Goals: To learn and better understand subtraction with signed numbers

* Defining Subtraction
* Finding a meaning for subtraction of a negative.
	+ Recall what opposite means and what notation is used for it
* Viewing change as a difference

# Defining Subtraction

Terms: Subtrahend, minuend, difference.

In any subtraction problem, these terms can be used to describe the subtraction problem as seen in the example below:

$$7-5=2$$

Difference

Minuend

Subtrahend

## Some needed definitions

The **Subtrahend** is the number being subtracted from

The **Minuend** is the number you are taking away

The **Difference** is the result

Subtraction is equivalently defined as adding a numbers opposite.

In math terms it looks like:

If a, b are any integers then

$$a-b=a+(-b)$$

Example:

If you consider your credit card balance, having $10 and purchasing a $6 item can be thought of as the subtraction statement:

$10-6$ or $10$

 $-6$

But it can also be considered as having $10 in your account and adding a transaction of a $6 debit which looks like:

$10+\left(-6\right)$ or $10$

 $+(-6)$

Both concepts are equivalent to each other.

So $10-6=10+(-6)$

So we are free to think of subtraction as a subtrahend minus a minuend

**or**

as the sum of two addends where the minuend in the subtraction problem is replaced with its opposite or (also called its additive inverse).

Examples:

 $12-7=12+(-7)$

And

$$3-\left(-2\right)=3+(+2)$$

In both examples the subtraction is equivalently expressed as adding the minuends opposite.

Example

1. Identify the minuend in each subtraction problem
2. Replace the subtraction problem with its equivalent addition problem of “adding the minuends opposite”
3. Simplify the result using addition of the opposite

$14-8=$ $-3-1=$ $17-15=$

$5-\left(-4\right)=$ $6-\left(-9\right)=$ $-4-\left(-1\right)=$

# Finding a meaning for subtracting a negative

## Recall the definition of a opposite or negative.

Recall that the opposite of a number is defined as:

The “Negative” or “opposite” of any number, is the number which represents the same quantity but indicates the opposite meaning of that number.

Example: Find the opposite or negative of each number.

Number

$6$ $32$ $-5$ $-147$ $-562$

Its opposite or negative is:

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If you view a credit card or bank statement as a continual addition of transactions, and the meaning of each transaction can be thought of as a credit or a debit.

Then the idea of subtracting a negative would have an interpretation as removing a charge.

The result of this would be a credit to your account.

Example:

If you have $10 in the bank and discovered that your current balance is a result of having a $5 charge take place which you did not authorize, then your credit card/bank would remove that charge.

 $10$

$$-(-5)$$

The result would be a 5 dollar credit.

So $10-\left(-5\right)=10+\left(+5\right)=15$

Which is consistent with the concept of subtraction being the same as adding the minuend’s opposite.

Examples: Express the subtraction as a “adding the minuends opposite”, then find the result:

$17-2=$ $12-\left(-7\right)=$

$-5-\left(-4\right)=$ $7-\left(+8\right)=$

Incorporating the Order of Operations into problems involving multiple operations:

Recall:

The Order of Operations (look it up in any math book)

1. Parenthesis or grouping symbols
2. Exponents
3. Multiplication AND Division in order of appearance from L$\rightarrow $R
4. Addition AND Subtraction in order of appearance from L$\rightarrow $R

Example: Simplify

$-3-\left(-13\right)-11=$ $4-\left(+7\right)-\left(-6\right)=$

$2-\left(7-9\right)=$ $-5-\left(-5-5\right)=$

# Change as a Difference

The change in a quantity, to measure the change in a quantity always subtract the former quantity from the later quantity:

$$Change in a quantity=Latter amount-Former amount$$

Or using other words

$$Change in a quantity=Final-Initial$$

Example:

If the outdoor temperature at noon is $52°$ and the temperature at 4pm is $50°$ what is the change in temperature?

If a scuba diver is at a depth of 100ft under water and rises to a depth of 30 ft under water, what is the change in the diver’s depth? Hint: under water is consider to be a negative height.