## NUMBER AND ALGEBRA
# Fraction Number Lines

## Learning focus

- Recognise that fractions are numbers that can be placed on a number line
- Add unit fractions within one whole
- Compare and order fractions with the same denominator
- Compare and order fractions where the numerator is 1

## Key vocabulary

- Fraction
- Whole
- Part
- Numerator
- Denominator
- Half, quarter, third, fifth, sixth and so on.
- Greater
- Smaller
- Compare

## Resources

- Sticks of identical lengths (to show quarters, fifths, sixths and so on)
- Chalk
- Label cards (0 and cards showing quarters, fifths, sixths and so on)
- Clipboards and pencils
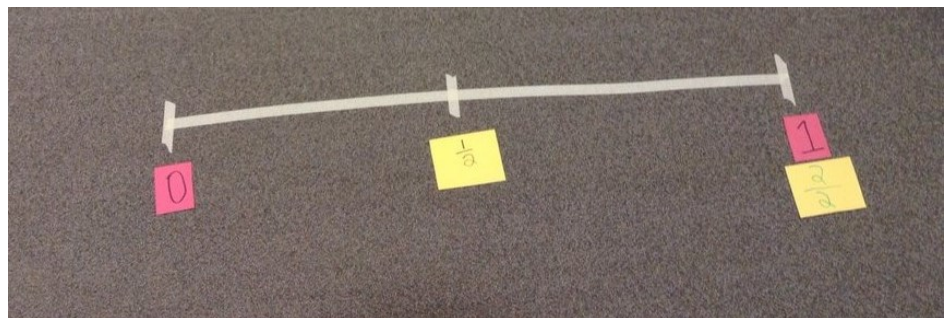


## Activity

To introduce the activity you will need five sticks of equal length. Explain that you have split a long stick into five equal parts. Place the five sticks in a straight line on the playground.



Ask questions to ensure understanding of the unit fraction being referred to.

> How many equal parts are there altogether?
> What fraction of the original stick is each part?
> How many fifths are there altogether?
> Show me one-fifth.
> Show me two lots of one-fifth, three lots of one-fifth, and so on.

## Teaching point

All non-unit fractions are made up of more than one of the same unit fraction.

Establish that 'two lots of one-fifth' is also called 'two-fifths', 'three lots of one-fifth' is also called 'three-fifths', and so on.

Encourage the children to count along the row of sticks in two ways:

*One-fifth, two-fifths, three-fifths, four-fifths, five-fifths*
*One one-fifth, two one-fifths, three one-fifths, four one-fifths, five one-fifths*

Draw attention to the fact that five-fifths is the same as one whole.

## Teaching point

If the whole is divided into equal parts, then all of those parts is the same as having one whole. In other words, when the numerator and the denominator are the same, the fraction is equivalent to one whole.

Explain that fractions are also numbers. Use chalk to draw an empty number line just below the five sticks. It should be the same length as the five sticks. Label one end of the line with 0 and the other end with 1. Use chalk to mark intervals to show each fifth.

Then invite children to place the fraction cards $(\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{5})$ in the correct places.
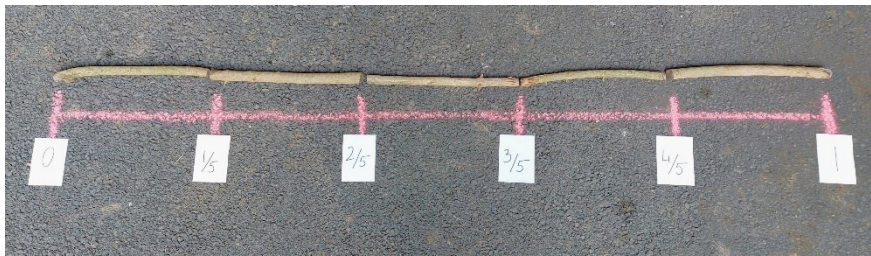


Distinguish between one-fifth as a part of something (a long stick) and the number one-fifth as a point on the number line.

## Teaching point

It is important to recognise that fractions are also numbers. Distinguish between a fraction as a part of something and a fraction as a point on a number line.

Encourage the children to count along the number line in two ways (as above).

Use the number line to explore repeated addition of unit fractions. Invite one child to stand at zero on the number line and then make three jumps along the line. Encourage the children to describe the actions. Demonstrate how this can be written as an addition calculation.

*One-fifth, and another one-fifth, and another one-fifth make three one-fifths.*

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{3}{5}$$

*Three-fifths is made up of one-fifth, and another one-fifth, and another one-fifth*

$$\frac{3}{5} = \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$$

Now choose two fractions. For example: $\frac{2}{5}$ and $\frac{4}{5}$. Encourage the children to compare the fractions and explain their reasoning.

*Which is greater?*
*How can you tell? Can you show me?*

They can explain their reasoning by using the sticks or by using the number line. Alternatively, they may use verbal reasoning:

*$\frac{2}{5}$ is 2 lots of $\frac{1}{5}$*
*$\frac{4}{5}$ is 4 lots of $\frac{1}{5}$*
*I know that 4 is greater than 2. So, $\frac{4}{5}$ is greater than $\frac{2}{5}$*

## Teaching point

When comparing non-unit fractions with the same denominator, the greater the numerator, the greater the fraction.

Assign the children to small groups. Give each group a set of sticks of identical length and a piece of chalk. For example, one group could have 4 sticks of identical length, another group could have 6 and another 8. Each group must place their sticks in a straight line and use chalk to indicate the corresponding fractions. They should then use chalk to draw a number line below their sticks; they should mark intervals that correspond with each stick and label them to indicate the fraction.

They could then explore how various non-unit fractions are formed by repeated addition of a unit fraction, writing equations for each example. Encourage each group to share and discuss their findings.

*What is your unit fraction?*
*What is this number on your number line?*
*How did you represent this?*

Each group could also compare pairs of fractions. They could be given a pre-prepared worksheet with fraction pairs to explore or they could choose their own fractions to compare. They should record their findings using the appropriate mathematical symbols ($<$ and $>$). Each group should be able to explain their reasoning in different ways.

*Which fraction is greater / smaller?*
*How can you tell? Can you show me?*

## Taking ideas further

Assign the children to small groups. Give each group a set of cards displaying unit fractions such as: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{6}$. Each group should draw a large 0-1 number line on the playground and then position their fraction cards in the correct places. Working approximately is fine; they do not have to divide the line exactly. They should be able to explain their reasoning for the placement of each fraction.

The activity above could be developed to include a mixture of unit and non-unit fractions.

## Assessment opportunities

Are the children able to:

- Position a fraction correctly on a 0-1 number line
- Represent non-unit fractions as repeated addition of unit fractions
- Determine which fraction is greater / smaller (when comparing fractions with the same denominator)
- Determine which fraction is greater / smaller (when comparing fractions where the numerator is 1)