

## Rules of Arithmetic

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Graduate Bsc (Hons) MathsSci (Open) GIMA

The basic rules of arithmetic are:-

**B**racket    **D**ivision    **M**ultiplication    **A**ddition    **S**ubtraction

When evaluating an expression you must do each sum in the correct order of priority which is

1. Brackets
2. Multiplication or Division
3. Addition or Subtraction

This can easily be remembered as BODMAS

E.g.  $3 \times 5 - (6 + 2) / 4$

Step 1      Evaluate bracket first

$$3 \times 5 - 8 / 4$$

Step 2      Next is the division or multiplication

Division:             $3 \times 5 - 2$     or    multiplication:  $15 - 8 / 4$

Multiplication:     $15 - 2$     or    division            :  $15 - 2$

Step 3      finally the subtraction

$$15 - 2 = 13$$

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### FRACTIONS

The rules of arithmetic when dealing with fractions are:-

Addition: To add fractions make sure the denominators are the same

E.g. to add  $\frac{1}{2} + \frac{1}{3}$

We cannot simply add these i.e.  $\frac{1}{2} + \frac{1}{3} \neq \frac{1}{5}$

First we find the common denominator (a number which 2 and 3 divides evenly) which is 6. Hence we have

$$\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

Subtraction: Follows the same method as addition.

E.g. to subtract  $\frac{1}{2} - \frac{1}{3}$

First we find the common denominator (a number which 2 and 3 divides evenly) which is 6. Hence we have

$$\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

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**Multiplication:** We simply multiply each term of the numerator and then do the same for the denominator.

E.g. to multiply  $\frac{1}{2} \cdot \frac{2}{3} \cdot \frac{4}{5}$

Solution  $\frac{1}{2} \cdot \frac{2}{3} \cdot \frac{4}{5} = \frac{1 \cdot 2 \cdot 4}{2 \cdot 3 \cdot 5} = \frac{8}{30} = \frac{4}{15}$

**Division:** For division we turn the term which is the divisor upside down and change the division sign to a multiplication sign and then evaluate.

E.g. to divide  $\frac{\frac{1}{2}}{\frac{1}{3}}$

Solution: Turn the divisor upside down i.e.  $1/3$  becomes 3 and we change the division sign to multiplication.

$$\frac{\frac{1}{2}}{\frac{1}{3}} = \frac{1}{2} \cdot 3 = \frac{3}{2}$$

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For more complicated expressions we apply the rules of fractions together with priorities of arithmetic.

E.g. 
$$\frac{\frac{1}{2}}{\left(3 \cdot \frac{1}{5}\right)} + \frac{2}{3}$$

Step1      Bracket first

$$\frac{\frac{1}{2}}{\left(\frac{3}{5}\right)} + \frac{2}{3}$$

Step 2      Do the division using rules for fractions

$$\frac{\frac{1}{2}}{\frac{3}{5}} = \frac{1}{2} \cdot \frac{5}{3} = \frac{5}{6}$$

Step 3      Finally do the addition

$$\frac{5}{6} + \frac{2}{3} = \frac{5}{6} + \frac{4}{6} = \frac{9}{6} = \frac{3}{2}$$