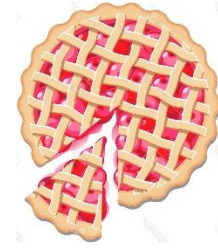


## Fractions

Fractions describe parts of a whole.

$$\frac{\textit{Part}}{\textit{Whole}}$$



The top of the fraction is called the numerator, and the bottom of the fraction is called the denominator. The numerator refers to a section of the whole, and the denominator refers to how many pieces in total make up the whole.

We can use fractions to describe things that have been broken into equal parts, for example:



Here we have a rectangle that has been split into five equal parts. One out of the five parts is shaded in. 1 represents a part of the whole, and in total we have 5 parts. This is represented in the fraction  $\frac{1}{5}$ .

The same fraction can be represented in different terms if we **expand** or **reduce** the fraction.

### Expanding Fractions

Expanding a fraction means that we increase the amount of parts in the whole, but the size of the whole stays the same. For example:



Now we have ten total parts in the whole, and two of them are shaded, creating a fraction of  $\frac{2}{10}$ . Though the fraction has increased, the ratio of shaded boxes to unshaded boxes is the same—in other words, the value of the fraction is the same.

We expand a fraction by multiplying the numerator and the denominator by the same amount. In this example, we multiplied the numerator and the denominator of the original fraction by two:

$$\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

### Reducing Fractions

Reducing fractions means that we decrease the amount of parts in the whole, but the size of the whole stays the same. For example:



Now we have five total parts in the whole, and one of them is shaded, creating a fraction of  $\frac{1}{5}$ . Though the fraction has decreased, the ratio of shaded boxes to unshaded boxes is the same—in other words, the value of the fraction is the same.

We reduce a fraction by dividing the numerator and the denominator by the same amount. In this example, we divided the numerator and the denominator of the fraction  $\frac{2}{10}$  by two:

$$\frac{2 \div 2 = 1}{10 \div 2 = 5}$$

Fractions can only be made up of whole numbers (numbers without decimal places). Therefore, fractions can only be reduced if the numerator and denominator can be divided into whole numbers. For example:

If we have the fraction  $\frac{9}{27}$ , we **cannot** reduce this fraction by dividing it by 2, because if we do, both 9 and 27 will have decimal places. However, we can divide it by 3, because 3 fits evenly into both 9 and 27.

$$\frac{9 \div 3 = 3}{27 \div 3 = 9}$$

### Reducing Fractions to Simplest Terms

Reducing a fraction to its simplest term means that we have reduced that fraction as much as we can **without** creating decimal places. It is common that test questions will ask for fractions reduced to the simplest term.

The way we do this is to find the Greatest Common Factor (GCF) between the numerator and the denominator. The GCF is the highest number that goes into both the numerator and the denominator.

$$\frac{8}{12} \quad \text{The GCF between 8 and 12 is 4.}$$

We can then divide both the numerator and the denominator by the GCF.

$$\frac{8 \div 4 = 2}{12 \div 4 = 3}$$

Our new fraction is  $\frac{2}{3}$ , which is the simplest form of this fraction because it cannot be reduced further without creating decimals.

Solve the following problems on expanding and reducing fractions.

Sample question: Expand the fraction  $\frac{2}{6}$  by a factor of 2.

$$\frac{2 \times 2 = 4}{6 \times 2 = 12}$$

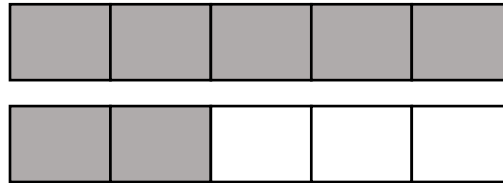
1. Expand the fraction of  $\frac{4}{5}$  by a factor of 3. \_\_\_\_\_
2. Expand the fraction of  $\frac{6}{10}$  by a factor of 2. \_\_\_\_\_
3. Expand the fraction of  $\frac{7}{8}$  by a factor of 4. \_\_\_\_\_
4. Expand the fraction of  $\frac{2}{13}$  by a factor of 3. \_\_\_\_\_
5. Reduce the fraction of  $\frac{6}{12}$  to simplest terms. \_\_\_\_\_
6. Reduce the fraction of  $\frac{3}{18}$  to simplest terms. \_\_\_\_\_
7. Reduce the fraction of  $\frac{14}{21}$  to simplest terms. \_\_\_\_\_
8. Reduce the fraction of  $\frac{8}{10}$  to simplest terms. \_\_\_\_\_
9. Reduce the fraction of  $\frac{5}{25}$  to simplest terms. \_\_\_\_\_
10. Reduce the fraction of  $\frac{12}{20}$  to simplest terms. \_\_\_\_\_



### Improper and Mixed Fractions

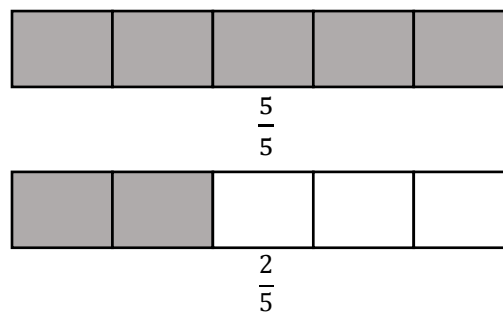
An improper fraction is a fraction where the numerator is larger than the denominator. This means that we have **more** than one whole. For example:

If we have the fraction  $\frac{7}{5}$ , we have more than one whole, because one whole is made up of 5 parts (which we know because the denominator is 5). The fraction  $\frac{7}{5}$  looks like this:



7 parts are shaded in, where the size of the whole is 5 parts.

A mixed fraction is a fraction where we have more than one whole, but we do not allow the numerator to be larger than the denominator. Our fraction of  $\frac{7}{5}$  looks like this:



We can see that  $\frac{5}{5}$  is equal to one whole, so we can express it as 1. We are then left with  $\frac{2}{5}$ , which does not need to be reduced further because the numerator is less than the denominator, it represents less than one whole. Our mixed fraction is then written as  $1\frac{2}{5}$ .

We can also convert a mixed fraction back to an improper fraction. This is done by multiplying the denominator of the fraction by the whole number, and then adding it to the numerator. For example:

$$\begin{array}{c}
 14 + 4 = 18 \\
 \begin{array}{c} \curvearrowright \\ 4 \\ \curvearrowright \end{array} \\
 2\frac{4}{7} = \frac{18}{7} \\
 \begin{array}{c} \curvearrowleft \\ 7 \\ \curvearrowleft \end{array} \\
 2 \times 7 = 14
 \end{array}$$

Solve the following problems on mixed and improper fractions.

11. Convert the fraction of  $\frac{5}{4}$  to a mixed fraction. \_\_\_\_\_

12. Convert the fraction  $\frac{7}{3}$  to a mixed fraction. \_\_\_\_\_

13. Convert the fraction  $\frac{8}{5}$  to a mixed fraction. \_\_\_\_\_

14. Convert the fraction  $\frac{7}{2}$  to a mixed fraction. \_\_\_\_\_

15. Convert the fraction  $\frac{3}{2}$  to a mixed fraction. \_\_\_\_\_

16. Convert the fraction  $1\frac{2}{3}$  to an improper fraction. \_\_\_\_\_

17. Convert the fraction  $2\frac{3}{4}$  to an improper fraction. \_\_\_\_\_

18. Convert the fraction  $1\frac{2}{5}$  to an improper fraction. \_\_\_\_\_

19. Convert the fraction  $4\frac{3}{6}$  to an improper fraction. \_\_\_\_\_

20. Convert the fraction  $3\frac{1}{5}$  to an improper fraction. \_\_\_\_\_



## Fractions: Answer Sheet

1)  $\frac{12}{15}$

2)  $\frac{12}{20}$

3)  $\frac{28}{32}$

4)  $\frac{6}{39}$

5)  $\frac{1}{2}$

6)  $\frac{1}{6}$

7)  $\frac{2}{3}$

8)  $\frac{4}{5}$

9)  $\frac{1}{5}$

10)  $\frac{3}{5}$

11)  $1\frac{1}{4}$

12)  $2\frac{1}{3}$

13)  $1\frac{3}{5}$

14)  $3\frac{1}{2}$

15)  $1\frac{1}{2}$

16)  $\frac{5}{3}$

17)  $\frac{11}{4}$

18)  $\frac{7}{5}$

19)  $\frac{27}{6}$

20)  $\frac{16}{5}$