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Multiplicative Patterns on the Place Value Chart Guide Notes

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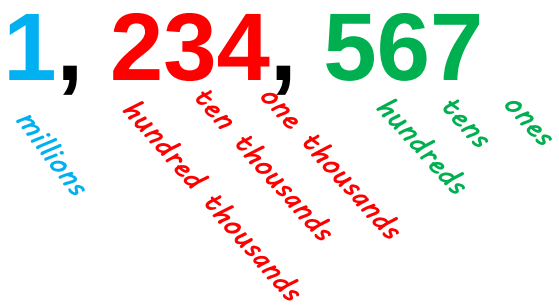
Place Value System

All numbers are made up of **digits** from **1** to **9**. Each of these digits has its place and value. The **place value** of a particular digit relies on its position. The last digit starts with ones, the next would be tens, and so on as can be seen below.



The place of a digit is **10 times bigger** than the place value of the **digit to its right**. For example, the place value of 4 in the picture is ten times bigger than that of 5.

Example 1:

Hundreds = 10 x Tens

One thousands = 10 x Hundreds

Similarly, the place of a digit is **10 times smaller or 1/10** than the place value of the **digit to its left**. For example, the place value of 3 in the picture is 1/10 than that of 2.

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Example 2:

Thousands = 1/10 x Ten Thousands

Hundred Thousands = 1/10 x Millions

Sample Problem 1:

Determine whether the place value of 4 is ten times **smaller or bigger** than the place value of 6.

a. 123, 465
b. 64, 389
c. 154, 678

Sample Problem 2:

Complete the sentences to make them true.

a. Hundreds = _____ Tens
b. Ten Thousands = _____ Hundred Thousands
c. Thousands = _____ Hundreds

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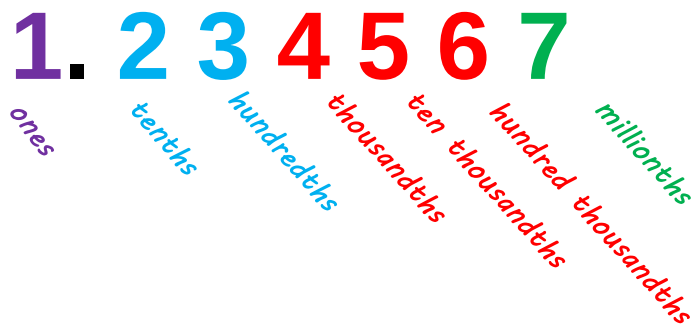
Multiplicative Patterns on the Place Value Chart Guide Notes

Math 5

Decimal Place Values

Decimals is expressed in the form of whole number then a dot and followed by one or more digits representing the decimal places. The decimal places also represent the digits' places as shown below.



Value of Digits Based on their Place Values

We can read and write out a particular digits' exact value by locating its place value.

Example:

To find the value of **3** in **35 467**, first locate the place value of **3**. In this case, it's **ten thousands**. Hence, the value of **3** is **3 ten thousands** **or** **30 thousands**.

Using the same idea, the value of **4** in **23.647** is **4 hundredths**.

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Sample Problem 3:

Determine the value of 5 from given the numbers below.

a. 156.78
b. 20.865
c. 45 678.92
d. 2.386759

Place Value Charts

Using place value charts make it easier to know the place values of all the given digits.

The chart below shows the place value chart for whole numbers from ones to millions. The values of the digits can also be found by multiplying the digit to its place value.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
1,000,000	100,000	10,000	1, 000	100	10	1

For example, the digits of **405 789** can be filled in the table as shown below.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
	4	0	5	7	8	9

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A similar place value chart shown below can be made for numbers with decimal places.

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
100	10	1	.	1/10	1/100	1/100

This means that for 309.16, we can fill in the place value chart shown below.

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
3	0	9	.	1	6	0

Sample Problem 4:

Fill in the place value chart below for the following numbers.

1.

	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
23,467							
3, 067, 128							
145, 398							

2.

	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
12.507							
3.14							
225.079							

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Math 5

Multiplying and Dividing Numbers by 10, 100, and 1000

Multiplying and dividing numbers by 10, 100, and 1 000 can be easily done by moving the place values of the digits to the left or right, depending on the operation.

Observe the three numbers **1.567**, **15.67**, and **156.7**. If we place each of the digits on a place value chart, we'll have the following.

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
		1	.	5	6	7
	1	5	.	6	7	
1	5	6	.	7		

Notice that as the digits move one place to left, the value increases ten times.

This means that we have:

$$15.67 = 1.567 \times 10$$

$$156.7 = 1.567 \times 100$$

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Using the same idea, we can easily divide numbers by 10 by moving the digits' decimal place one step to the right.

Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
2	4	6	.	8		
	2	4	.	6	8	
		2	.	4	6	8

Using 246.8, see what happens as 24.68, and 2.468 are divided by 10 and 100 respectively.

$$24.68 = 246.8 \div 10$$

$$2.468 = 246.8 \div 100$$

Sample Problem 5:

Move the place values of the digits to solve the following problems.

1. 21.034 x 100 =

2. 456.089 x 10=

3. 137.48 ÷ 10 =

4. 9105.123 ÷ 100 =

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Multiplicative Patterns on the Place Value Chart Guide Notes

Math 5

Powers of 10

Recall that we have

$$10^1 = 10 \times 1 = 10$$

$$10^2 = 10 \times 10 = 100$$

$$10^3 = 10 \times 10 \times 10 = 1000$$

This pattern continues for powers of 10. As a matter of fact, if we need to multiply 10 n times to itself, we'll have

$$\underbrace{10 \times 10 \times 10 \times \ldots \times 10}_{\text{There are n 10's here.}} = \underbrace{100000\ldots000}_{\text{n zeroes}} = 10^n$$

Multiplying and Dividing Numbers by a Power of Ten

Using our knowledge about powers of ten, we can multiply and divide numbers (both whole numbers and those with decimals) by moving the place values of the numbers.

Move the places to the right depending on power of 10 or the number of zeroes present.

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Example:

$$348 \times 1\ 000$$

For whole numbers, we start moving starting from the ones place. Since $1\ 000 = 10^3$ and has three zeroes, we move three places from 8 to the right.

$348 \times 1\ 000$

	3	4	8	0	0	0

=

This means that $348 \times 1\ 000 = 348\ 000$. The same process can be performed when multiplying decimals by a power of ten.

Example:

$$234.56 \times 100$$

Start from the decimal point this time when moving the place values. Place the decimal point to its new position after moving.

Since $100 = 10^2$ or has two zeroes present, we move the decimal point two places to the right.

$23.456 \times 100 =$

2	3	.	4	5	6	

This gives us $23.456 \times 100 = 2345.6$ now.

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Use the same process when dividing numbers by powers of ten. The only difference is to **move the place values to the left** instead.

Examples:

33 548 ÷ 10 000 =

3	3	5	4	8

This means that **33 548 ÷ 10 000 = 3.3458**

346 789.45 ÷ 100 000 =

3	4	6	7	8	9	.	4	5

while, **346 789.45 ÷ 100 000 = 3.4678945**

Sample Problem 6:

Find the product or quotient of the following by moving the decimal places, left or right.

1. 5.17895 x 10 000 =
2. 30.348 x 1 000 =
3. 56 374.8 ÷ 10 000 =
4. 4 572 394.23 ÷ 10 000 =

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Multiplicative Patterns on the Place Value Chart Guide Notes

Math 5

Fractions with Denominators as Powers of Ten

Changing fractions (with denominators as powers of ten) to decimals can be done easily by moving the place values of the digits as we have done in the previous section.

Remember that given a fraction, $\frac{A}{B}$ we can express it as A ÷ B to find its decimal counterpart.

So, if B (the denominator) is a power of ten, we can simply move the decimal places to the left, as many times as the number of zeros the denominator has.

Example:

$$\frac{45\,678}{100} = 45\,678 \div 100$$

$$= 456.78$$

Sample Problem 7:

Change the following fractions to decimals.

1. $\frac{34\,567}{100} =$

2. $\frac{5\,433}{1\,000} =$

3. $\frac{4\,334\,098}{10\,000} =$

4. $\frac{9\,823\,743}{100\,000} =$