Decimals

A decimal represents part of a number. Since the number system we use is base 10, we call this representation decimal (Latin decim = a tenth). With money we use 2 decimal places, these are “the parts of a dollar” or cents.

Place Values

Name	Thousands	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths	Ten Thousandths
Digit placement	5	2	4	5	.	1	5	3	7
Fractional Equivalent	5, 000	200	40	$\frac{5}{1}$	“and”	$\frac{1}{10}$	$\frac{5}{100}$	$\frac{3}{1000}$	$\frac{7}{10,000}$

Example:
$3.20 = 3 dollars & 20 cents the .2 is a tenths unit (2 dimes), written as a fraction is $\frac{20}{100}$

& should be reduced to 1/5.

Writing a decimal in words:

1) Write the whole-number part in words.
2) Write “and” for the decimal point.
3) Write the decimal part in words as though it were a whole number, followed by the place value of the last digit.

Writing a decimal from words, into standard form:

1) Write the whole number part, remember to insert 0s before the decimal to fill in empty places
2) Put the decimal in the proper place.
3) Write the decimal part, putting 0s in after the decimal to fill in empty places.

Writing decimals as a fraction:

1) Place the number to the right of the decimal over its place value.
2) Reduce as necessary.

Examples:

$$.4 \xrightarrow{\text{place value is tenths}} \frac{4}{10} \xrightarrow{\text{common factor of 2}} \frac{2}{5}$$

$$.0327 \xrightarrow{\text{place value is ten thousandths}} \frac{327}{10000}$$

Writing a fraction as a decimal: There are 2 methods; sometimes 1 method is easier than the other. Method 1 always works relatively easily.

Method 1: Divide the denominator into the numerator, since the fraction line means divide by the number below.

Method 2: Change to the equivalent fraction with a power of 10 on the bottom.

Examples $\frac{2}{3}, \frac{7}{20}, \frac{90}{12}$

Method 1, division:	Method 2, equivalent fractions:
$\frac{2}{3} \rightarrow$ .666… 3) 2.000 -18 20 -18 20 -18 2	$\frac{2}{3} \rightarrow$ ugly, 3 does not go evenly into any power of 10
$\frac{7}{20} \rightarrow$ .35 20) 7.00 - 60 100 -100 0	$\frac{7}{20} \rightarrow \frac{7*5}{20*5} \rightarrow \frac{35}{100} \rightarrow .35$
$\frac{90}{12} \rightarrow$ 7.5 12) 90.0 - 84 60 - 60 0	$\frac{90}{12} \rightarrow \frac{3*30}{3*4} \rightarrow \frac{30}{4} \rightarrow$ $\frac{30*25}{4*25} \rightarrow \frac{750}{100} \rightarrow 7.50$

Comparing Decimals:

Just like comparing whole numbers we compare the digits from each number from left to right. If the digits of the same place value are the same we move to the next place value & compare until we reach a place value with different digits. It may be necessary to add 0s after the last decimal place as a place holder so the 2 numbers have the same number of digits.

Comparing Decimals with Fractions:

Convert the decimal to a fraction or the fraction to a decimal then compare appropriately.

Rounding Decimals:

Just like whole numbers, look at the digit to the right of the place value you wish to round to. If that digit is 5 or greater, the place value goes up one & the following numbers turn to zero. If the digit to the right of the place value is less than 5 turn it & the ones following to 0s. Zeros at the end of a decimal are just place holders and do not need to be written for this class.

Adding & Subtracting Decimals:

1) Write the decimals so that the decimal points line up vertically.
2) Add or subtract as for whole numbers.
3) Place the decimal point in the sum or difference so that it lines up vertically with the decimal points in the problem.

Reminders: a whole number has the decimal at the end, 0s can be placed after the last decimal place value so the numbers have the same number of decimal places.

Examples:

3.245	54.0600
+23.86	- 2.1234
27.105	51.9366

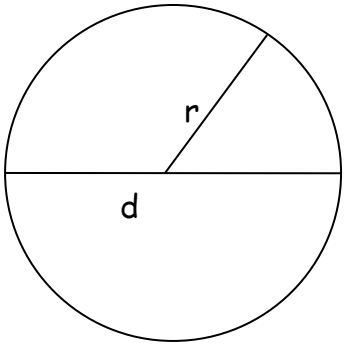
Multiplying Decimals

1) Multiply the decimals as though they were whole numbers.
2) The decimal point in the product is placed so the number of decimal places in the product is equal to the ***sum*** of the number of decimal places in the factors.

Shortcuts with Powers of 10

(10, 100, 1000, …) Move the decimal point to the ***right*** the same number of places as there are ***zeros*** in the power of 10.

(.1, .01, .001, …) Move the decimal point to the ***left*** the same number of places as there are ***decimal places*** in the power of 10.



The circumference of a circle is the length around the circle. It is calculated using π, we often use the diameter, d, but since the radius, r, is .5d (one half the diameter) we can also write it that way.

$C = \pi d$ or $C = 2\pi r$

Examples:

3.1415	2.36	156
x 5	x 100	x .001
15.7075	236.00	0.156

Dividing Decimals:

1) Move the decimal point in the divisor to the right until the divisor is a whole number.
2) Move the decimal point in the dividend to the right the ***same number of places*** as the decimal point was moved in Step 1.
3) Divide. Place the decimal point in the quotient directly over the moved decimal point in the dividend.
    a) If necessary place zeros at the end of the dividend to continue dividing.

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Examples:
2.36 ÷ 100 = .0236 156 ÷ .001 = 156000

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      26.17580...
1.24) 32.458000
    - 24 8
      7 65
    - 7 44
      218
    - 124
      940
    - 868
      720
        ...
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Normally you continue with your division until you come to the end, or to the appropriate Significant Digit. In this case we went for a few extra digits, now we will round to the nearest 100^{th}. The quotient is 26.17580…, to the nearest hundredth it is 26.18.

Significant Digit*: is the largest of the smallest place values that we know to be accurate, 0 place holders are not included.* In this case we had 1.24 & 32.458, the 4 in 1.24 is in the hundredths place value & the 8 in the 32.458 is in the thousandths place value, so the hundredths place value is the significant digit.

Some Applications
The mean, the median, and the mode are called **measures of central tendency**. They describe a set of data, or a set of numbers, by a single "middle" number.
The **mean (average)** of a set of number items is the sum of the items divided by the number of items.

The **median** of an ***ordered set*** of numbers is the middle number. If the number of items is even, the median is the mean (average) of the two middle numbers.

The **mode** of a set of numbers is the number that occurs most often. (It is possible for a set of numbers to have more than one mode or to have no mode.)

Example:
Mean: (1 + 2 + 3 + 3 + 3 + 4 + 4 + 6 + 8 + 9 + 12)/11 → 55/11 → 5
Median: 1, 2, 3, 3, 3, 4, 4, 6, 8, 9, 12 → 4
Mode: 1, 2, 3, 3, 3, 4, 4, 6, 8, 9, 12 → 3

To calculate a **weighted average** (used for GPA); use a table similar to the following:

Course(optional)	Letter Grade(optional)	Value of Grade	Credit Hours	Value x Credit Hours
Computers & Problem Solving	B+		3.0	
Calculus II	B		4.0	
Discrete Methods	C+		3.0	
Religions of the East	A		3.0	
Russian II	B		3.0	
Total				

$$\text{GPA} = \frac{\text{Total of Value x Credit Hours}}{\text{Total Credit Hours}}$$

Normal Value for Grades
A 4.0
B 3.0
C 2.0
D 1.0
F 0
If + only is used the the + value adds a .5, so a B+ is 3.5.
If a + & - is used check to see how they break it down (not common).