

Arithmetic

When multiplying or dividing positive and negative numbers the sign of the result is given by:

positive \times positive = positive positive \times negative = negative

negative \times positive = negative negative \times negative = positive

$$\frac{\text{positive}}{\text{positive}} = \text{positive}$$

$$\frac{\text{positive}}{\text{negative}} = \text{negative}$$

$$\frac{\text{negative}}{\text{positive}} = \text{negative}$$

$$\frac{\text{negative}}{\text{negative}} = \text{positive}$$

The BODMAS rule reminds us of the order in which operations are carried out. BODMAS stands for:

B rackets ()	First priority
O f	Second priority
D ivision \div	Second priority
M ultiplication \times	Second priority
A ddition $+$	Third priority
S ubtraction $-$	Third priority

Fractions:

$$\text{fraction} = \frac{\text{numerator}}{\text{denominator}}$$

Adding and subtracting fractions: to add or subtract two fractions first rewrite each fraction so that they have the same denominator. Then, the numerators are added or subtracted as appropriate and the result is divided by the common denominator: e.g.

$$\frac{4}{5} + \frac{3}{4} = \frac{16}{20} + \frac{15}{20} = \frac{31}{20}.$$

Multiplying fractions: to multiply two fractions, multiply their numerators and then multiply their denominators: e.g.

$$\frac{3}{7} \times \frac{5}{11} = \frac{3 \times 5}{7 \times 11} = \frac{15}{77}$$

Dividing fractions: to divide two fractions, invert the second and then multiply: e.g. $\frac{3}{5} \div \frac{2}{3} = \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}$.

Proportion and Percentage:

To convert a fraction to a percentage multiply by 100 and label the result as a percentage.

$$\frac{5}{8} \text{ as a percentage is } \frac{5}{8} \times 100\% = 62.5\%$$

$$\frac{1}{3} \text{ as a percentage is } \frac{1}{3} \times 100\% = 33\frac{1}{3}\%$$

Some common conversions are:

$$\frac{1}{10} = 10\%, \quad \frac{1}{4} = 25\%, \quad \frac{1}{2} = 50\%, \quad \frac{3}{4} = 75\%$$

Ratios are an alternative way of expressing fractions. Consider dividing £200 between two people in the ratio of 3:2. For every £3 the first person gets, the second person gets £2. So the first gets $\frac{3}{5}$ of the total, and the second gets $\frac{2}{5}$ of the total; that is £120 and £80.

Generally, to split a quantity in the ratio $m : n$, the quantity is split into $\frac{m}{m+n}$ of the total and $\frac{n}{m+n}$ of the total.