

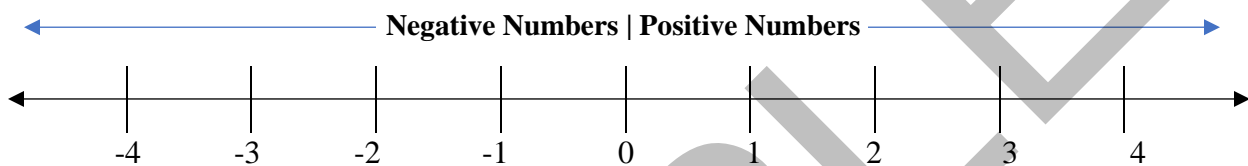
# Staying Sharp with Sixth Grade Math

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## Lesson 1

### Positive and Negative Numbers

**Positive numbers** move to the right of zero (more than zero), while **negative numbers** move to the left of zero (less than zero).



No sign indicates a positive number.

7    4    3

The sign “-” indicates a negative number.

-7    -4    -3

Write “negative” or “positive” for each of the following numbers.

3

-456

-567

321

When working with equations, there can only be one sign at a time between numbers.

When you add a positive number to another number, there is only one sign in between the numbers, so the signs in between do not change.

For example:  $5 + 5 = 10$

When you subtract a positive number from another number, there is only one sign in between the numbers, so the signs in between do not change.

For example:  $10 - 5 = 5$

When you try to add or subtract a negative number, things get a little more complicated.

For example:  $5 + (-2) = 3$  OR  $5 - (-5) = 10$

Since there can only be one sign between numbers in an equation, you will have to eliminate one sign. How do you know which sign to eliminate? Here are two rules to help!

1. **Two of the same sign in between become a positive sign in between.**

$$(+)\text{ and }(+)=(+)$$

$$(-)\text{ and }(-)=(+)$$

2. **Two opposite signs in between become a negative sign in between.**

$$(+)\text{ and }(-)=(-)$$

Let's look at our two examples to see this better.

Example 1:  $5 + (-2) = 3$

The signs are opposite (+ and -), so we would eliminate the (+) and use the (-).

Our problem becomes:  $5 - 2 = 3$

Example 2:  $5 - (-5) = 10$

The signs are the same (- and -), so they would become a (+).

Our problem becomes:  $5 + 5 = 10$

Now let's consider what happens if the number you subtract is bigger than the number that you start with. If the number you subtract is bigger, you will subtract the smaller number from the larger number and your answer will be negative. (*This also applies if you add a larger negative number to a smaller positive number.*)

For example:  $10 + (-21) = -11$  --->  $10 - 21 = -11$

(-21) is larger, so you would subtract 10 from 21, and your answer will be negative.

This is because you move left on your number line when you subtract.

When you subtract 21 from 10, you move past the zero on your number line, so the answer will be a negative number.

Try a few on your own.

$8 + (-3) =$

$2 + (-21) =$

$6 - (-4) =$

$7 + (-6) =$

$4 - (-2) =$

$24 + (-12) =$

## Lesson 2: Rules for Multiplying Positive and Negative Numbers

Obviously, we have to do more than add and subtract numbers. We also need to multiply and divide. You will find that the rules are very similar.

1. **When you multiply or divide two numbers with the same sign, the answer will be positive.**

Example:  $5 \times 5 = 25$

Example:  $-15 \div -3 = 5$

2. **When you multiply or divide two numbers with opposite signs, the answer will be negative.**

Example:  $3 \times (-8) = -24$

Example:  $-18 \div 6 = -3$

What if you have more than two numbers to combine? Easy. Start by multiplying or dividing in order, from left to right. Then look at the signs. If there are an odd number of negative signs, the answer is negative. If there are an even number of negative signs, the answer is positive.

Example:  $5 \times (-6) \div (-2) \times 7 \div (-3) = -35$

Solution: We can predict that the answer will be **negative**, because there are three minus signs, which simplify to a negative.

Then we work from left to right and do the multiplication and division in order: Five times six is thirty. Divide by two to get fifteen. Multiply by seven to make one hundred five. Divide by three to get thirty-five. The answer is **negative** thirty-five ( $-35$ ).

Try a few on your own.

$8 \times (-3) =$

$(-5) \times 12 =$

$(-9) \times (-4) =$

$(-5) \times (-10) =$

$(-4) \times (-17) =$

$7 \times (-11) =$

## Lesson 3

### Related Equations – Addition

**Inverse operations** are opposites. They reverse the other operation.

Today we will look closer at related equations using the inverse of addition, which is subtraction. Simply start with the answer and *subtract* one of the other numbers to create two related equations.

Let's do a few together.

**Original Equation:**

$$45 + 32 = 77$$

$$134 + 245 = 379$$

**Related equations using the inverse:**

Inverse operations:  $77 - 32 = 45$

$$77 - 45 = 32$$

Inverse operations:  $379 - 245 = 134$

$$379 - 134 = 245$$

Your turn. Try these on your own.

$$93 + 13 = 106$$

Inverse operations:

$$321 + 158 = 479$$

Inverse operations:

$$547 + 232 = 779$$

Inverse operations:

$$155 + 243 = 398$$

Inverse operations:

## Lesson 4

### Related Equations – Subtraction

We discussed inverse operations for addition. Now let's work some with subtraction.

If the inverse of addition is subtraction, then the inverse of subtraction is addition. Just as with addition, we will use the inverse operation to create two related equations. Start with the answer, and then add one of the other numbers.

Let's do a few together.

**Original Equation:**

$$432 - 32 = 400$$

$$1589 - 547 = 1042$$

**Related equations using the inverse:**

Inverse operations:  $400 + 32 = 432$   
 $32 + 400 = 432$

Inverse operations:  $1042 + 547 = 1589$   
 $547 + 1042 = 1589$

Now you try a few.

$$235 - 25 = 210$$

Inverse operations:

$$5298 - 321 = 4977$$

Inverse operations:

$$685 - 242 = 443$$

Inverse operations:

$$279 - 58 = 221$$

Inverse operations:

## Lesson 5

### Related Equations – Multiplication

Now that we've covered addition and subtraction inverse operations, let's work through some multiplication.

For multiplication, the inverse operation is division. Start with the answer of the original problem, and then divide one of the other numbers to create two related equations.

Let's try a few together.

**Original Equation:**

$$10 \times 4 = 40$$

$$932 \times 34 = 31,688$$

**Related equations using the inverse:**

Inverse operations:  $40 \div 10 = 4$   
 $40 \div 4 = 10$

Inverse operations:  $31,688 \div 34 = 932$   
 $31,688 \div 932 = 34$

Now you try a few.

$$674 \times 56 = 37,744$$

Inverse operations:

$$78 \times 14 = 1092$$

Inverse operations:

$$125 \times 3 = 375$$

Inverse operations:

$$453 \times 16 = 7248$$

Inverse operations: