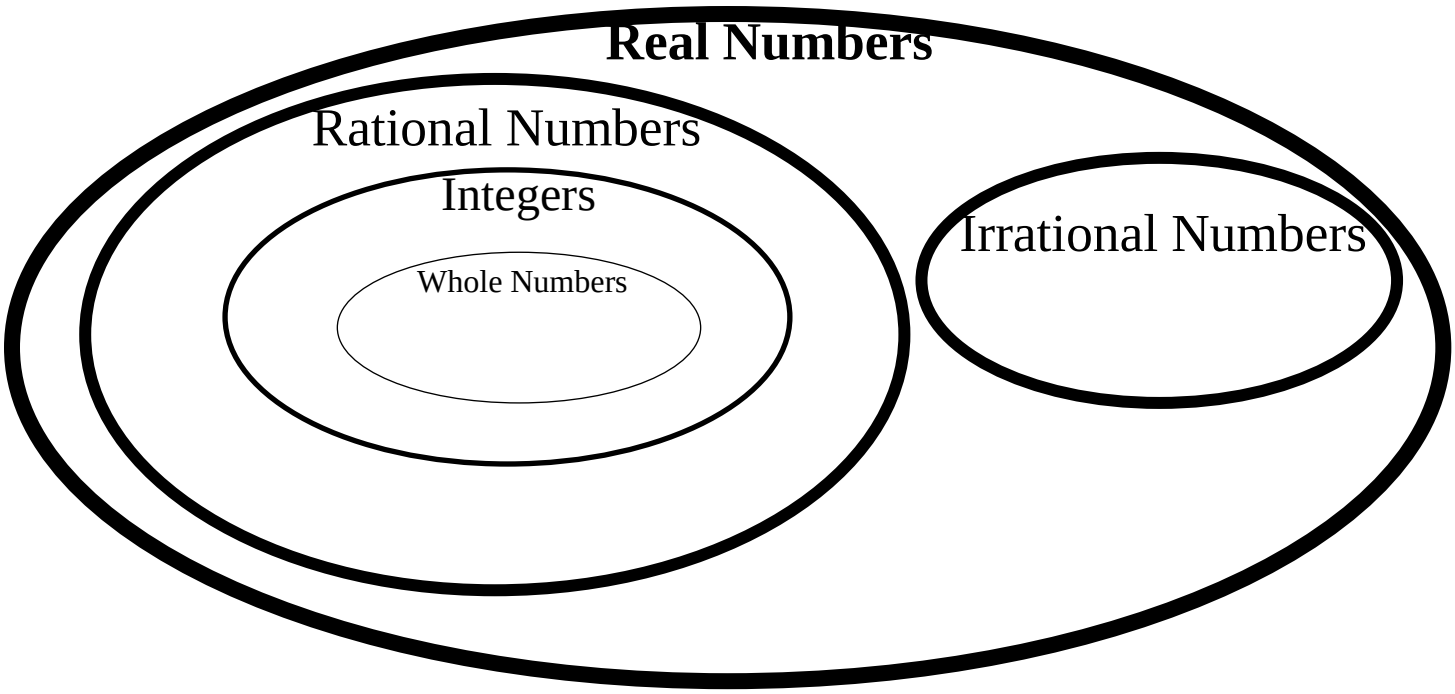
2) $\sqrt[3]{118}$ is between _____ and _____

3) $\sqrt[3]{100}$ is between _____ and _____

4) $\sqrt{135}$ is between _____ and _____

Place the following set of numbers on the Venn diagram to classify the type of number. Then indicate in the table below to which set(s) of numbers it belongs.

$\left\{-12, \sqrt{6}, -2.6, 0.222\overline{2}, -0.\overline{2}, \frac{7}{3}, \sqrt{100}, \sqrt[3]{12}\right\}$



1)	-12	Whole #	Integer	Rational #	Irrational #	Real #
2)	$\sqrt{6}$	Whole #	Integer	Rational #	Irrational #	Real #
3)	-2.6	Whole #	Integer	Rational #	Irrational #	Real #
4)	$0.222\overline{2}$	Whole #	Integer	Rational #	Irrational #	Real #
5)	$-0.\overline{2}$	Whole #	Integer	Rational #	Irrational #	Real #
6)	$\frac{7}{3}$	Whole #	Integer	Rational #	Irrational #	Real #
7)	$\sqrt{100}$	Whole #	Integer	Rational #	Irrational #	Real #
8)	$\sqrt[3]{12}$	Whole #	Integer	Rational #	Irrational #	Real #

Graph the following sets of numbers on a number line. Mark intervals of $\frac{1}{10}$ on your number lines.

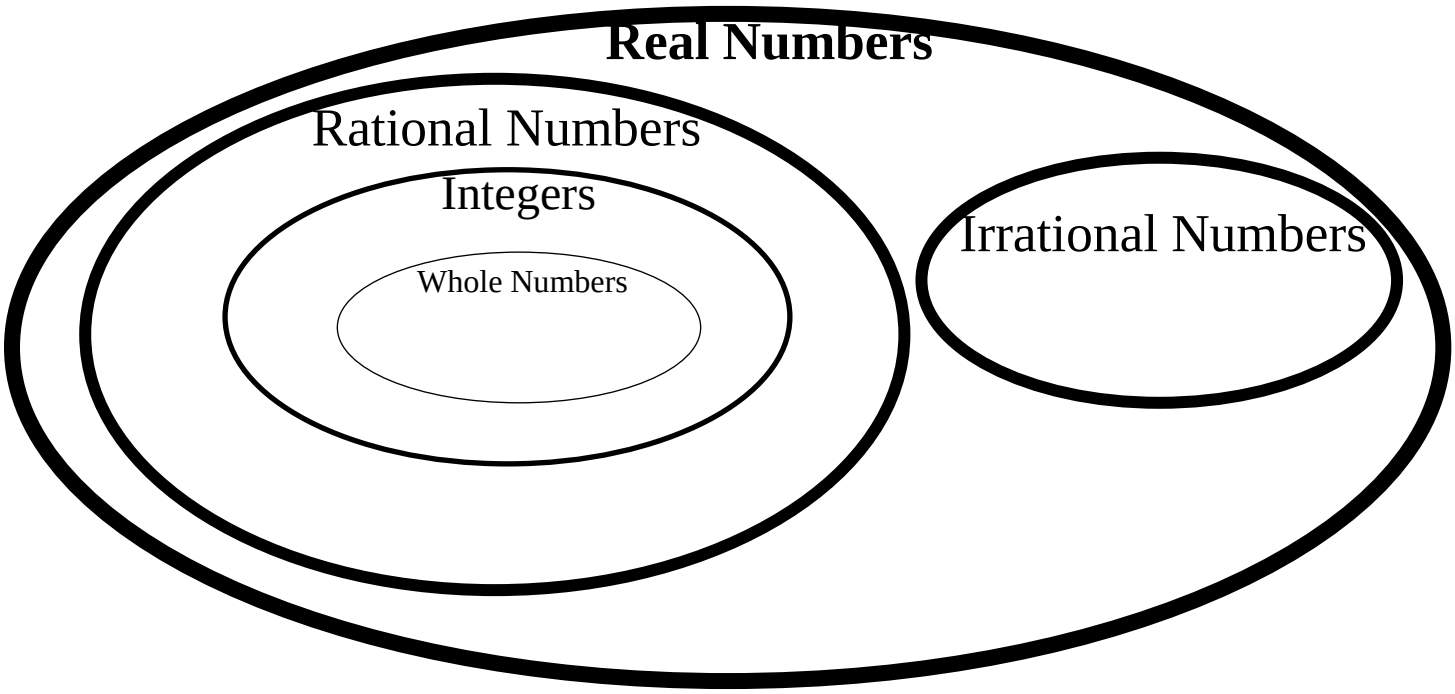
9) { $1.2, \sqrt{2}, 1\frac{7}{9}$ }

10) { $4\frac{3}{4}, 4.\overline{2}, \sqrt{24}$ }

HOMEWORK

Place the following set of numbers on the Venn diagram to classify the type of number. Then indicate in the table below to which set(s) of numbers it belongs.

$\left\{6\frac{2}{5}, \sqrt[3]{125}, \sqrt{50}, -\frac{3}{4}, 7.2\overline{3}, -8, \frac{15}{3}, \sqrt[3]{25}, 0, \pi\right\}$



1)	$6\frac{2}{5}$	Whole #	Integer	Rational #	Irrational #	Real
2)	$\sqrt[3]{125}$	Whole #	Integer	Rational #	Irrational #	Real
3)	$\sqrt{50}$	Whole #	Integer	Rational #	Irrational #	Real
4)	$-\frac{3}{4}$	Whole #	Integer	Rational #	Irrational #	Real
5)	$7.2\overline{3}$	Whole #	Integer	Rational #	Irrational #	Real
6)	-8	Whole #	Integer	Rational #	Irrational #	Real
7)	$\frac{15}{3}$	Whole #	Integer	Rational #	Irrational #	Real
8)	$\sqrt[3]{25}$	Whole #	Integer	Rational #	Irrational #	Real
9)	0	Whole #	Integer	Rational #	Irrational #	Real
10)	π	Whole #	Integer	Rational #	Irrational #	Real

Homework is continued on the next page.

Simplify.

11) $\sqrt{25}$ = _____ 12) $\sqrt[3]{64}$ = _____ 13) $\sqrt{64}$ = _____ 14) $\sqrt[3]{1}$ = _____ 15) $\sqrt{1}$ = _____

State the two consecutive integers that the following irrational numbers are in between:

1) $\sqrt{20}$ is between _____ and _____

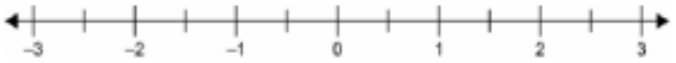
2) $\sqrt[3]{40}$ is between _____ and _____

3) $\sqrt[3]{134}$ is between _____ and _____

4) $\sqrt{96}$ is between _____ and _____

5) Plot and label the following numbers to their correct places on the number line to the right.

$$\frac{4}{3}, -\frac{2}{3}, \sqrt{4}, \sqrt{8}$$



Multiple Choice: Circle the letter beside the correct answer.

6) Which statement is correct?

A. All integers are rational numbers.

B. All irrational numbers are whole numbers.

C. A real number must be a rational number.

D. A repeating decimal is an irrational number.

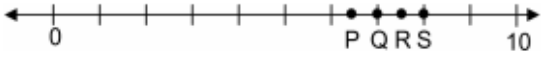
7) Which number is irrational?

A. $(1.5)^2$ B. $\sqrt{41}$

C. $\sqrt{49}$ D. $(15)^2$

8) Which point on the number line shows the *best* estimate of the irrational number below?

$\sqrt{57}$



A. P B. Q C. R D. S

9) Which set below includes only irrational numbers?

A. $\{-\sqrt{12},\ -3.7\overline{6},\ \sqrt{36},\ 4.3858\ldots\}$

B. $\{-7.2322\ldots,\ \sqrt{5},\ \sqrt{15},\ 8.27451\ldots\}$

C. $\{-5.6,\ \sqrt{14},\ 6.3\overline{245},\ \sqrt{81}\}$

D. $\{-\sqrt{8},\ .3\overline{7},\ 3.265165065\ldots,\ \sqrt{90}\}$

10) Which expression shows the first step in finding the value of $6 + 3(5 - 2)^2$?

A. $6 + 3(3)^2$ B. $9(5 - 2)^2$

C. $6 + (15 - 2)^2$ D. $6 + 3(25 - 4)$

11) Which operation should be performed first in the expression

$18 - 2 + 5 \times (16 + 66 \div 2)$?

A. $2 + 5$ B. 5×16

C. $16 + 66$ D. $66 \div 2$

8A: Classifying and Comparing Real Numbers

Identify the following numbers as rational or irrational:

1.	$\frac{2}{3}$	Rational	Irrational	2.	$2.\overline{15}$	Rational	Irrational
3.	$\sqrt{15}$	Rational	Irrational	4.	-14	Rational	Irrational
5.	52	Rational	Irrational	6.	$\sqrt[3]{125}$	Rational	Irrational
7.	$\sqrt{49}$	Rational	Irrational	8.	π	Rational	Irrational

Convert the following fractions to decimals:

9. $\frac{5}{8}$ = _____

10. $\frac{4}{9}$ = _____

Convert the following decimals to fractions:

11. 0.625 = _____

12. $0.\overline{24}$ = _____

Between which two consecutive integers are the following numbers?

13. $\sqrt{35}$

14. $\sqrt[3]{81}$

Simplify the following perfect squares and cubes:

15. $\sqrt{\frac{4}{9}}$

16. $\sqrt[3]{\frac{27}{64}}$

17. $\sqrt{121}$

18. $\sqrt[3]{8}$

Put the following numbers in order from least to greatest:

19. $\sqrt{6},\ \frac{5}{2},\ 2.1$

20. $\frac{22}{3},\ \sqrt{60},\ 7.6$

21. Graph the following numbers on the number line. Mark intervals of $\frac{1}{10}$ on your number line.

$$\left\{\sqrt{10},\ \frac{7}{2},\ 3.\overline{3}\right\}$$