Lesson - Decimals and thousandths

Year: Year 5

Hello, I am Otto! Decimals are the numbers we use for prices, races, rulers and recipes. A decimal point separates the whole part of a number from the part that is smaller than one. In Year 5 you meet tenths, hundredths and thousandths, link them to fractions, compare and round decimals and multiply or divide them by 10, 100 and 1,000.

Starter activity

A sprinter runs 100 metres in 12.45 seconds. Her friend runs it in 12.5 seconds. Who is faster? Many people say 12.5 is smaller because 5 is smaller than 45. Think about it carefully while you read this lesson, then check your answer at the end of Example 3.

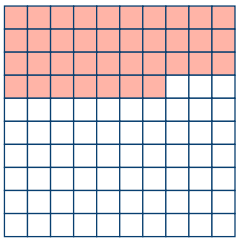
Tenths, hundredths and thousandths

Definition: decimal place

The digits after the decimal point are called **decimal places**. The first decimal place is **tenths**, the second is **hundredths** and the third is **thousandths**. Each column is ten times smaller than the column on its left.

Ones	.	Tenths	Hundredths	Thousandths
4	.	5	6	3

The chart shows 4.563. The digit 5 is worth 5 tenths (0.5), the 6 is worth 6 hundredths (0.06) and the 3 is worth 3 thousandths (0.003). We read it as "four point five six three". Never read the digits after the point as a whole number such as "five hundred and sixty-three".



This 10 by 10 grid is one whole split into 100 equal squares. Each square is one hundredth, 0.01. There are 37 squares shaded, so the shaded part is 0.37 or $\frac{37}{100}$. Each column of ten squares is one tenth, 0.1.

Key fact: dividing by 10

One tenth is 0.1. One tenth of a tenth is a hundredth, 0.01. One tenth of a hundredth is a thousandth, 0.001. There are 10 tenths in 1, 100 hundredths in 1 and 1,000 thousandths in 1.

Example 1

Write the value of the digit 8 in 6.287 and in 6.828.

In 6.287 the 8 is in the hundredths column, so it is worth 8 hundredths, **0.08**. In 6.828 the first 8 is in the tenths column, worth **0.8**, and the second 8 is in the thousandths column, worth **0.008**.

Decimals and fractions

Rule: decimals as fractions

A decimal with one decimal place is a fraction with denominator 10. With two decimal places the denominator is 100, and with three decimal places it is 1,000. So $0.7 = \frac{7}{10}$, $0.09 = \frac{9}{100}$ and $0.123 = \frac{123}{1000}$.

Method: writing a decimal as a simplified fraction

1. Count the decimal places to choose the denominator 10, 100 or 1,000.
2. Write the digits after the point as the numerator.
3. Find a common factor of the numerator and denominator.
4. Divide both by that factor until you cannot go further.

Example 2

Write 0.375 as a fraction in its simplest form.

There are three decimal places, so $0.375 = \frac{375}{1000}$. Divide top and bottom by 25 to get $\frac{15}{40}$, then by 5 to get $\frac{3}{8}$. So $0.375 = \frac{3}{8}$.

Key fact: fractions to know

$0.5 = \frac{1}{2}$, $0.25 = \frac{1}{4}$, $0.75 = \frac{3}{4}$, $0.2 = \frac{1}{5}$, $0.4 = \frac{2}{5}$, $0.8 = \frac{4}{5}$, $0.1 = \frac{1}{10}$, $0.01 = \frac{1}{100}$ and $0.001 = \frac{1}{1000}$. Learn them by heart, they appear everywhere in money and measures.

Comparing and ordering decimals

Method: comparing decimals

1. Compare the whole number parts first.
2. If they are equal, compare the tenths digits, then the hundredths and then the thousandths.
3. To make this easy, write zeros at the end so that every number has the same number of decimal places.

Example 3

Who was faster, the sprinter with 12.45 seconds or the one with 12.5 seconds?

Write 12.5 as 12.50. Both numbers have 12 whole seconds. Compare the tenths: 4 is less than 5, so 12.45 is less than 12.50. The smaller time is the faster runner, so the sprinter with **12.45 seconds is faster**. Adding a zero does not change the value of a decimal.

Watch out

A decimal with more digits is not always bigger! 0.35 is bigger than 0.305, even though 0.305 has more digits. Line up the decimal points or add zeros: 0.350 against 0.305. Remember too that 0.5 is the same as 0.50 and 0.500.

Rounding decimals

Rule: rounding decimals

To round to the nearest whole number, look at the **tenths** digit. To round to one decimal place, look at the **hundredths** digit. If the digit you look at is 5 or more, round up. If it is 4 or less, round down. Decimal places to the right of the one you keep are removed.

Example 4

Round 7.846 to the nearest whole number and to one decimal place.

Nearest whole number: the tenths digit is 8, so round up to **8**. One decimal place: the hundredths digit is 4, so round down and the answer is **7.8**.

Note

The symbol ≈ means "is approximately equal to". We write 7.846 ≈ 7.8 to one decimal place. A rounded value is only an estimate, but a very useful one when you check a long calculation.

Multiplying and dividing by 10, 100 and 1,000

Rule: moving the digits

When you multiply by 10, every digit moves **one place to the left**. For 100 the digits move two places, and for 1,000 they move three places. When you divide, the digits move to the right. The decimal point does not move, the digits do. Use a zero as a place holder when a column would be empty.

Example 5

Work out 3.45 × 100 and 3.45 ÷ 10.

For × 100 the digits move two places left: 3.45 becomes 345. For ÷ 10 they move one place right: 3.45 becomes **0.345**. So 3.45 × 100 = **345** and 3.45 ÷ 10 = **0.345**.

Example 6

A pencil costs £0.35. How much do 1,000 pencils cost? How much does one pencil cost if 100 pencils cost £28?

1,000 pencils: 0.35 × 1,000 = 350, so they cost **£350**. One pencil: £28 ÷ 100 = **£0.28** (28 pence).

Did you know?

Decimals were made popular by a Flemish mathematician, Simon Stevin, who wrote a small book about them in 1585. He wanted money, measures and weights to be easy to calculate with. The decimal point we use in Britain is a dot raised or on the line, but many countries in Europe use a comma instead.

Otto's tip

To compare decimals, always write extra zeros so that all the numbers have the same number of decimal places. Then you can ignore the point and compare them like whole numbers.