Why Use Negative Numbers?

Have you seen negative numbers somewhere in your life? Think about some instance for a minute – I would bet it has something to do with direction, along with the value.

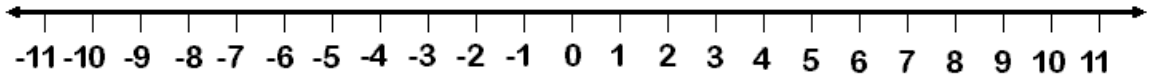
Negative numbers generally occur when a change is measured from some reference. For example:

- Temperature in Celsius is measured relative to freezing. The temperatures above zero are positive, and those below zero are negative.
- The height of a river above and below flood stage is measured relative to a certain mark. The height above is positive and levels below flood stage are negative numbers.
- Golf scores in a televised match are relative to a standard skill called "par". Players that use fewer strokes than par (and that is good!) will have a negative score.
- Accountants call the amount of money you *have* is positive, while the amount of money you *owe* is negative.
- Football yards of "rushing" are measured relative to the line of scrimmage. The distance moved forward is positive, while the distance when the ball moves backwards is negative.
- In electronics, voltage and current are measured relative to zero, and negative numbers are as frequent as positive values.

What Are Negative Numbers

Look at a number line. Negative numbers are numbers less than (to the left of) zero. The number line below demonstrates this idea. Notice that both positive and negative numbers go on forever.

Numbers get larger as you go to the right and smaller as you go to the left. Notice for example that –3 is smaller than –2.



Two numbers are **opposites** if they are the same distance from zero on a number line, but on opposite sides of zero. We say -5 is "negative five" or "the opposite of five".

Is +0 the same as –0? These are two different names for the same point on the number line. They mean the same thing. Adding zero is identical to subtracting zero.

Addition and subtraction with negative numbers is quite convenient, since there is nothing special about the number zero. There is no extra "special case" to handle when you combine numbers on either side of zero. You simply add and subtract them as usual.

Negatives on Your Calculator

Every calculator seems to have a different way to enter negative numbers. *Read your manual* to find out how your calculator does it!

The +/- key on your calculator gives the opposite of the number (changes the sign) on the display.

A Few Words About Parentheses

A parenthesis is a symbol like "(" or the matching symbol ")". The plural of parenthesis is *parentheses*.

Parentheses in mathematics are used to group things together. They tell you that items inside them belong together; they are slightly separated from things outside them. Operations inside parentheses must be done before other operations.

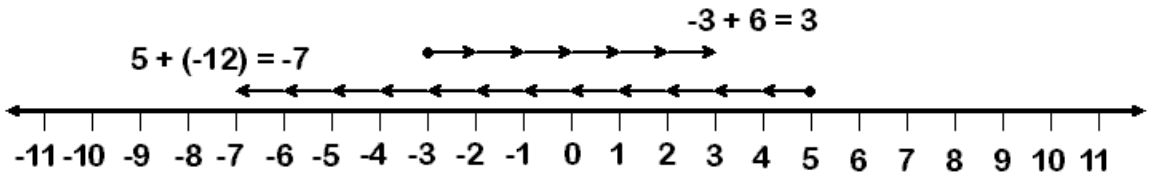
We use parentheses with negative numbers to avoid confusion with other operations such as addition or subtraction. For example, "3 + (-5)" means, "three plus negative five" and tells you the minus sign is working on the five. Otherwise, you would see the "+ -" together and it would be confusing.

Adding: a + (-b)

This is just another way to write regular subtraction! a + (-b) = a - b

Start with the first number you are given and move:

- to the left if you are adding a negative number;
- to the right if you are adding a positive number.



Why would you ever write subtraction that way? First, because there is no longer any subtraction. That is, all your subtraction problems are merely addition, and you just

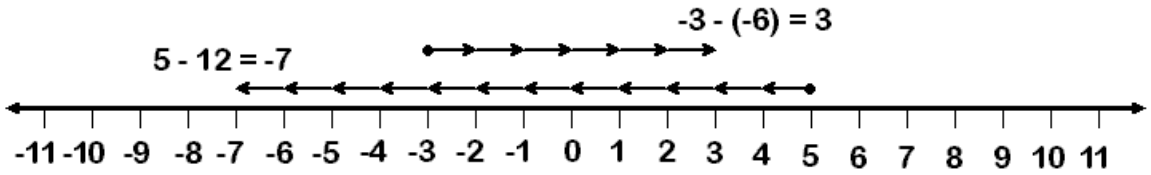
happen to have some negative numbers thrown into the mix. Second, because addition problems let you easily swap the order of the numbers. Sometimes it is handy to write a + (-b) in another form such as (-b) + a.

Subtracting: a - (-b)

This is just another way to write regular addition The two negative signs cancel each other out!

Start with the first number you are given and move:

- to the left if you are subtracting a positive number;
- to the right if you are subtracting a negative number.



Multiplying and Dividing: (-a) ×·(-b) or (-a)/(-b)

To multiply or divide positive or negative numbers

- Ignore the sign (positive or negative) and multiply or divide as usual.
- The answer is positive if both numbers have the same sign.
- The answer is negative if the numbers have opposite signs.

Examples: 6 × 3 = 18 6 × (-3) = -18 -6 × 3 = -18 -6 × (-3) = 18

10 / 2 = 5 10 / (-2) = -5 -10 / 2 = -5 -10 / (-2) = 5

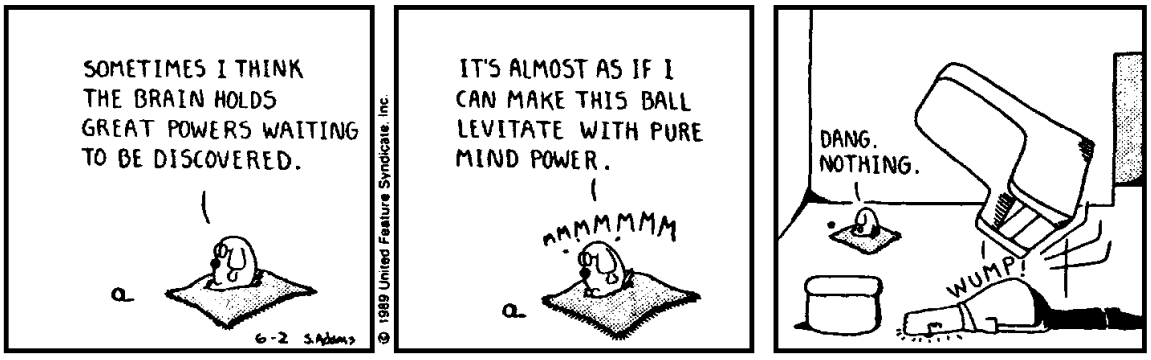
☞ Always do parentheses first!

☞ Just as two negatives in a sentence mean positive, so a negative times a negative equals a positive: -3 × -4 = 12

Vocabulary

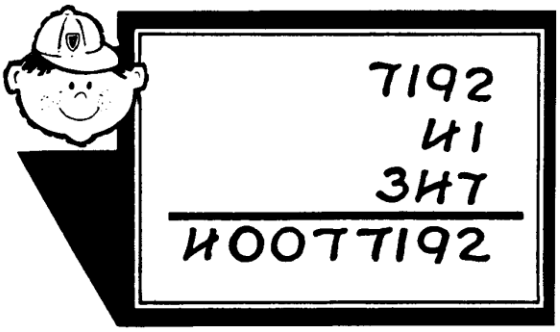
- *Negative numbers* - numbers less than zero
- *Absolute value* - the value of a number without its + or - sign. That is, the number of units it is from 0 on the number line.
- *Radical* - the symbol indicating that a root is to be taken. For example, $\sqrt{16}$ is "square root of 16". The square root is the radical operation. This is *not* the same as saying "Radical, dude!"
- *Square root* - a number which multiplied by itself yields the number inside the square root symbol. For example, "square root of 49 is 7 or -7" is written as $\sqrt{49} = 7$ or -7. The *square root* is one of the radical operations.
- *AAAAAA* -- American Association Against Acronym Abusers Anonymous

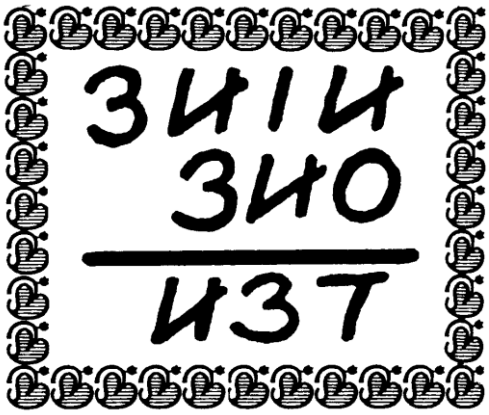
Dilbert, by Scott Adams



Just For Fun…

This math problem is wrong!
Can you find the correct answer?





However, the other math problem is right! Do you see why?

1) Compute with negative numbers in addition and subtraction:

a) –7 – 11 = *Example: (-7) + (-11) = -18*

b) 13 – 12 = _____

c) 13 – 13 = _____

d) 13 – 14 = _____

e) –13 + 12 = _____

f) 4 – 12 = _____

g) –4 – 12 = _____

h) –10 – 20 + 5 = _____

i) 19 + (–9) = _____

j) 32 – (–10) = _____

k) 5 + (-10) = _____

l) (–6) + (–12) = _____

m) 6 – (-12) = _____

n) (–12) – (–8) = _____

2) Answer these problems about addition and subtraction with negative numbers.

a) What is the sum of any pair of opposites, such as -30 + 30?

b) Beginning at sunrise Tuesday morning, the temperature dropped 5 degrees. But the skies cleared Tuesday afternoon, and the temperature rose 10 degrees by sunset. What was the change in temperature at sunset, compared to sunrise?

c) Madison dove from the 10 meter board. She dove 3 meters under the water. How far did she travel from her highest to lowest point?

d) Tyler plays football. He lost 6 yards on the first play, then gained 15 yards on the next. What was his total advance after these two plays?

3) Answer these questions about negative numbers in multiplication and division:

a) What is the product of two positive numbers? Circle *positive* or *negative*.

b) What is the product of two negative numbers? Circle *positive* or *negative*.

c) What is the product of a positive and a negative number?
Circle *positive* or *negative*.

d) Is "+0" the same as "-0"? Circle *yes* and not *no*.

4) Multiply and divide these negative numbers:

a) $(-2) \times (-2) =$ *Example: +4*

b) $(-4) \times 4 =$ _____

c) $(-1) \times (-1) =$ _____

d) $(-7) \times (-7) =$ _____

e) $\frac{-21}{-7} =$ _____

f) $-5 \times 5 \times 5 =$ _____

g) $0 \times (-10) =$ _____

h) $\frac{(-5)\times(-4)}{(-4)\times(-1)} =$ _____

i) $(-1) \times (-4 - 2) =$ _____

j) $(-1) \times (4 - 7) =$ _____

k) $\frac{9-81}{11-23} =$ _____

5) Mental Math: do these in your head, and write down the answers. When you're done, *check your answer* with pencil and paper, or with a calculator.

a) What is 25% of 60?

b) What is the smallest prime number?

c) What is 0.125 when it is written as a fraction?

d) What is the greatest common factor (GCF) of 25 and 35?

e) To be evenly divisible by 6, the number must be divisible by both 2 and 3. Answer *yes* or *no*: Is 89328 evenly divisible by 6?

f) The sum of Mark's and Rob's ages is 12. Mark is 10 years older than Rob. Write *yes* or *no*: would Rob be allowed in Math Club? (*How old is Rob?!*)

g) Now what is your name?

h) Now ask someone (with a different name) to check your answers for you!

Thanks! Now please separate the homework from the lesson. Turn in the homework by itself.. (Keep the lesson part; I already know what it says!)