Fractions: A **fraction** is a ratio of two integers. The horizontal line indicates division.

> <u>Ex:</u> $\frac{7}{9}$, $\frac{543}{172}$, $\frac{-16}{12}$, $\frac{16}{-12}$, $\frac{-43}{-67}$ are all fractions. $\frac{7}{9}$ means 7 divided by 9 .

Numerator: That part of a fraction **above** the line.

Denominator: That part of a fraction **below** the line.

> <u>Ex:</u> In $\frac{7}{9}$ the numerator is 7 and the denominator is 9.

Simplifying Fractions: Fractions may be **simplified** by dividing out the same factors in both numerator and denominator.

> A **completely simplified** fraction is a fraction whose numerator and denominator have no common factors (except 1), and the denominator is a positive integer.
>
> Unless the problem states otherwise, **all fractional answers must be in completely simplified form.**
>
> <u>Ex:</u> $\frac{16}{12} = \frac{4 \cdot 4}{4 \cdot 3} = \frac{4}{3}$, $\frac{-24}{-6} = \frac{(-1)(24)}{(-1)(6)} = \frac{24}{6} = \frac{4 \cdot 6}{1 \cdot 6} = \frac{4}{1} = 4$.

Decimals: A **decimal** is a shorthand way of writing an integer divided by a power of 10.

> The number of digits to the right of the decimal point equals the power of 10.
>
> <u>Ex:</u> $0.234 = \frac{234}{10^3} = \frac{234}{1000}$, $1.37 = \frac{137}{10^2} = \frac{137}{100}$, $17.9 = \frac{179}{10^1} = \frac{179}{10}$, $0.0013 = \frac{13}{10^4} = \frac{13}{10000}$.

Terminating Decimal: Any decimal number which has **only zeros** to the **right** of a certain digit.

> These zeros are not usually written.
>
> <u>Ex:</u> $0.234 = 0.234000000\ldots$, $17.9 = 17.90000\ldots$.

Repeating Decimal: Any decimal number which is **not** terminating and which **repeats** some collection of digits.

> A repeating decimal is written with a bar over the repeating digits.
>
> <u>Ex:</u> 0.234234234 is terminating and so is **not** repeating.
>
> $0.\overline{234} = 0.234234234\ldots$ **is** a repeating decimal.
>
> Those three little dots make a **big** difference!

Decimal / Fraction: Any repeating or terminating decimal can be written as a fraction.

> <u>Ex:</u> $0.\overline{234} = \frac{234}{999}$, $1.7\overline{34} = 1.3 + 0.\overline{43} = \frac{13}{10} + \frac{43}{99}$.
>
> **The number of 9's in the denominator equals the number of repeating digits.**
>
> > Sometimes you have to be clever:
> >
> > $0.792\overline{47} = 0.792 + 0.000\overline{47} = \frac{792}{10^3} + \frac{0.\overline{47}}{10^3} = \frac{792}{1000} + \frac{47/99}{1000} = \frac{792}{1000} + \frac{47}{99000}$.
>
> Any fraction can be written as a repeating or terminating decimal.
>
> <u>Ex:</u> $\frac{2}{3} = \frac{6}{9} = 0.\overline{6}$, $\frac{2}{11} = \frac{18}{99} = 0.\overline{18}$, $\frac{1}{4} = 0.25$.
>
> **The only fractions in completely simplified form which can be written as terminating decimals are those whose denominators can be factored into products of powers of 2 and powers of 5.**
>
> <u>Ex:</u> $\frac{1}{4} = \frac{1}{2^2} = \frac{5^2}{2^2 \cdot 5^2} = \frac{25}{10^2} = 0.25$, $\frac{3}{20} = \frac{3}{10 \cdot 2} = \frac{3 \cdot 5}{10 \cdot 2 \cdot 5} = \frac{15}{10^2} = 0.15$.
>
> <u>Ex:</u> $\frac{19}{350} = \frac{19}{7 \cdot 50}$ does **not** terminate (all you need do is find one factor which is not a power of 5 or 2, in this case 7).

Rounding: It is often necessary to **round** decimals to a certain number of **significant digits**. To do this, count the required number of digits from the left starting with the **first non-zero digit**. Then: Rule: If the next digit is 0, 1, 2, 3, 4 then replace the remaining digits with zeros.

                  If the next digit is 5, 6, 7, 8, 9 then increase the last significant digit by 1 and replace the remaining digits with zeros.

     Ex: Round the following numbers to three significant digits: 7916, 7914, 16.437 .

     Soln: In each case count three digits from the left and examine the fourth digit:

          791$\underline{6}$, so increase 1 by 1 and replace the remaining digits with zeros to get 7920.

          791$\underline{4}$, so replace remaining digits with zeros to get 7910.

          16.4$\underline{3}$7 , so replace remaining digits with zeros to get 16.400 = 16.4 .

     Ex: What is 79.896 to four significant figures?

     Soln: Count four digits from the left and examine the fifth digit: 79.89$\underline{6}$.

          Increase 89 by 1 to get 79.900 , so the answer is 79.90 . Notice that a zero is kept to emphasize that the number is accurate to four significant digits. 79.9 is accurate to only three significant digits.

     Ex: What is 0.079896 to four significant figures?

     Soln: Count four digits from the left starting with the first non-zero digit: 0.07989$\underline{6}$.

          Increase 89 by 1 to get 0.07990 . As above, the last zero must be kept.

Numbers 2 Homework Problems (NO CALCULATORS)

a) Write the simplest common fraction which names the same number as $0.\overline{3}$.

b) Write the simplest common fraction which names the same number as $0.8\overline{3}$.

c) Write the simplest common fraction which names the same number as $0.\overline{24}$.

d) Write the common fraction equivalent to $0.5\overline{7}$.

e) What is the fraction equivalent to $2.0\overline{45}$?

f) Write as a decimal: $\frac{5}{16}$.

g) Write the simplest common fraction which names the same number as $0.\overline{36}$.

h) Give the letter(s) corresponding to the fraction(s) given which, when written as decimals, will not terminate. (a) $\frac{3}{150}$, (b) $\frac{7}{75}$, (c) $\frac{11}{250}$, (d) $\frac{15}{48}$.

i) To what decimal is $\frac{1}{40}$ equivalent?

j) Express $\frac{21}{11}$ as a repeating decimal.

k) Express $0.\overline{164}$ as a common fraction.

l) What is $0.\overline{49} - 0.\overline{35}$? Express your answer as a common fraction.

m) Express 0.0138 as a common fraction.

n) Express $\frac{1}{30}$ as a decimal.

o) Express $0.\overline{26}$ as a common fraction.

p) Express $0.\overline{25}/0.\overline{5}$ as a common fraction.

q) The fraction $\frac{13}{(128)(125)}$ is equivalent to what terminating decimal?

r) What is the repeating decimal equivalent to $\frac{118}{55}$?

s) What is 127,986 to three significant figures?

t) What is 127,986 to two significant figures?

u) What is 127,986 to four significant figures?

v) What is 127,986 to five significant figures?

w) What is 12.7986 to three significant figures?

x) What is 12.7986 to two significant figures?

y) What is 12.7986 to four significant figures?

z) What is 12.7986 to five significant figures?

aa) What is 0.000127986 to four significant figures?