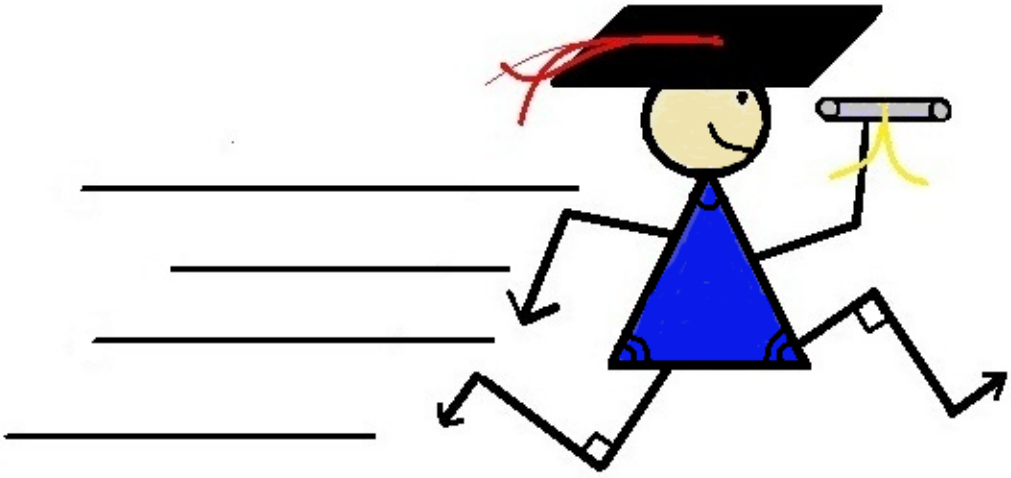
Chapter 1

Algebra Lingo

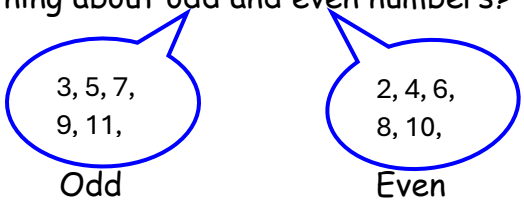


Learn Math Fast

Lesson 1: Integers and Natural Numbers

In the world of math, there are a lot of new words to learn. If you don't know the meaning of these words, it is going to be nearly impossible to understand algebra instructions. Let's take some time right now and go over some of the terminology. But don't worry, there are only 12 new words/phrases to learn and some of them you may already know, so let's get started.

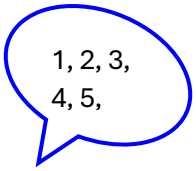
Do you remember learning about odd and even numbers?



When you separate numbers like this into their own special groups, each group is called a *set of numbers* or a *number set*. In algebra, there are a few number sets you should learn about. I'll start with the biggest set of all; the set that contains every single number in the world. Every number under the sun is included in this set of numbers. It is the granddaddy of all number sets, and they are called *Real Numbers.*

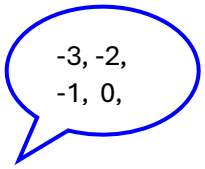
All numbers are considered to be *real numbers,* (except imaginary numbers, but you don't need to worry about those until college level math). It doesn't matter if it is odd, even, positive or negative, a decimal number, or a fraction – all numbers are real numbers.

Word #1 Real Numbers. Write that down.

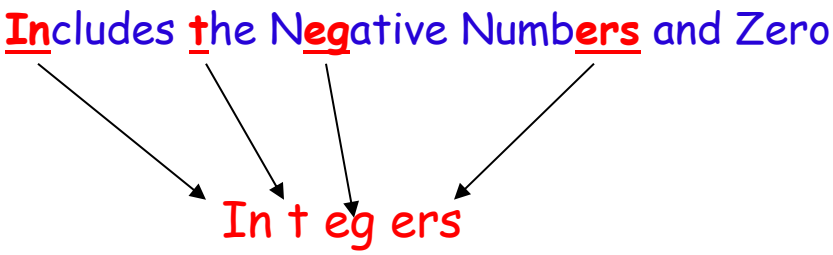


When we count, we don't use every single real number. We count using only the *natural numbers.* Natural numbers are the numbers you use to teach a child how to count, you know, 1, 2, 3, 4, and so on. You wouldn't teach a child to start with 0 and you wouldn't teach negative numbers or use fractions either. You would just stick to the *natural numbers* 1, 2, 3, 4, 5, 6, 7...it's only natural!

Word #2 Natural Numbers, write that down too.



Once you include negative numbers and zero to all the natural numbers, you have a new set of numbers called *integers.* It's easy to remember which numbers are called *natural numbers* because that's how we *naturally* count, but the word "integer" isn't as obvious. To help you remember which set of numbers are called integers, use this trick.



Keep in mind that fractions are not included in the sets of integers or natural numbers. Only whole numbers are included in these two sets.

Word #3: Integers. Write that down.

It is possible for a number to be both an integer and a natural number. For example, the number three is both an integer and a natural number. The number -3 is an integer, but it is not a natural number. A fraction, such as $\frac{3}{4}$, is neither an integer nor a natural number, but all of them are *real numbers.*

Here are the three new terms you learned in this lesson along with an example of a set of numbers from each group.

1. Real numbers -5, $\frac{1}{2}$, 62.8, -.77
2. Natural numbers 1, 2, 3, 4, 5, 100
3. Integers -8, -3, 22, 0, 16

Once you understand the difference between the three number sets above, complete the worksheet on page 13.

Name_____ Date _____

Worksheet 1

Name each set of real numbers as all natural numbers, all integers, or neither.

1. 5, 7, 18, 29
2. -2, 1, 3, 9
3. 0, 1, 2, 3
4. .5, 1, 1.5, 2, 2.5
5. -20, -21, -22
6. 1015, 1025, 1046
7. 1, $\frac{1}{2}$, 3, 5
8. -1, 0, 1
9. 253.5, 600.5, 3
10. 7, 12, -3, 0, 5
11. 14, 12, 110, 6
12. $\frac{1}{2}$, .335, $\sqrt{37}$, 0

13. Fill in the blanks to spell out the helpful integer phrase.

In t eg ers

_____ _____ _____ _____ and _____

14. When you teach a child how to count, which set of numbers do you use?

_____

15. Which set of numbers includes every number in the world? _____

* Review

16. $-3 \times -9 =$
17. $\frac{1}{4} \div \frac{3}{5} =$
18. $10 + x = -19$
19. $\frac{49}{7} = x$
20. $3a = 99$
21. $\frac{1}{2} \cdot \frac{1}{2} =$
22. $\sqrt{121} =$
23. $\frac{1}{2}x = 32$
24. $12^2 =$
25. $3\frac{4}{7} \times 4\frac{3}{5} =$
26. $4^2 + (3-1) + 5(8+2) =$

Lesson 2: Rational and Irrational Numbers

You've just learned the first three new words/phrases: real numbers, natural numbers, and integers. There are just two more sets of numbers to learn about, but don't worry, they are easy because their names make sense… a little bit.

We already said that ALL numbers are real numbers. Some of them are integers and some of them are natural numbers. Next, you will learn that every real number is either a *rational number* or an *irrational number*. Let me explain.

One definition of the word *rational* is "sensible" or makes sense. A rational person makes more sense than an irrational person, just like a *rational number* makes more sense than an *irrational number*.

Most numbers are rational, but every so often you will run into one of those numbers that have never ending decimal places. For example, you probably remember learning that the number for pi is 3.14, but that is a rounded number. Pi is actually a big, long, irrational number that never ends. Here are the first 31 decimal places.

$$\Pi = 3.14159265358979323846264338327 95\ldots$$

Since this number never ends or repeats, it is called an *irrational number*. An irrational number is impossible to write as a fraction, unless you round the number, but then it is not exact. That's the problem with irrational numbers. Here are two more common examples of irrational numbers.

$$\sqrt{2} \qquad\qquad \sqrt{7}$$

It is easy to solve a problem like $\sqrt{4}$ because the answer is a rational number, two, but $\sqrt{2}$ and $\sqrt{7}$ have never ending decimal places.

$$\sqrt{2} = 1.414213562373095\ldots$$
$$\sqrt{7} = 2.645751311064591\ldots$$

The square root of 7 is 2.645751311064591…this number goes to the one-hundred-trillionth decimal place, and it's still not done. Since this number won't end, I cannot write it as a fraction. This number makes no sense…it is completely irrational.

Any number that cannot be written as a fraction is called irrational. Look at these next two numbers. It ***is*** possible to write these numbers as a fraction.

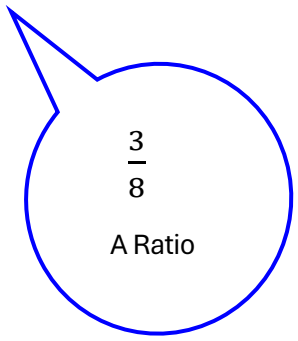
$\sqrt{16}$ 53.007

The square root of 16 is 4, as a fraction that is written as $\frac{4}{1}$. The other rational number is 53.007, as a fraction that number is written as $\frac{53{,}007}{1000}$.

The difference between a rational number and an irrational number is that a rational number <u>can</u> be written as a fraction. The root word for rational is "ratio." A fraction is a ratio. That's the real reason why a number that can be written as a fraction is called a "ratio-nal" number.

I should also tell you that technically each number of the fraction must be an integer and the denominator can't be zero; that's the technical stuff. Basically, rational numbers are exact and irrational numbers have no end; that's all you really need to know.

Word #4 Rational numbers.
Word #5 Irrational numbers.



Complete the worksheet on the next page.

Name_____ Date _____

Worksheet 2

Name each real number as an integer, a natural number or neither, and then say whether it is rational or irrational. The first one is done for you.

* 17 A rational, natural number and an integer.

1. -17
2. .34
3. .33
4. $\sqrt{4}$
5. $\sqrt{2}$
6. -7/8
7. 0
8. π
9. 100
10. 1/3

Review pre-algebra by solving the following.

11. 3a = 27
12. $\frac{1}{2}a = 5$
13. -12 x -12 =
14. -8^2 =
15. $\sqrt{36}$ =
16. x – 5 = - 10
17. 8(6 + 3) =
18. (3 + 3) – 2^2 + (4 x 6)($\sqrt{4}$) =

Fill in the blanks with the correct order of operations (PEMDAS).

19. _____, Exponents, _____, _____, Add, _____

20. $-\frac{5}{9} \div \frac{5}{6} =$
21. $\frac{7}{12} \times -\frac{8}{11} =$
22. $2\frac{7}{9} + 4\frac{4}{27} =$