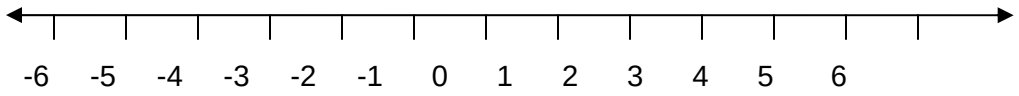
First Year Math WORKLOAD

GENERAL DIRECTIONS: Read and study the lesson below and answer WORKSHEETS 1 & 2. It is required that you submit these on July 2, 2009.

	Real Number System
Lesson 1.1	**OBJECTIVES:** 1. To identify the subsets of real numbers. 2. To define the different sets of numbers and identify their elements. 3. To graph real numbers on the number line.

The real number system evolved over time by expanding the notion of what we mean by the word "number. The set of real numbers contains all positive numbers, negative numbers and zero.



" At first, "number" meant something you could count, like how many sheep a farmer owns. These are called the set of natural numbers, or sometimes the counting numbers.

Set of Natural Numbers or "Counting Numbers"

{1, 2, 3, 4, 5 . . .}

- The use of three dots called 'ellipsis' at the end of the list is a common mathematical notation to indicate that the list keeps going forever.

At some point, the idea of "zero" came to be considered as a number. If the farmer does not have any sheep, then the number of sheep that the farmer owns is zero. We call the set of natural numbers plus the number zero, the whole numbers.

Set of Whole Numbers

Natural Numbers together with "zero"

{0, 1, 2, 3, 4, 5 . . . }

Set of Integers

Whole numbers plus negatives

{. . . –4, –3, –2, –1, 0, 1, 2, 3, 4 . . . }

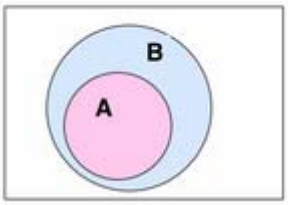
Set of Rational Numbers

All numbers of the form $\frac{a}{b}$, where *a* and *b* are integers (but *b* cannot be zero)

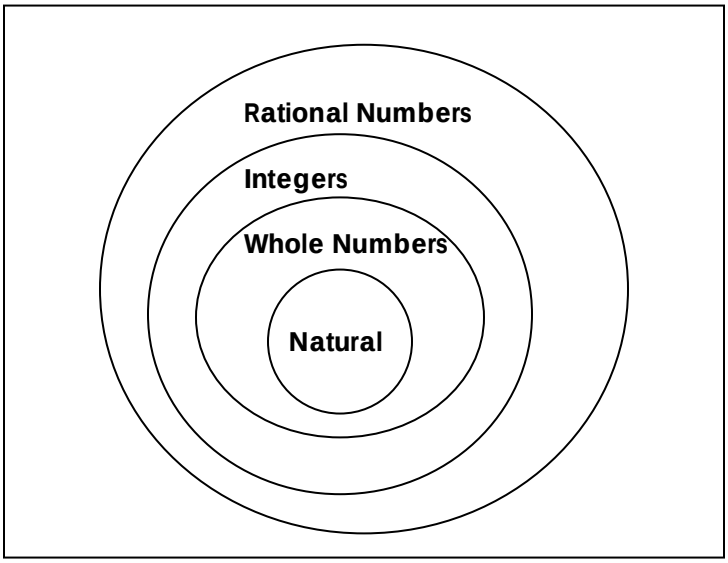
Rational numbers include what we usually call ***fractions***

- Notice that the word *"rational"* contains the word *"ratio"* which should remind you of fractions.

This means that all the previous sets of numbers (**natural numbers, whole numbers, and integers**) are **subsets** of the ***rational numbers***. Recall that a set A is a **subset** of a set B if A is 'contained' inside B. The diagram below called the Venn diagram illustrates that set A is a subset of set B.



The elements of the set of natural numbers are contained in the set of rational numbers.



Since fractions can be converted to decimals, and decimals to percent, decimals and percent are the other representations of rational numbers. Fractions when converted to decimals either terminate (come to an end) "***terminating decimals"*** or repeat (some parts of a decimal repeats forever) ***"repeating decimal***. For instance, $\frac{2}{5} = 0.4$ is a terminating decimal while $\frac{1}{3} = 0.33333... = 0.\overline{3}$ is a repeating decimal. Terminating and repeating decimals are always rational numbers.

Now it might seem as though the set of rational numbers would cover every possible case, but that is not so. There are ***numbers that cannot be expressed as a fraction***. There are decimals that don't terminate and at the same time do not repeat. These numbers are called ***irrational numbers***. For instance, $\sqrt{2} = 1.414213562...$, $\pi = 3.141592654$ and $e = 2.718281828...$ are some examples of irrational numbers.

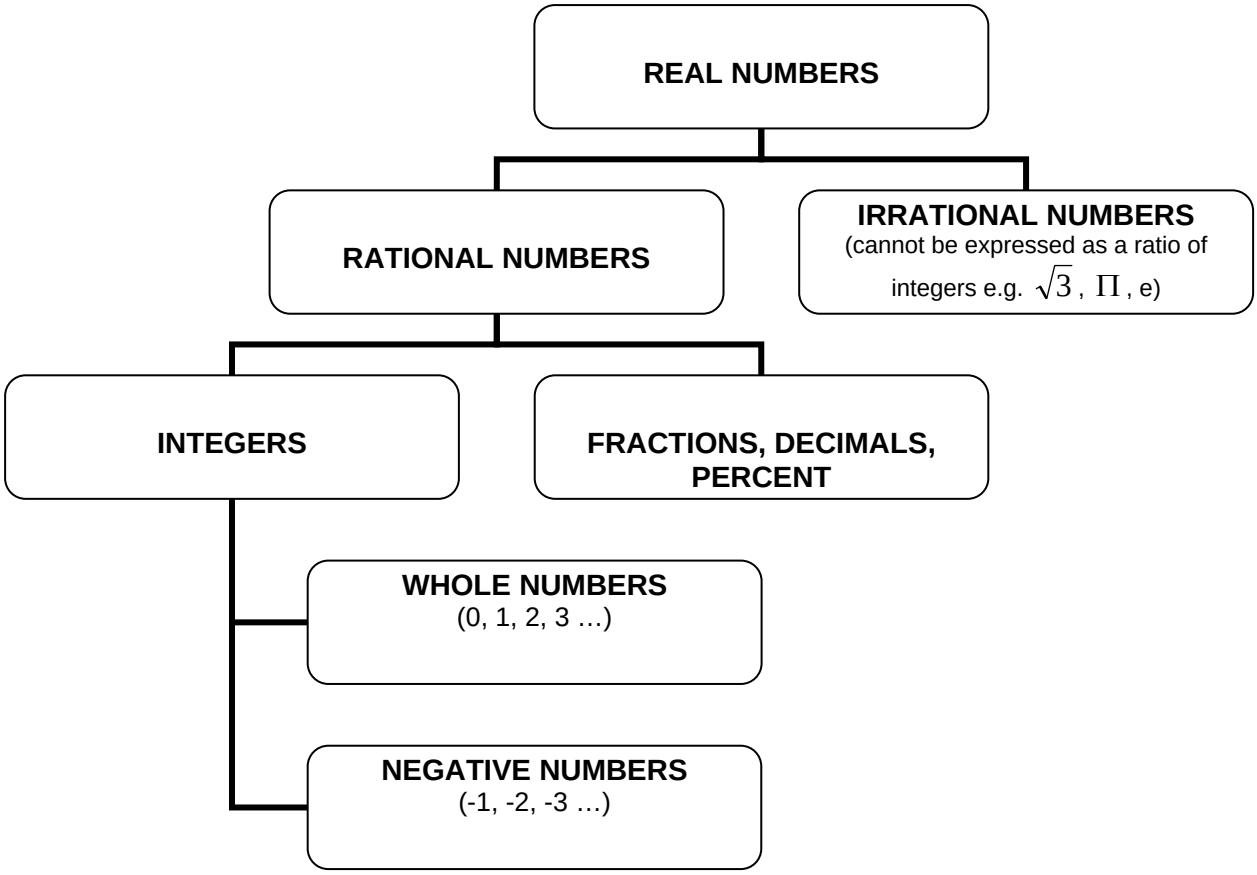
Set of Irrational Numbers

- Cannot be expressed as a ratio of integers.
- As decimals they never repeat and terminate.

Set of Real Numbers

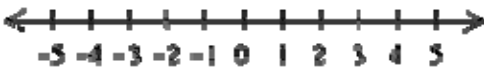
When we put the irrational numbers together with the rational numbers, we finally have the complete set of real numbers.

The following diagram illustrates the relationships of the sets that make up the real numbers. This is the diagram of the **Real Number System.**



The Real Number Line

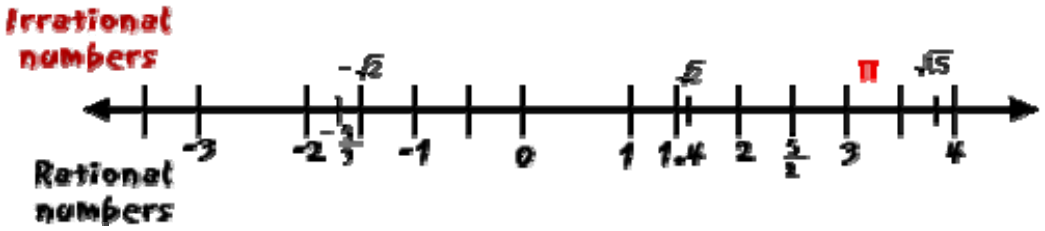
The real numbers can be pictured as points on a horizontal line called a real number line.



- Every real number corresponds to a distance on the number line, starting at the center (zero).
- Negative numbers represent distances to the left of zero, and positive numbers are distances to the right.
- The arrows on the end indicate that it keeps going forever in both directions.

Graphing Real Numbers

The point that corresponds to a number is the graph of the number. Illustrating the point as represented by a shaded dot is called graphing the number or plotting the point.



- Each real number is paired with exactly one point on a number line.
- Each point on a number line is paired with exactly one real number.

Thus, the set of real numbers does fill up the number line.

PAREF-SOUTHRIDGE SCHOOL
Algebra I

Name: _____ **Score: _____**

Section: _____ **Date: _____**

WORKSHEET 1

Try These!

A. True or False?

_____1. Some rational numbers are integers.
_____2. Not all irrational numbers are real numbers.
_____3. The product of any two integers is a negative integer.
_____4. The irrational numbers are numbers withy decimal representations that are non-terminating and non- repeating.
_____5. The real numbers consist of all real rational and some irrational numbers.
_____6. Every rational number is a real number.
_____7. Some integers are not real numbers.
_____8. Every whole number is positive.
_____9. Some real numbers are not rational.
_____10. Some whole numbers are not integers.
_____11. Every integer is a rational number.
_____12. Every integer is positive.
_____13. Some irrational numbers are negative.
_____14. Not every rational number is positive.
_____15. The number 0 is rational.

B. Complete the chart by indicating whether the given number belongs in the set. Use check (√) mark.

	Natural Numbers	Whole Numbers	Integers	Rational Numbers	Irrational Numbers	Real Numbers
8						
-11						
$\frac{0}{10}$						
16.2						
$-3\frac{1}{6}$						
$-\sqrt{3}$						

Need More Challenge!

A. Give three examples that satisfy the given condition.

1. positive real numbers but not integers _____
2. real numbers but not positive numbers _____
3. real numbers but not whole numbers _____
4. rational numbers but not negative numbers _____
5. rational numbers but not integers _____

B. List all numbers from the set { -9, -1 ¼ , 0, 2π, 5.9 , 7, 3e, -3/5 } that are

1. whole numbers _____
2. integers _____
3. non-integer rational _____
4. rational _____
5. real numbers _____

C. Graph the following real numbers on the number line.

1. -10
2. 6.25
3. $-3\frac{3}{4}$
4. $\sqrt{10}$
5. 2π

Conquer These!

Answer this.

1. Point *A* corresponds to -3 and point *B* corresponds to 5. What number corresponds to the point that is three times as far from *A* as it is from *B*?

2. Point *P* corresponds to -9 and point *Q* corresponds to 3. What number corresponds to the point that is half as far from *P* as it is from *Q*?

3. Point *G* corresponds to -0.9 and point *H* corresponds to 1.6. What number corresponds to the point that is one fourth as far from *G* as it is from *H*?

WORKSHEET 2

I. Complete the table by writing YES or NO in each space to indicate the set to which the number belong. The first one is already done for you.

	Natural	Whole	Integer	Rational	Irrational	Real
1. -9	*No*	*No*	*Yes*	*Yes*	*No*	*Yes*
2. 13						
3. $\sqrt{5}$						
4. -7						
5. $-\frac{7}{2}$						
6. 0						
7. $\sqrt{121}$						
8. $-\frac{18}{3}$						
9. π						
10. $2.\overline{34}$						
11. -2.7						
12. $\frac{7.8}{1.3}$						
13. $\frac{1}{0}$						
14. $\frac{22}{7}$						
15. $-\sqrt{49}$						
16. $\sqrt{-4}$						

II. Tell whether each statement is true ALWAYS, SOMETIMES or NEVER. Write your answer on the space before each item.

_____ 1. The sum of two natural numbers is a natural number.

_____ 2. The difference of two rational numbers is a natural number.

_____ 3. The difference of two whole numbers is a whole number.

_____ 4. The quotient of two integers is an integer.

_____

_____ 5. An integer is a rational number.

_____ 6. A whole number is a natural number.

_____ 7. A rational number can be an irrational number.

_____ 8. An irrational number is a real number.

_____ 9. A rational number is an integer.

_____ 10. The square root of a whole number is rational.

III. Answer the following concisely.

1. Does a calculator display the ***exact*** values of all rational numbers? Justify you answer.

_____
_____
_____
_____

2. Does a calculator display the ***exact*** values of all irrational numbers? Justify you answer.

_____
_____
_____
_____

3. Can the ratio of two irrational numbers be a rational number?

_____
_____
_____
_____

4. Can the ratio of two rational numbers be an irrational number?

_____
_____
_____
_____