Decimals

Why do we need decimals?

- Decimals give a statement of the accuracy of measurement
- They are convenient to show relative size

What is the difference between 3.2 and 3.20?

- 3.2 indicates a level of accuracy of $\frac{1}{10}$, i.e. 3.2 is between 3.15 and 3.24
- 3.20 indicates a level of accuracy of $\frac{1}{100}$, i.e 3.20 it is between 3.150 and 3.249

Why is $312 > 289$?

To answer the question we need to understand the place value system.

hundreds	Tens	Units
3	1	2

hundreds	Tens	Units
2	8	9

Because the $3 > 2$ in the hundreds, $312 > 289$

A common misconception with decimals is that students see the number with the most digits as the largest number. E.g $2.127 \ngtr 3.2$

It is essential that students fully understand the place value system.

The size of a decimal is determined by the size of its digits, on a sliding scale, from left to right.

hundreds	tens	units	.	tenths	hundredths

Write the following decimals in order of size: 3.214, 3.09, and 3.8.

3.214

Three units	**two tenths or $\frac{2}{10}$**	**one hundredth or $\frac{1}{100}$**	**four thousandths or $\frac{4}{1000}$**

3.214= $3 + \frac{2}{10} + \frac{1}{100} + \frac{4}{1000}$

3.09

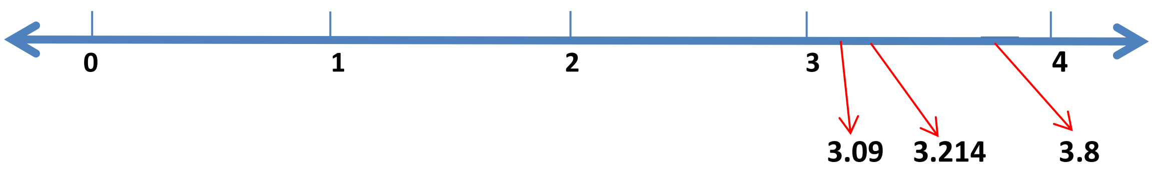
Three units	**zero tenths or $\frac{0}{10}$**	**nine hundredths or $\frac{9}{100}$**

3.09= $3 + \frac{0}{10} + \frac{9}{100}$

3.8

Three units	**eight tenths or $\frac{8}{10}$**

3.8 = $3 + \frac{8}{10}$



Written in order of size, from smallest to largest are: 3.09, 3.214, 3.8

Adding and Subtracting Decimals

Simplify 0.5 + 1.34

```
  O.50
+ 1.34
  1.84
```

In this example we've obeyed the rule of adding like terms to like terms.

How do we know which terms are the like terms?

Simplify the following: 0.8 - 0.008

```
 0.800
-0.008
 0.792
```

What is the value of the 8 in 0.8?

What is the value of the 8 in 0.008?

Note

Addition and subtraction of decimals is similar to that of fractions in that we add the numbers with the same denominator. (i.e. like terms to like terms)

e.g. $\frac{1}{10} + \frac{1}{10} = \frac{2}{10}$**, which is equivalent to** $\frac{1}{5}$**.**

Also, 0.1 + 0.1 =

```
  0.1
+ 0.1
  0.2
```

Algebraic fractions are also added and subtracted in the same manner as fractions and decimals. (i.e. like terms to like terms)

Multiplying Decimals

Estimate → **Calculate** → **Check**

Example: 34.5 × 20.5

Estimate

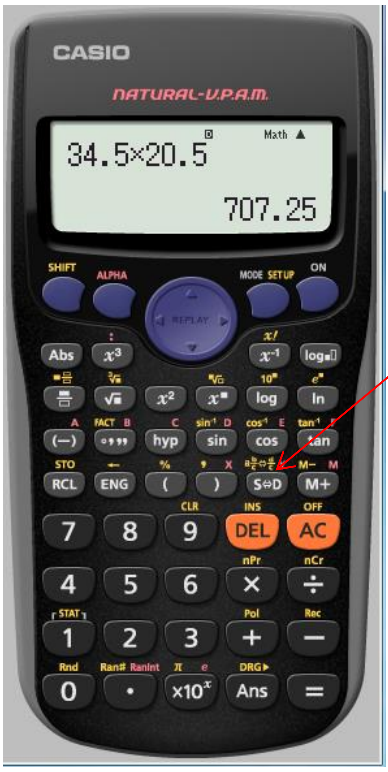
2 times 35 is 70, so 20 times 35 is 700. A reasonable estimate of the answer is 700.

Calculate

```
  34.5
 ×20.5
  1725
 69000
707.25
```

The common problem with multiplication in decimals is where to place the decimal point. If the original estimate is accurate this should inform the decision. In this case the point goes between the 7 and the 2, giving each digit the correct value.

Check



On the calculator insert:

| 34 | . | 5 | x | 20 | . | 5 | = |

| S⇔D |

Division of Decimals

Estimate → **Calculate** → **Check**

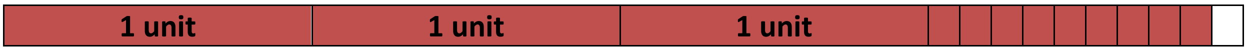
Divide 3.9 by 0.7

Estimate

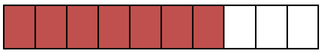
By rounding to the nearest whole number, 4 ÷ 1 = 4. A reasonable estimate to the answer is 4.

Estimation will not always give a very accurate result

Calculate



1 + 1 + 1 + 0.9 = 3.9



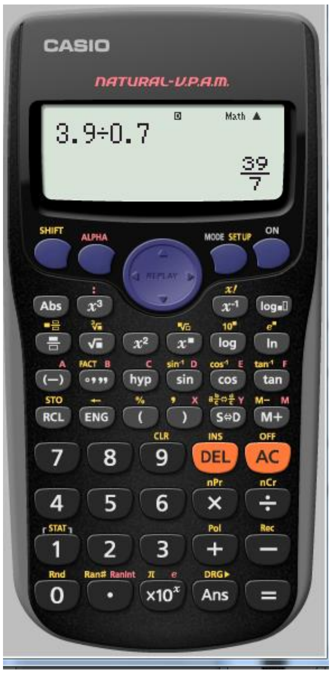
0.7

3.9 ÷ 0.7

39 ÷ 7 = $\frac{39}{7}$ **=** $5\frac{4}{7}$

To divide by a decimal we bring the divisor to a whole number. In this example we multiply 0.7 by 10. To keep the calculation equal to what is asked we must also multiply 3.9 by 10.

Check



3 . 9 ÷ 0 . 7 =

Avoid common misconceptions:

Division does not always make a number smaller

Also

Multiplication does not always make a number bigger

e.g. 6 × 0.5 = ?