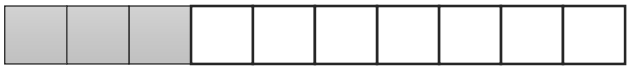
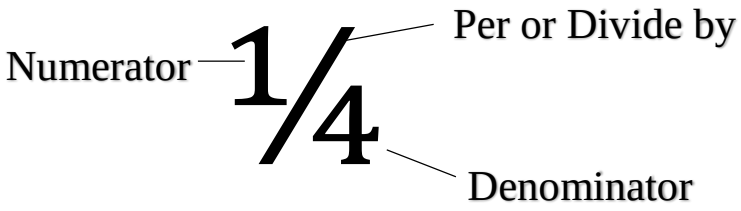
## DECIMALS, FRACTIONS AND PERCENTAGES

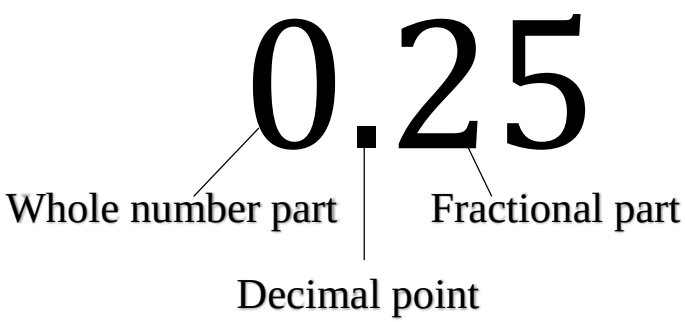
Considering the figure below:



$$(a)\frac{3}{10} = (b)\ 0.3$$

The expression (a) is a fractional number while (b) is a decimal fractional number.




### Decimals in Words

In reading decimal fractional numbers, we read the whole number part as normal. For example: 210.0 is two hundred and ten. The fractional part of a decimal fractional number is read by just mentioning the digits that make the fractional part. For example: 210.02 is two hundred and ten point zero two.

## Place Value of Decimal Fractions

The position of a digit in any given number (whole or decimal) is called its place in that number. And such place has a value, that value is what is called place value. Consider the figure below

| H | T | U | | Tth | Hth |
|---|---|---|---|---|---|
| 2 | 1 | 0 | . | 0 | 2 |
| Whole number part | | | | Fractional part | |

The place values of the digits are

2 – Hundreds (H)
1 – Tens (T)
0 – Unit (U)
. – point
0 – Tenth
2 – Hundredth

## Expansion Form

$$210.02 = 2 \times 10^2 + 1 \times 10^1 + 0 \times 10^0 + 0 \times 10^{-1} + 2 \times 10^{-2}$$

$$= 2 \times 100 + 1 \times 10 + 0 \times 1 + 0 \times \frac{1}{10} + 2 \times \frac{1}{100}$$

$$= 200 + 10 + 0 + 0 + 0.02 = \mathbf{210.02}$$

## Converting Fractions to Decimals

Fractions can be converted to decimals and vice versa. To write a fraction as a decimal we can:

**Use known facts:**

**Example**: Convert ¾ to decimal

Note that ¾ = ¼ × 3.

But we know that ¼ = 0.25

∴ 3 × ¼ = 3 × 0.25=**0.75**

**Make the denominator 10, 100, or 1000, etc.**

**Example**: Convert $\frac{21}{50}$ to decimal.

$\frac{21}{50} = \frac{21}{50} \times \frac{2}{2} = \frac{42}{100} = \mathbf{0.42}$

**Divide the Numerator by the Denominator**

**Example**: Convert $\frac{190}{50}$ to decimal.

$\frac{190}{50}\ [zero\ cancel\ zero] = \frac{19}{5}$

$\frac{19}{5} = \mathbf{0.38}$

The above example have a finite number of digits after decimal point. They are, therefore called terminating decimals.

If we continue to divide $\frac{4}{7}$, we would get 0.5714285…. This is called the repeated pattern of a decimal. By rounding the decimal to two decimal places, $\frac{4}{7} = 0.57\ (2\ d.p)$.

0.27272727, 0.3333333, and 0.66666667, are called recurring decimals. A recurring decimal has one or more repeated digits. The dot (.) above 2 and 7 shows that both are repeated.

**Conversion of Decimals to Fractions**

Decimal numbers can be converted to fractions. To convert a decimal to a fraction, write it with a denominator of 10, 100, 1000, or other powers of 10.

**Example**: Convert 0.5 to a fraction in its lowest term.

**Solution**

$0.5 = \frac{0.5}{1} \times \frac{10}{10} = \frac{5}{10} = \mathbf{\frac{1}{2}}$

## Percentages

Consider the table below. The table show the scores of John in an examination.

| Basic Science | Social Studies | Maths | English | French |
|---|---|---|---|---|
| $\frac{38}{50}$ | $\frac{18}{25}$ | $\frac{8}{10}$ | $\frac{7}{10}$ | $\frac{3}{5}$ |

In which of these subjects did he perform best. It will be difficult to tell the highest fraction from the table. Writing the answers in decimal fractional form would give which is greater though.

$$\frac{38}{50} = 0.76; \frac{18}{25} = 0.72; \frac{8}{10} = 0.8; \frac{7}{10} = 0.7; \frac{3}{5} = 0.6$$

We can now see that his highest score is 0.08 which is that of mathematics.

Another method of expressing his marks is by writing the fractions to have the same denominator, 100.

$$\frac{38}{50} = \frac{76}{100}; \frac{18}{25} = \frac{72}{100}; \frac{8}{10} = \frac{80}{100}; \frac{7}{10} = \frac{70}{100}; \frac{3}{5} = \frac{60}{100}$$

All the fractions now have a denominator of 100. A fraction with a denominator of 100 is called a percentage. The symbol for percentage is %.

## Conversion of Fractions to Percentages

Fractions can be expressed as percentages by multiplying them by 100.

Example: express $\frac{4}{5}$ as percentage.

$$\frac{4}{5} \times \frac{100}{1} = 4 \times 20 = 80\%$$

**Conversion of Percentages to Fractions**

Express 15% as fraction

$$\frac{15}{100} = \frac{3}{20}$$

**Word Problems**

A 120g bar of soap contains 45g of soda. What percentage of the soap is soda?

**Solution**

$$\frac{45}{120} \times 100 = \frac{4500}{120} = \frac{450}{12} = \frac{150}{4} = \frac{75}{2} = 37\frac{1}{2} \; or \; 37.5$$