

Introduction to Fractions: math lesson, Grade 3 – download the PDF

Have you ever shared a pizza, a candy bar, or a ribbon with a friend? Then you have already used fractions! In this chapter you will learn to name equal parts, place fractions on a number line, find fractions that are equal, and decide which fraction is greater.

1. What is a fraction?

A fraction describes equal parts of one whole. The whole can be a shape, a length, a bar of chocolate, or even a group of objects.

D Definition: fraction

When a whole is cut into **equal parts**, a fraction tells how many of those parts we are talking about. In $\frac{3}{4}$, the **denominator** 4 tells how many equal parts make the whole. The **numerator** 3 tells how many of those parts we take.



3 of 4 equal parts = $\frac{3}{4}$

We read $\frac{3}{4}$ as “three fourths”. The bottom number names the kind of part, and the top number counts the parts.



Equal parts only!

The parts must be exactly the same size. A rectangle cut into 4 pieces of different sizes does not show fourths, even though it has 4 pieces.

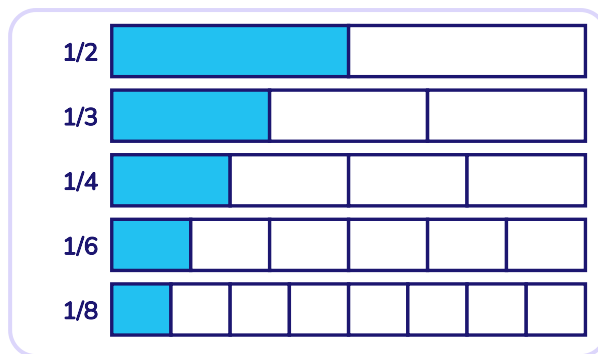
2. Unit fractions



Definition: unit fraction

A **unit fraction** has a numerator of 1. It names exactly one of the equal parts, such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, or $\frac{1}{8}$.

Fraction	How we say it	The whole is cut into
$\frac{1}{2}$	one half	2 equal parts
$\frac{1}{3}$	one third	3 equal parts
$\frac{1}{4}$	one fourth (or one quarter)	4 equal parts
$\frac{1}{6}$	one sixth	6 equal parts
$\frac{1}{8}$	one eighth	8 equal parts



Look at the bars. All five bars are the same length, but the colored pieces get smaller and smaller. The more parts you cut the whole into, the smaller each part is.

P Property: size of unit fractions

If two unit fractions describe the same whole, the one with the **greater denominator** is the **smaller** piece. For example, $\frac{1}{8} < \frac{1}{3}$.

3. Fractions of a whole

Every fraction is built from unit fractions. The fraction $\frac{a}{b}$ means “a pieces, each one of size $\frac{1}{b}$ ”. So $\frac{3}{4}$ is three pieces of size $\frac{1}{4}$.

E Example 1: the garden bed

A garden bed is split into 6 equal sections. Carrots grow in 4 sections, and the other sections are empty.

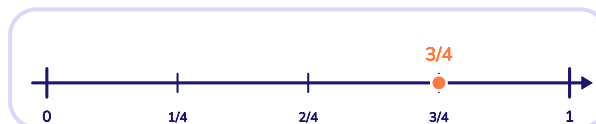
Carrots fill $\frac{4}{6}$ of the bed. The empty part is $\frac{2}{6}$ of the bed. Together, $\frac{4}{6} + \frac{2}{6} = \frac{6}{6}$, which is the whole bed.

4. Fractions on a number line

Fractions are numbers, so they have a place on a number line. We use the distance from 0, just as we do with whole numbers.

M Method: place $\frac{a}{b}$ on a number line

1. Draw the part of the line from 0 to 1.
2. Cut it into **b** equal lengths.
3. Each length is $\frac{1}{b}$ long.
4. Start at 0 and make **a** jumps of that length. You land on $\frac{a}{b}$.



To show $\frac{3}{4}$, the line from 0 to 1 is cut into 4 equal lengths, and the point is 3 jumps from 0. Notice that the last mark, $\frac{4}{4}$, is the same point as 1.

! Zyro's tip

On my planet we count jumps, not marks! If you count the marks, you will be off by one because the first mark is 0. Count the little lengths between the marks.

Fractions can go beyond 1 as well. If you keep jumping past 1 in the same size steps, you reach numbers such as $\frac{5}{4}$ and $\frac{6}{4}$.

5. Equivalent fractions

D Definition: equivalent fractions

Two fractions are **equivalent** when they name the same amount of the same whole. On a number line, they are at the same point.



The three bars have the same length. The colored part is the same size each time, so $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$. We also have $\frac{1}{3} = \frac{2}{6}$ and $\frac{2}{3} = \frac{4}{6}$.

E Example 2: three fourths and eighths

Cut every fourth of a bar into 2 smaller equal pieces. The bar now has 8 equal parts instead of 4. The 3 colored fourths become 6 colored eighths.

$$\text{So } \frac{3}{4} = \frac{6}{8}.$$

⚠ Do not add, cut!

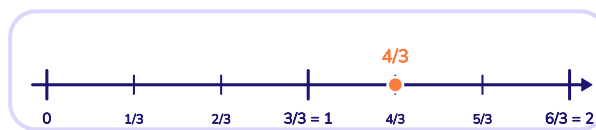
Adding the same number to the top and the bottom does not keep the amount the same. For example, $\frac{1}{2}$ is not equal to $\frac{2}{3}$, even though $1 + 1 = 2$ and $2 + 1 = 3$. Equivalent fractions come from cutting each part into the same number of smaller equal parts.

6. Whole numbers as fractions

When every part of the whole is taken, you have the whole. When you collect whole units, you can also write the amount as a fraction.

P Property: whole numbers as fractions

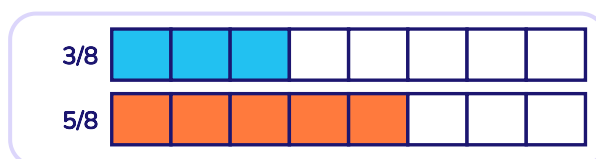
$\frac{n}{n} = 1$ for any number of parts n , and $\frac{n}{1} = n$. For example, $\frac{4}{4} = 1$ and $\frac{5}{1} = 5$.



On this number line each unit is cut into thirds. The point at $\frac{3}{3}$ is the same point as 1, and the point at $\frac{6}{3}$ is the same point as 2. So $2 = \frac{6}{3}$. In the same way, $3 = \frac{12}{4}$, because 3 wholes each hold 4 fourths.

7. Comparing fractions

To compare fractions, the wholes must be the same size. Half of a giant pizza is more than half of a tiny cookie! We use the symbols $>$ (greater than), $<$ (less than), and $=$ (equal to).



P**Two rules for comparing**

- **Same denominator:** the parts are the same size, so the fraction with the greater numerator is greater. Example: $\frac{5}{8} > \frac{3}{8}$.
- **Same numerator:** the same number of parts is taken, so the fraction with the smaller denominator is greater, because its parts are bigger. Example: $\frac{3}{4} > \frac{3}{6}$.

E**Example 3: same numerator**

Maya ran $\frac{2}{3}$ of a trail and Ravi ran $\frac{2}{8}$ of a trail of the same length. Both took 2 parts. Thirds are bigger than eighths, so $\frac{2}{3} > \frac{2}{8}$. Maya ran farther.

A**Bigger number, smaller piece**

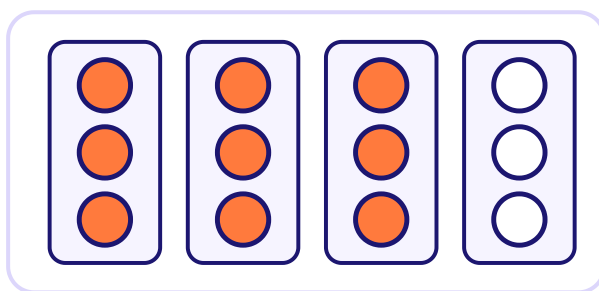
When the numerators are the same, the fraction with the bigger denominator is the smaller one. Do not say that $\frac{1}{8}$ is greater than $\frac{1}{3}$ just because 8 is greater than 3.

8. Fractions of a set

A fraction can also describe part of a group of objects. The group is the whole, and we share it into equal groups.

M Method: find $\frac{a}{b}$ of a set

1. Divide the set into **b** equal groups. This gives the size of one group, which is $\frac{1}{b}$ of the set.
2. Take **a** of those groups.



Here there are 12 counters in 4 equal groups of 3. One fourth of the set is 3 counters. Three fourths of the set is $3 \times 3 = 9$ counters.

E Example 4: stickers

Find $\frac{2}{3}$ of 15 stickers.

Step 1: $15 \div 3 = 5$, so one third is 5 stickers. Step 2: two thirds is $2 \times 5 = 10$ stickers.

Key takeaways

- A fraction names equal parts of a whole: the denominator says how many equal parts, and the numerator says how many are taken.
- A unit fraction like $\frac{1}{6}$ is one part. A greater denominator means a smaller part.
- To place $\frac{a}{b}$ on a number line, cut 0 to 1 into b equal lengths and make a jumps from 0.
- Equivalent fractions, like $\frac{1}{2}$ and $\frac{4}{8}$, are at the same point on the number line.
- $\frac{n}{n} = 1$ and $\frac{n}{1} = n$. Every whole number can be written as a fraction.
- Same denominator: compare the numerators. Same numerator: the smaller denominator is the greater fraction.
- To find a fraction of a set, divide by the denominator, then multiply by the numerator.



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