Grade : 5

Critical concept: Fractions and decimals

Curricular content

Decimal fractions to thousandths

Benchmarks of zero, half and whole

Equivalent fractions

Language

Decimals are a special type of fraction- they are always expressed as tenths, hundredths, thousandths etc. They can also be called decimal fractions. (Special type of fraction where the denominator is always 100)

Numerator :how many we have

Denominator: how many equal parts make up a whole

Fractions are made up of equal size pieces (shares of a whole)

**Important for naming decimals: 0.4 is said 4 tenths, not zero point four

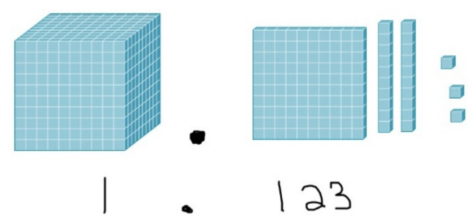
Factor: a number that when multiplied by another factor gives you a product.

Examples and Strategies

Start with a review of place value showing each place value is ten times larger/smaller than the column next to it.

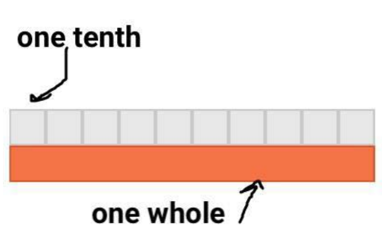
There are special manipulatives you can get that are built proportionally for decimals. (Decimal strips)
If you don’t have these, you can use the regular base ten blocks as shown below:

Name the cube “one”
The flats are then tenths
Rods are hundredths
Unit cubes are now thousandths



Build numbers using this model. Practice naming. Example 1.04 is one and 4 hundredths
1.205 is 1 and two hundred five thousandths

Linking decimals and fractions is easy to see when you use Cuisenaire rods
Model tenths using Cuisenaire rods as in the example below. Show that ten tenths is one whole.



Each of the grey/white is one tenth (because it takes ten to make a whole orange). You can show that one tenth is written 0.1 or $\frac{1}{10}$. Decimals are fractions written with a multiple of ten as a denominator. If you were to continue to put down white squares, you would have more than one whole orange rod; written as 1.1 or 1.2 etc depending on how many more white tenths you have than one whole.

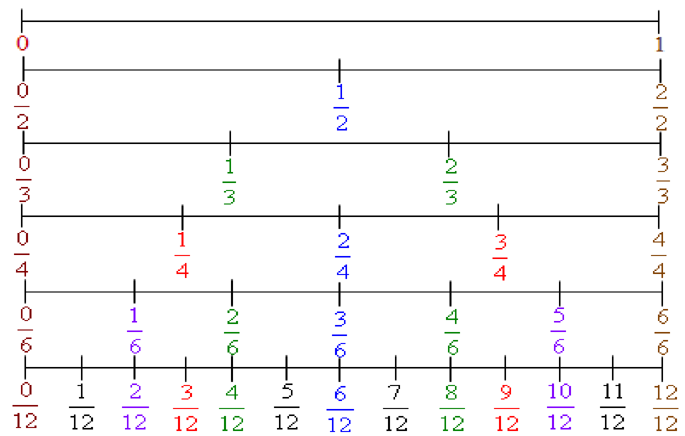
In addition to understanding the relative size of decimals, and knowing how to name decimal fractions, grade 5 students are required to do addition and subtraction with decimals to thousandths.

Equivalent fractions: represent the same amount, or same length, but the number of pieces is different

FRACTIONS
It is important to remember that fractions are really the first time that students will have seen a situation where the size of a “value or number” isn’t fixed. For example one-half can be a different size depending on the size of the whole. (refer to the grade 4 critical concept sheet for an explanation)

Benchmarks of zero, one half and one

Using a number line:



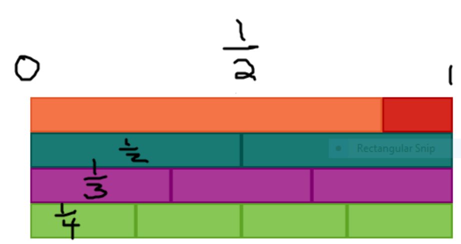
Start with a number line showing zero and one whole. It is important to emphasize that 1 means “one whole” and the values in between zero and one are when we only have a fraction, or parts, of one whole.

Dividing the number line first into half and marking the half way point will likely be easy for students to see.

Then divide the same number line into thirds, then fourths as shown in the diagram. What is essential for students to understand here is whether a given value is less than or more than half. Students can work toward being able to estimate how close to the whole, or half, a given value is.

It is not necessary to go all the way through to twelfths as shown in this diagram, but it may be useful for estimating purposes.

Benchmarks using Cuisenaire Rods



Create a “whole” – in the case of the example it is of length 12

Create trains of pieces of the same colour. In this example, dark green takes two pieces to make up the whole, meaning each piece is length ½

Purple is 1/3, light green is ¼ etc. You can now compare fractions to see whether they are closer to benchmarks of zero, half and whole.

Equivalent fractions

Equivalent fractions: same length, with more or less pieces
Students often find it easier to create equivalent fractions with more pieces compared to with less. E.g finding that $\frac{2}{3} = \frac{4}{6}$ is easier than finding $\frac{8}{12} = \frac{2}{3}$ Make sure you practice finding both ways.

Using Cuisenaire rods is a nice way to show that equivalent fractions are the same length. In the example below we built a whole of length 12. Then ask students to build as many FACTOR trains as they can. A factor train is all the same colour and is exactly the same length as the whole. If a number is NOT a factor, then you will not be able to make a train of the same length.
Once you have built all the factor trains, you can find places where the pieces are the same length. For example, find the trains that have pieces that end at exactly one half. Answer: $\frac{3}{6}$, $\frac{6}{12}$, $\frac{2}{4}$,
You can do the same for 1/3, ¼ etc

From this diagram you can see many equivalent fractions (equivalent lengths). For example, you can see $\frac{3}{12} = \frac{1}{3}$ and $\frac{6}{12} = \frac{3}{6} = \frac{1}{2} = \frac{2}{4}$ etc

Once students are good at finding equivalent fractions using Cuisenaire rods you can start making the connection with the multiplicative relationship. (we increase or decrease the number of pieces that make up the numerator and denominator by the same factor)

Example

$$\frac{2}{3} \;\frac{\times 3}{\times 3}\!=\; \frac{6}{9}$$

$$\frac{6}{9} \;\frac{\div 3}{\div 3}\!=\; \frac{2}{3}$$

Where does this lead?

Rational expressions (grade 11)

$$\frac{2x}{xy} + \frac{4}{x^2} - 3 =$$

$$= \frac{2\,x^2 + 4y - 3x^2 y}{x^2 y} \quad x \neq 0, y \neq 0$$