Unit 1: Back to Basics

Let's review the basics about place value, addition, subtraction, multiplication, and division. We want to be able to perform these functions quickly and effectively, so we can build on these and move on to more advanced topics. The rules you use for these arithmetic functions will be the same when we move on to working with things like decimals, fractions, and even variables.

Also, these functions make up most of our use of mathematics in our everyday life. If you're purchasing items at a store and want to know if you have enough money, or what your change will be, you'll be using arithmetic. If you want to build the largest dog house that you can with the wood Grandpa gave you, you'll be using arithmetic. If you want to know how much longer the car ride will be to Aunt Cindy's house, you'll be using arithmetic. When you can perform these functions quickly and accurately, it will be simple to apply them to any situation.

This unit is intended as a review; these should be facts that you know. If you can already perform all of these functions, then use this review to work on your accuracy and speed.

Week 1

Day 1: Place Value

Before we can perform functions with numbers, we need to understand what numbers are. In the number system we most often use, we express numbers using ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. Using only these ten digits, we can show any number by assigning values based on the position of the digit in a number. Each place in a number is ten times greater than the place to its immediate right. Knowing this, we can make a place value chart that looks like this:

Millions			Thousands			Ones		
Hundred Millions	Ten Millions	One Millions	Hundred Thousands	Ten Thousands	One Thousands	Hundreds	Tens	Ones
		7	0	2	3	8	4	5

Using these place values, we can see that the number 7,023,845 actually means we have:

- 7 millions,
- 0 hundred thousands,
- 2 ten thousands,
- 3 one thousands,
- 8 hundreds,
- 4 tens,
- and 5 ones.

In other words, we have 7,000,000 + 20,000 + 3,000 + 800 + 40 + 5.

Remember that zeroes are important place holders. The zero in the hundred thousands place tells us that there are no hundred thousands in this number, but we can't leave it out! If the zero were

not there holding that place, then all of the digits would shift to different place values:

723,845 ≠ 7,023,845.

Let's Practice

1. In what place value, or position, is the underlined digit?

   a. $\underline{4}2,021$

   b. 5,38$\underline{9}$,000

   c. 30$\underline{4}$,885,299

   d. 2,6$\underline{5}$4

   e. 41,$\underline{0}$03

2. Write these word expansions as numbers. (Remember to use zeroes to hold places where no other digits are needed!)

   a. 5 ten thousands, 3 thousands, 9 hundreds, 9 tens, and 9 ones

   b. 4 millions

   c. 7 hundred thousands, 4 thousands, 6 hundreds, 2 tens, and 1 ones

   d. 2 hundred millions, 2 ten millions, 1 millions, 4 hundred thousands, 5 ten thousands, 8 thousands, 6 hundreds, 7 tens, and 8 ones

   e. 3 ten millions, 4 thousands, 6 hundreds, 7 tens, and 7 ones

3. Write these expansions as numbers.

   a. 4,000,000 + 200,000 + 30,000 + 400 + 60 + 7

   b. 20,000 + 5,000 + 1

   c. 3,000 + 900 + 10 + 2

   d. 100,000,000 + 10 + 9

   e. 800,000 + 40,000 + 5,000 + 900 + 30 + 7

Day 2: Addition

When numbers are added together, the numbers are called **addends** and the answer is called the **sum**. If you are adding larger numbers, or if you are adding several numbers at one time, it is usually easier to line the numbers up in a column so that the ones digits of each number are on top of each other.

23 + 510 + 34 →

```
  23
 510
+ 34
```

Now, add the digits in the ones column, and place the result under the ones column. Then add the tens column and place the result under the tens column. Continue adding columns until all columns are added.

```
  23          23          23
 510    →    510    →    510
+ 34        + 34        + 34
   7           67         567
```

Sometimes when you add a column, the answer is more than a one-digit answer. When that happens, write the ones digit of your answer under the column you are adding and carry the additional digits over to be added in with the next column.

```
   1           1           1
  14          14          14
  37          37          37
+ 291       + 291       + 291
   2           42         342
```

Let's Practice

1. Add these numbers.

a.
```
  25
  97
+ 45
```

b.
```
  677
  201
+ 131
```

c.
```
  568
  244
+ 303
```

d.
```
  65
 147
  76
+ 9
```

e.
```
   21
1,104
2,300
  255
+ 91
```

f.
```
  760
   28
  103
  838
+ 62
```

2. Add these numbers. Remember to rewrite them in columns lining up the ones digits of each number.

   a. 58 + 29 + 204 =

   b. 568 + 10 + 29 + 308 =

   c. 1,264 + 2,397 + 902 + 45 =

   d. 33 + 45 + 1,061 + 774 =

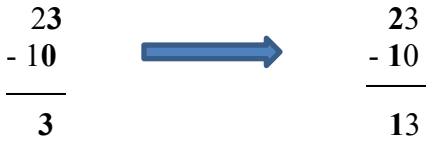
Day 3: Subtraction

When numbers are subtracted, the first number is called the **subtrahend**, the second number is called the **minuend**, and the answer is called the **difference**. Just like in addition, when you subtract it is much easier if you write the numbers in columns by lining up the ones digits.

23 – 10 

$$\begin{array}{r} 23 \\ -\ 10 \\ \hline \end{array}$$

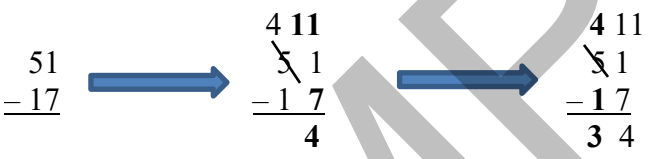
Also, like in addition, you start subtracting in the ones column. Subtract the bottom number from the top number and write your answer in the ones column. Move on to each additional column and do the same.



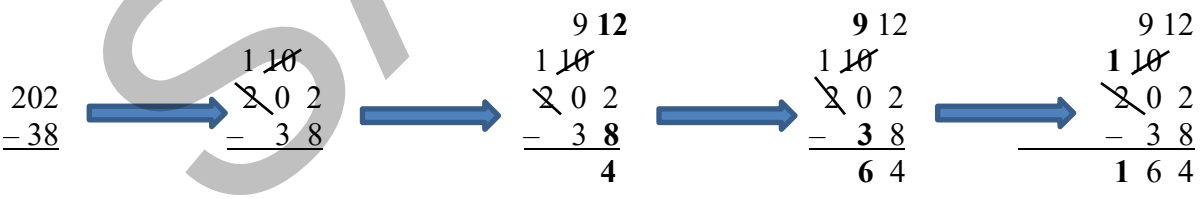
Sometimes the top number in a column is smaller than the bottom number in that column. When that happens, you need to borrow from the next column to the left.

First, subtract 1 from the top number of the column directly to the left, then add 10 to the top number in the column that you're working in.

Now subtract the bottom number of that column from the new top number and write your answer underneath.



What if the column to the left is a zero? Then you need to borrow from the next column to the left that has something to borrow from. Once you borrow a one from a column farther to the left, add it to the zero, making that column equal 10. Now you can borrow from the 10 and continue as before.



Let's Practice

Subtract these numbers.

1. a. 567 − 122

b. 1,266 − 63

c. 44,981 − 2,731

d. 959 − 848

e. 34,621 − 830

f. 300 − 176

g. 8,032 − 1,034

h. 29,588 − 790

2. Line these numbers up by place value and then subtract them.

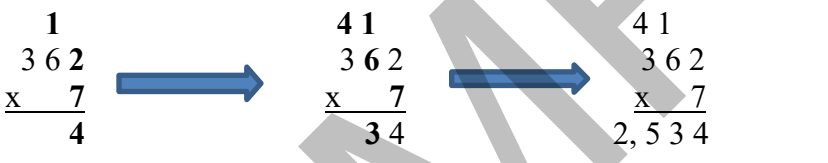
a. 5,679 – 442 =

b. 284,046 – 3,872 =

Day 4: Multiplication

In multiplication, the numbers being multiplied are called the **factors** and the answer is called the **product**. Multiplication is just a fast way of doing addition. For example, 3 x 5 is the same as saying add five 3's together: 3 x 5 = 3 + 3 + 3 + 3 + 3. Multiplication can be expressed in three ways. The most common, and probably the most familiar to you, is the x. (Example: 4 x 6) In Pre-Algebra you will learn about variables, which include the letter x. It can get confusing, then, if you have an expression that contains an x for multiplication and an x for a variable. (Example: x x 5) So, we can use the second way of expressing multiplication, a · . (Example: 7 · 8) One last way that is often used in Algebra is to use parentheses without any additional operator. (Example: (9)(3))

When you want to multiply numbers that are larger than one digit, you need to put the numbers in columns, lining up the ones places. (Is this starting to sound familiar?) First, multiply the two numbers in the ones places. Put the ones digit of the answer under the ones digits of the factors and carry the other digits. Then multiply the tens digit of the top number with the bottom number. Add to that anything that you carried. Put the ones digit of that answer down in the next available place in the answer and carry the other digits to the next number to be multiplied. Continue until you have multiplied all digits.



7 x 2 = 14
Put the 4 in the ones place and carry the 1.

7 x 6 = 42
42 + 1 = 43
Put the 3 in the tens place and carry the 4.

7 x 3 = 21
21 + 4 = 25
Put the 25 in the next places.

Let's Practice

1. Multiply these numbers.

a.	b.	c.	d.	e.
544 x 7	309 x 3	1,395 x 5	4,129 x 4	239 x 2
f.	**g.**	**h.**	**i.**	**j.**
56,024 x 6	2,113 x 8	39,276 x 1	9,377 x 9	8,485 x 5

2. Multiply these numbers. Remember to rewrite them in columns lining up the ones digits of each number.

a. 32 x 5 =

b. 721 x 3 =

c. 4,003 x 4 =

d. 3,658 x 6 =

e. 764 x 2 =

Day 5: Division

In a division problem, the number being divided, usually the first number, is called the **dividend**; the number being divided by, usually the second number is called the **divisor**; and the answer is called the **quotient**. Division can be expressed three ways: ÷, /, or ⟌. All three mean the same thing.

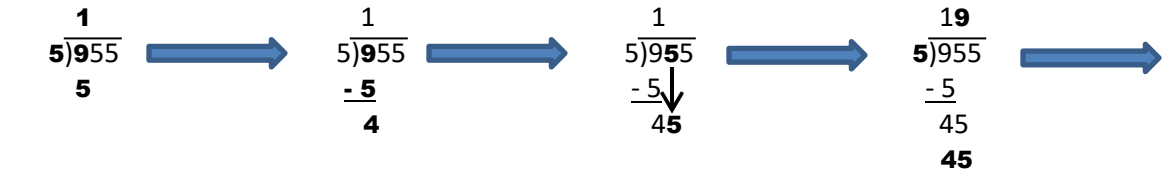
$$12 \div 3 = 12/3 = \frac{12}{3} = 3\overline{)12}$$

When working with large numbers, you need to use long division. Unlike the other operations we've worked on, long division starts with the digit(s) in the highest place value positions and works down to the ones place. Long division requires repeating several steps until you reach the digit in the last place. To begin, you need to write the division problem in the format that uses this symbol ⟌.

$$950 \div 5 = 5\overline{)950}$$

The next step is to determine how many times the divisor can go into the farthest digit to the left of the dividend. Place this number above the digit in the dividend, then multiply the divisor by this digit and place the answer to that under the dividend. Next, subtract that number from the first digit of the dividend and place that number underneath.

Now, bring down the next digit of the dividend. Start this process over, using these same steps, but now the "dividend" that you're dividing into is the number on the bottom of your division problem. To help you remember these steps, keep these symbols in mind: ÷, x, -, ↓. Continue this process until the last digit has been carried down and divided out.

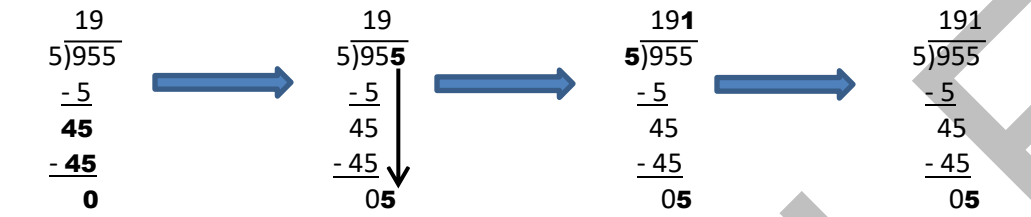


The most 5's you can get out of 9 is 1.
5 x 1 = 5

9 – 5 = 4

Bring down the next digit.

The most 5's you can get out of 45 is 9.
5 x 9 = 45



45 – 45 = 0

Bring down the next digit.

The most 5's you can get out of 5 is 1.
5 x 1 = 5

5 – 5 = 0

For today, we are only going to work with problems that end up without a remainder. Later we will tackle those "sticky" problems that don't divide out equally.

Let's Practice

1. Divide these numbers.

a. $4\overline{)644}$ b. $3\overline{)9{,}036}$ c. $2\overline{)9{,}934}$ d. $9\overline{)999}$ e. $8\overline{)936}$

f. $7\overline{)945}$ g. $5\overline{)8{,}120}$ h. $6\overline{)942}$ i. $4\overline{)932}$ j. $2\overline{)7{,}792}$

(Happy Friday. There is no #2 today.)