Working with Decimals

Addition w/decimals

Suppose that we want to determine the following sum:

$$23.001 + 0.9 + 120.12 + 0.05$$

We begin by arranging the entries (addends) in a column, being careful to ***align all decimal points!*** That is, $23.001 + 0.9 + 120.12 + 0.05$ becomes:

$$
\begin{array}{r}
23.001 \\
0.9 \\
120.12 \\
+\quad 0.05 \\
\hline
\end{array}
$$

You may find it helpful to tack on some zeros, like so…

$$
\begin{array}{r}
23.001 \\
0.900 \\
120.120 \\
+\quad 0.050 \\
\hline
\end{array}
$$

…to help you keep track of place values, but it is not necessary. Next, merely add the entries in each column—like you usually would. In your sum, be sure to place the decimal point such that it lines up perfectly with the addends' decimals.

```
      1
   23.001
    0.900
  120.120
+   0.050
  ───────
  144.071
```

Subtraction with Decimals

Suppose that we want to solve the following subtraction problem:

$$42.7 - 0.036$$

As in addition, we begin by arranging the minuend (42.7) and the subtrahend (0.036) in columns, being careful to align the decimals—like so:

```
  42.7
− 0.036
───────
```

We can add zeros, if we want, to 42.7 without changing its value. Doing so may help us avoid making errors.

```
  42.700
− 0.036
───────
```

Next, we subtract the columns as we usually would, borrowing when necessary. Be careful to place your answer's (the difference's) decimal point such that it is aligned perfectly with the decimals of the minuend and subtrahend.

```
      6 9 10
  42.700
 − 0.036
 ───────
  42.664
```

-

Multiplication with Decimals

Suppose that we want to determine the product of 36.1 and 0.015 (i.e., we want to find 36.1 x 0.015). *Note: 36.1 and 0.015 are factors, whereas the answer we get when we multiply them is the product.* We begin by arranging the factors in columns, **but we do not need to line up the decimals!**

```
    36.1
  x0.015
  ──────
```

Next, multiply as usual.

```
    36.1
  x0.015
  ──────
    1805
    3610
  ──────
    5415
```

Careful—we're not done yet! Next, we need to count the total number of decimal places in our problem's factors—in our example, there are 4 decimal places. Then, working from right-to-left, we need to count 4 decimal places in our product and add a decimal, as so…

$$
\begin{array}{r}
36.1 \\
\times\,0.015 \\
\hline
1805 \\
3610 \\
\hline
.5415
\end{array}
$$

Division with Decimals

Suppose that we want to solve the following division problem:

$$2.5\overline{)36.405}$$

Because our divisor, 2.5, has one decimal place in it, we must move the divisor's (2.5) decimal one place to the right and the dividend's (36.405) decimal one place to the right as well. This will change the divisor into a whole number.

$$25\overline{)364.05}$$

Next, place a decimal on top of the division symbol—*directly over top of the dividend's decimal point.*

$$25\overline{)364.05}$$

Next, divide as usual, being careful to keep each column aligned perfectly. Most division errors, in my opinion, are caused by failure align the columns nicely.

```
         14.562
25)364.05
    25
    114
    100
        3 10
    14 0
    125
      155
      150
       50
       50
        0
```

Note: remember that sometimes the answer (quotient) does not terminate, in which case you will need to round it to some suitable place value.