Math Skills II

Digits

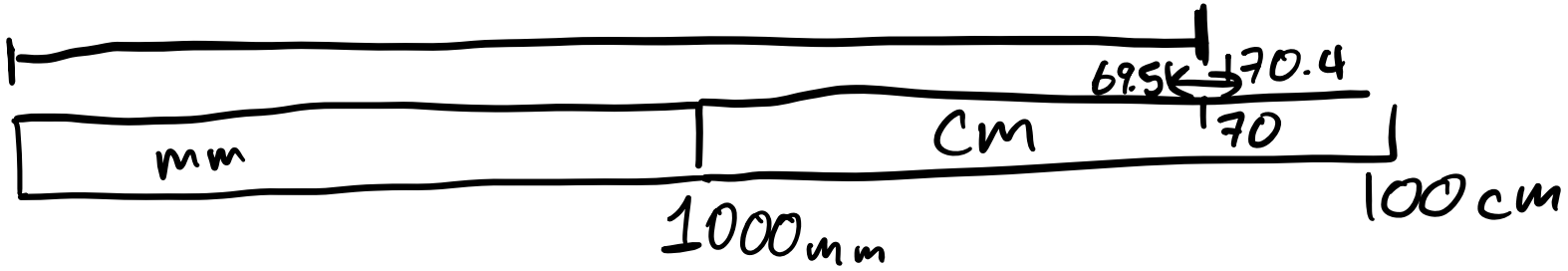
How do we decide how many digits to use when we do a problem?

Do we just guess?

Measurement

When I have a ruler with centimetre markings what precision can I measure to?

What about millimetre markings?



170 cm

Significant Digits

We have rules to decide how many digits our answer has.

We want to keep digits that give us information about things that we measured.

Measurement

The precision of our measurement determines our number of digits!

Our answer is determined by our least precise measurement.

Significant Digits

All non-zero digits are significant

1250

All zeroes to the left of our first non-zero digit are not significant

0.026

Everything to the right of our first non-zero digit is significant.

0.00732

170cm → 3 significant digits.

Significant Digits

Examples:

200 → 3 significant digits

0.500 → 3 significant digits

0.00253100 → 6 significant digits.

Significant Digits

Examples:

352.6 → 4

0.0034 → 2

4.9063 → 5

2 S.D.

$n = \frac{m}{M}$

50 g of Al

$M = 26.98$

$n = \frac{50}{26.98} = 1.85322\ldots$

$= 1.9$

Rounding

Sometimes what we calculate has more digits than we can give.

Our final answer will only have as many digits as the information we're given.

We have to round:

If the end digit is lower than 5, we round down

If the end digit is greater than or equal to 5, we round up

Rounding

Round the following:

0.0356 to 2 significant digits → 0.36

15.9234 to 4 significant digits.

15.92

4.675 to 3 significant digits

4.68

Scientific Notation

How do we show a really big or a really small number in a compact way?

123 456

We use scientific notation!

Avogadro's Number:

$N_A = 6.02 \times 10^{23}$

Scientific Notation

Scientific Notation Rules:

between 1 and 9.

The first part is a whole number and decimal, to the correct number of significant digits

6.02×10^{23}

The second part is a multiplication by a power of ten.

Scientific Notation

Mass of the Earth = 5 972 200 000 000 000 000 000 000 kg

5 S.D.

5.9722×10^{24} kg

Scientific Notation

Size of a virus: 0. 000 000 020 m.

2 S.D.

2.0×10^{-8} m

Scientific Notation

GENERAL SCIENCE DATA

Prefix	Symbol	Factor by which Base unit is multiplied	
terra	T	1 000 000 000 000	$=10^{12}$
giga	G	1 000 000 000	$=10^{9}$
mega	M	1 000 000	$=10^{6}$
kilo	k	1000	$=10^{3}$
hecto	h	100	$=10^{2}$
deca	da	10	$=10^{1}$
Common base units*		1	$=10^{0}$
deci	d	0.1	$=10^{-1}$
centi	c	0.01	$=10^{-2}$
milli	m	0.001	$= 10^{-3}$
micro	μ	0.000 001	$=10^{-6}$
nano	n	0.000 000 001	$=10^{-9}$
pico	p	0.000 000 000 001	$=10^{-12}$

*metre (m), gram (g), litre (L), mole (mol)