Short Division

Prior Knowledge:

- Times tables.
- Division with remainders.

Division is one of the four basic operations of arithmetic. To divide is to share, or group, a number into equal parts. For very simple divisions, we can use sharing or grouping. For example:

10 ÷ 2: | | | | | | | | | | (10 parts)

 (shared into groups of 2)

There are 5 groups, so we can say that 10 ÷ 2 = 5. However, when we are dividing larger numbers, it can be worth using the written division method known as the bus-stop method. It's called the bus-stop method because the numbers are placed within a structure made of a horizontal line and a vertical line, like the back and the roof of a bus shelter:

Example 1

Calculate 135 ÷ 5.

To divide 135 by 5, place the numbers into the frame like this:

$$5 \overline{)\ 1\ \ 3\ \ 5}$$

We work from left to right when performing written division, unlike when we use column subtraction, addition and multiplication.

To begin with, we must work out the answer to 1 ÷ 5, or how many 5s go into 1. 0 remainder 1 is the answer.

Write the 0 above the 1. The remainder, 1, goes in front of the next digit, 3, making it 13.

$$\begin{array}{r} 0 \\ 5 \overline{)\ 1\ \ {}^{1}3\ \ 5} \end{array}$$

Now we need to know how many 5s there are in 13, or 13 ÷ 5. The answer is 2 remainder 3. We place the 2 above the 3, attaching the remainder 3 to the next digit, 5, making it 35.

$$\begin{array}{r} 0\ \ 2 \\ 5 \overline{)\ 1\ \ {}^{1}3\ \ {}^{3}5} \end{array}$$

Finally, 35 ÷ 5 = 7.

$$\begin{array}{r} 0\ \ 2\ \ 7 \\ 5 \overline{)\ 1\ \ {}^{1}3\ \ {}^{3}5} \end{array}$$

135 ÷ 5 = **27**

BEYOND MATHS

Example 2

Calculate 150 ÷ 4.

Begin by placing the numbers into the frame:

$$4 \overline{)\ 1\ \ 5\ \ 0}$$

Working from left to right, begin with 1 ÷ 4, which is 0 remainder 1. Remember, we write the 0 above the 1 and the remainder 1 attaches itself to the next digit, 5, which makes it 15.

$$\begin{array}{r} \ \ 0 \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ 0} \end{array}$$

Next, calculate 15 ÷ 4, which is 3 remainder 3.

$$\begin{array}{r} \ \ 0\ \ 3 \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0} \end{array}$$

30 ÷ 4 = 7 remainder 2.

$$\begin{array}{r} \ \ 0\ \ 3\ \ 7 \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0} \end{array}$$

This time, we have reached the end of the digits but still have a remainder of 2. We could simply write 'r2' to indicate a remainder of 2 but, while expressing the remainder in this way can be useful in some questions, it is more accurate to write the answer as a fraction or as a decimal.

If we were to write the answer as a decimal, we would do this as follows:

1. Add a decimal point following your numbers, top and bottom:

$$\begin{array}{r} \ \ 0\ \ 3\ \ 7\ . \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0\ .} \end{array}$$

2. Place a 0 after the decimal point in the frame:

$$\begin{array}{r} \ \ 0\ \ 3\ \ 7\ . \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0\ .\ 0} \end{array}$$

3. Now attach the remainder (which in this case is 2) to the 0:

$$\begin{array}{r} \ \ 0\ \ 3\ \ 7\ . \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0\ .\ {}^{2}0} \end{array}$$

4. Now complete the division, 20 ÷ 4.

$$\begin{array}{r} \ \ 0\ \ 3\ \ 7\ .\ 5 \\ 4 \overline{)\ 1\ \ {}^{1}5\ \ {}^{3}0\ .\ {}^{2}0} \end{array}$$

150 ÷ 4 = **37.5**

To write our answer as a fraction, we would take our answer so far, 37, and follow it with a fraction with our remainder, 2, as the numerator and the number we are dividing by, 4, as the denominator. We could then cancel down our fraction:

150 ÷ 4 = $\mathbf{37\ \frac{2}{4}}$

150 ÷ 4 = $\mathbf{37\ \frac{1}{2}}$

Example 3

We can use the bus-stop method when dividing a decimal by a whole number.

Let's consider the calculation 5.2 ÷ 2.

Place the numbers in the frame, taking care to line up the decimal points.

$$\begin{array}{c|lll} & & . & \\ \cline{2-4} 2 & 5 & . & 2 \end{array}$$

Now, we can carry out the division like in other examples:

$$\begin{array}{c|lll} & 2 & . & \\ \cline{2-4} 2 & 5 & . & {}^{1}2 \end{array}$$

$$\begin{array}{c|lll} & 2 & . & 6 \\ \cline{2-4} 2 & 5 & . & {}^{1}2 \end{array}$$

5.2 ÷ 2 = **2.6**

Example 4

Calculate 1 ÷ 8.

Place the numbers in the frame:

$$\begin{array}{c|l} & \\ \cline{2-2} 8 & 1 \end{array}$$

As we can see, the number on the outside of the frame is larger than the one on the inside; however, if we were to add a decimal point and a 0 into the frame, this will allow us to continue the calculation.

$$\begin{array}{c|lll} & & . & \\ \cline{2-4} 8 & 1 & . & 0 \end{array}$$

$$\begin{array}{c|lll} & 0 & . & \\ \cline{2-4} 8 & 1 & . & {}^{1}0 \end{array}$$

$$\begin{array}{c|lll} & 0 & . & 1 \\ \cline{2-4} 8 & 1 & . & {}^{1}0 \end{array}$$

As we still have a remainder, 2, add another 0 into the frame:

$$\begin{array}{c|llll} & 0 & . & 1 & \\ \cline{2-5} 8 & 1 & . & {}^{1}0 & 0 \end{array}$$

$$\begin{array}{c|llll} & 0 & . & 1 & 2 \\ \cline{2-5} 8 & 1 & . & {}^{1}0 & {}^{2}0 \end{array}$$

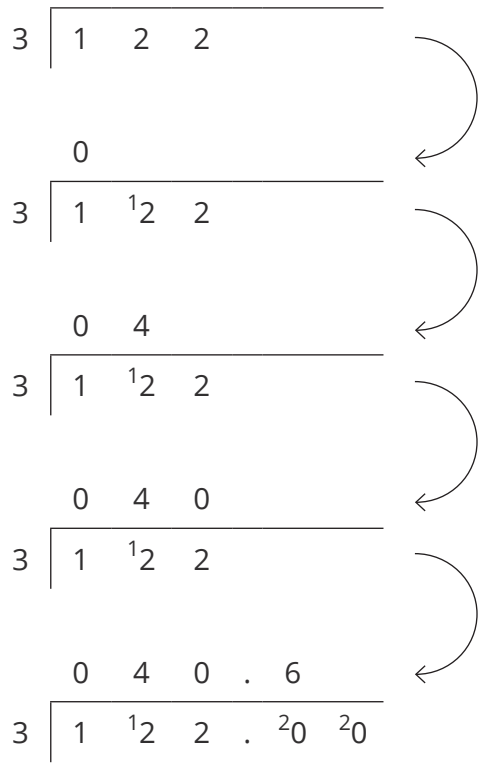
$$\begin{array}{c|lllll} & 0 & . & 1 & 2 & 5 \\ \cline{2-6} 8 & 1 & . & {}^{1}0 & {}^{2}0 & {}^{4}0 \end{array}$$

1 ÷ 8 = **0.125**

Example 5

Sometimes, there might be a recurring answer:

122 ÷ 3



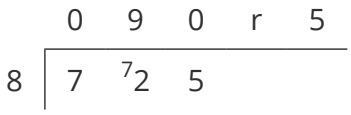
The remainder will continue to be 2, therefore the answer is recurring. We could write the remainder as a decimal: **$40.\dot{6}$**.

Or, we could write the remainder as a fraction. As before, use the remainder as the numerator (in this case, 2), and the value you are dividing by as the denominator (in this case, 3): **$40\frac{2}{3}$**.

Example 6

At a conference there are 725 people. Each table seats 8 people. How many whole tables are needed to seat everyone?

This question is asking how many times 8 fits into 725, or 725 ÷ 8.



Here we have a remainder of 5. In this example, writing the answer as a decimal or fraction isn't particularly beneficial. The remainder of 5 tells us that if there were 90 tables, then 5 people would be unseated. As we are being asked to find out the number of **whole** tables needed, **91** tables are needed to seat all 725 people.

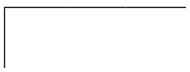
Your Turn

1. Calculate the following:

a. 675 ÷ 5

b. 186 ÷ 6

c. 244 ÷ 4



d. 156 ÷ 12

e. 126 ÷ 7

f. 256 ÷ 8

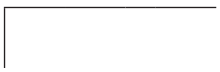
g. 1580 ÷ 4

h. 432 ÷ 16

2. Calculate the following:

a. 7.2 ÷ 2

b. 14.8 ÷ 4



c. 2.5 ÷ 5

d. 136.2 ÷ 6

e. 4.2 ÷ 3

f. 175.5 ÷ 15

g. 96.8 ÷ 4

h. 120.8 ÷ 8

3. Calculate the following, writing the remainders as decimals and fractions.

a. 276 ÷ 5

b. 146 ÷ 8

c. 570 ÷ 4

d. 268 ÷ 8

e. 474 ÷ 12

f. 2658 ÷ 5

g. 1505 ÷ 8

h. 332 ÷ 3

4. Calculate the following, writing the remainders as decimals.

a. 4.1 ÷ 5

b. 18.2 ÷ 4

c. 26.3 ÷ 4

d. 150.45 ÷ 8

e. 254.68 ÷ 20

f. 78.5 ÷ 4

g. 3 ÷ 8

h. 6 ÷ 30

5. a. A box holds 6 eggs. How many boxes are needed to hold 228 eggs?

b. A spoon holds 5ml of medicine. How many spoons of medicine would you get from a 275ml bottle of medicine?

c. Elliott buys a pack of 24 cans of lemonade for £6. Calculate the cost of one can of lemonade.

d. A group of 5 friends share the cost of a taxi journey. The total price was £24.50. If the friends share the cost equally, how much should they each pay?

e. Nathaniel is paid £8 an hour. In one week, he is paid £326. How many hours did Nathaniel work?

f. 588 fans travel to a football match in coaches. If each coach holds 56 people, how many coaches are needed to transport all the fans?

Challenge

A sports shop has 23 boxes of tennis balls, each with 5 tennis balls. It also has 132 individual tennis balls. If the individual tennis balls were also put into boxes of 5, how many **full** boxes of tennis balls would there be altogether?