



Year 6 Place Value

Numbers to ten million

Gattegno Chart

100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000
10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

If the counter moves up 1 row then the number is 10 times the size.

If the counter moves up 2 rows then the number is 100 times the size.

7,850,000 is 100 times the size of 78,500

What number is shown on the Gattegno chart?
78,500

1,000,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000	7,000,000	8,000,000	9,000,000
100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000
10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

What number is 100 times the size of 78,500?

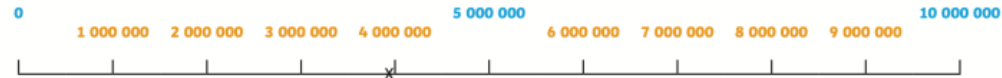
If the counter moves up 2 rows then the number is 100 times the size.

3 926 471

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	9	2	6	4	7	1

three million, nine hundred and twenty-six thousand, four hundred and seventy-one

3 926 471
3 926 000 471



1,250,341

Millions	Thousands			Ones		
O	H	T	O	H	T	O
●	●●	●●●		●●	●●●	●

One million, two hundred and fifty thousand, three hundred and forty-one.

212,731 < 233,814

M	HTh	TTh	Th	H	T	O
2	1	2	7	3	1	
2	3	3	8	1	4	

The first place value column I need to look at is hundred-thousands

10,000 is greater / less than 30,000
so 212,731 is greater / less than 233,814

Compare and order

equals

$$26 + 38 = 8 \times 8$$

Both calculations have the value 64.

Negative numbers



Eva has £10 in her bank account and buys a coat for £15. She now has £-5



Lift



Temperature - when the temperature is below freezing (0°C), it is shown as a negative number



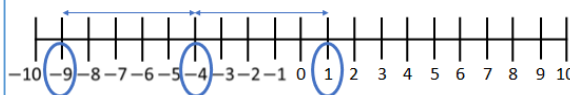
Negative numbers can be used to measure under sea level

$$-4 + 5 = 1$$

$$-4 - 5 = -9$$

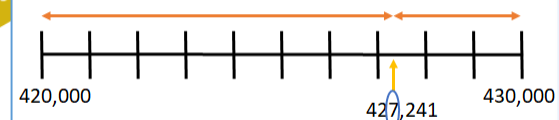
5 more than -4

5 less than -4



Rounding

Round 427,241 to the nearest 10,000



The previous multiple of 10,000 is 420,000
The next multiple of 10,000 is 430,000
427,241 is closer to 430,000 than 420,000
427,241 rounded to the nearest 10,000 is 430,000

Rounding to the nearest 100 000



Rounding to the nearest 1 000 000



Vocabulary
Million
hundred thousand
ten thousand
partition
gattegno chart
column
place holder
value
integer
power of 10
x times the size of
interval
greatest
ascending
descending
compare order
less than
multiple
negative number
degrees





Column + and -

Starting with the smallest place value, add each column in turn. Exchange tens, hundreds, thousands as required

	4	5	8	6	4
+	2	3	4	9	7
	6	9	3	6	1
		1	1	1	

	TTh	Th	H	T	O
	4	8	2	4	7
+	3	3	6	8	1
	8	1	9	2	8
	1	1			

+					
	8	1	9	2	8

	3	5	6 7	13 4	1 2
-		3	4	7	6
	3	2	2	6	6

Starting with the smallest place value, subtract each column in turn. Exchange tens, hundreds, thousands as required

Factors of 48

1	2	3	4	6	8	12	16	24	48
---	---	---	---	---	---	----	----	----	----

Factors of 30

1	2	3	5	6	10	15	30
---	---	---	---	---	----	----	----

Common factors: 1, 2, 3, 6

Multiples of 3

3	...	18	21	24	...	39	42
---	-----	----	----	----	-----	----	----

Multiples of 7

7	14	21	28	35	42
---	----	----	----	----	----

Common multiples: 21, 42...

Common factors and multiples

Year 6 Addition, Subtraction, Multiplication and Division (Part A)

Divisibility Rules!


A number is divisible by...

2	➔	if the <u>last digit</u> is <u>even</u> or <u>zero</u> .
3	➔	if the <u>sum</u> of the digits is divisible by <u>three</u> .
4	➔	if the <u>last two digits</u> are divisible by <u>four</u> .
5	➔	if the <u>last digit</u> is <u>zero</u> or <u>five</u> .
6	➔	if the number is divisible by both <u>two</u> and <u>three</u> .
8	➔	if the <u>last three digits</u> are divisible by <u>eight</u> .
9	➔	if the <u>sum</u> of the digits is divisible by <u>nine</u> .
10	➔	if the <u>last digit</u> is <u>zero</u> .

Square numbers

The result of a number multiplied by itself.
Has to be a whole number.
Has to build a **complete** square.

$2^2 = 4$ Two squared




2×2

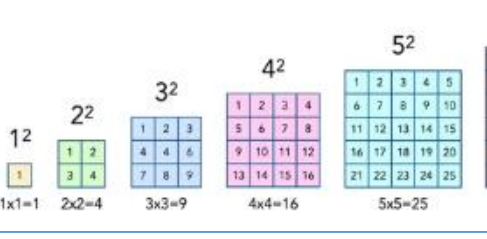
Cube numbers

The result of a number multiplied by itself and then multiplied by itself again.

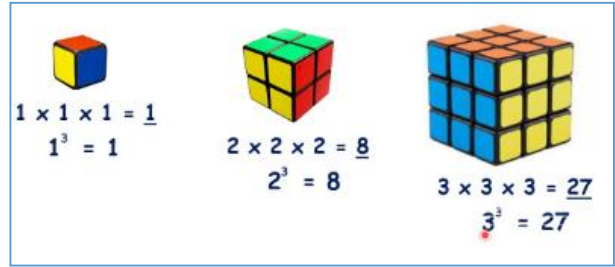
$2^3 = 8$ Two cubed



$2 \times 2 \times 2$



$1^2 = 1$ $2^2 = 4$ $3^2 = 9$ $4^2 = 16$ $5^2 = 25$



$1 \times 1 \times 1 = 1$ $1^3 = 1$ $2 \times 2 \times 2 = 8$ $2^3 = 8$ $3 \times 3 \times 3 = 27$ $3^3 = 27$

Prime numbers

Integers that have exactly two factors are called **Prime Numbers**

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Is 1 a prime number?
 Prime number: a number with exactly two factors
 What are the factors of 1? 1
 $1 \times 1 = 1$
 How many factors does 1 have? 1
 1 has one factor.
 Prime numbers have exactly two factors.
 1 is not a prime number.

- ### Vocabulary
- Add
 - subtract
 - multiply
 - divide
 - divisor
 - dividend
 - quotient
 - factor
 - common factors
 - common multiples
 - divisibility
 - divisible
 - prime
 - composite
 - prime factors
 - square number
 - cube number
 - long
 - multiplication
 - groups of
 - long division
 - partition
 - multiple
 - order of operations
 - brackets
 - estimate
 - inverse



Year 6

Addition, Subtraction, Multiplication and Division (Part B)

Mental methods of calculation

Multiply 4-digits by 2-digits

1	5	4	
×	2	6	

3	0	8	0
4	0	0	4
1	1		

Start with the ones.
 $154 \times 6 = 924$
 $154 \times 20 = 3080$
 $3080 + 924 = 4004$

Short division

$5,291 \div 4 = 1,322 \text{ r}3$

Start from the left.

Thousands	Hundreds	Tens	Ones
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1
1000 1000	100 100	10 10	1

1	3	2	2	r3
4	5	2	9	1

How many groups of 4 thousands are there in 5,000?
 How many groups of 4 hundreds are there in 1,200?
 How many groups of 4 tens are there in 90?
 How many groups of 4 ones are there in 11?

$39 + 13 = 52$

Strategy 1 – Partitioning and adding

Strategy 2 – Round then add

$39 + 13$
 $40 + 13 = 53$
 $53 - 1 = 52$

Factors

36×5
 $2 \times 18 \times 5$
 $2 \times 5 \times 18$
 $10 \times 18 = 180$

Double and halve

$\div 2 \left(\begin{array}{l} 36 \times 5 \\ 18 \times 10 \end{array} \right) \times 2 = 180$

Count on

$34 - 29 = 5$

$29 \xrightarrow{+1} 30 \xrightarrow{+4} 34$

$48 \div 8 = 6$

dividend (48)
 divisor (8)
 quotient (6)

Long division

Division using factors.

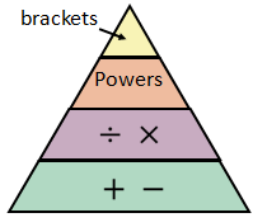
$720 \div 24 = 30$
 $720 \div 6 = 120$
 $120 \div 4 = 30$
 $720 \div 12 = 60$
 $60 \div 2 = 30$

Which factor pair will you find it easier to divide 720 by?

1 and 24 24 4 and 6
 2 and 12 3 and 8

Order of operations

B	Brackets	$10 \times (4 + 2) = 10 \times 6 = 60$
O	Order	$5 + 2^2 = 5 + 4 = 9$
D	Division	$10 + 6 \div 2 = 10 + 3 = 13$
M	Multiplication	$10 - 4 \times 2 = 10 - 8 = 2$
A	Addition	$10 \times 4 + 7 = 40 + 7 = 47$
S	Subtraction	$10 \div 2 - 3 = 5 - 3 = 2$



Success criteria

- List multiples of the divisor (are you going to do repeated addition or partition and add?)
- Divide
- Multiply
- Subtract
- Bring it down...
- ... and bring it on back!

			2	4	
1	2	2	8	8	
		-	2	4	
				4	8
		-		4	8
					0

Listing the multiples of the divisor can be helpful for long division.

1) 13
 $10 + 3 = 13$
 $20 + 6 = 26$
 $30 + 9 = 39$
 $40 + 12 = 52$
 $50 + 15 = 65$
 $60 + 18 = 78$
 $70 + 21 = 91$
 $80 + 24 = 104$
 $90 + 27 = 117$

2) 14
 $10 + 4 = 14$
 $20 + 8 = 28$
 $30 + 12 = 42$
 $40 + 16 = 56$
 $50 + 20 = 70$
 $60 + 24 = 84$
 $70 + 28 = 98$
 $80 + 32 = 112$
 $90 + 36 = 126$

3) 21
 $20 + 1 = 21$
 $40 + 2 = 42$
 $60 + 3 = 63$
 $80 + 4 = 84$
 $100 + 5 = 105$
 $120 + 6 = 126$
 $140 + 7 = 147$
 $160 + 8 = 168$
 $180 + 9 = 189$

4) 22
 $20 + 2 = 22$
 $40 + 4 = 44$
 $60 + 6 = 66$
 $80 + 8 = 88$
 $100 + 10 = 110$
 $120 + 12 = 132$
 $140 + 14 = 154$
 $160 + 16 = 176$
 $180 + 18 = 198$

Listing the multiples of the divisor can be helpful for long division.

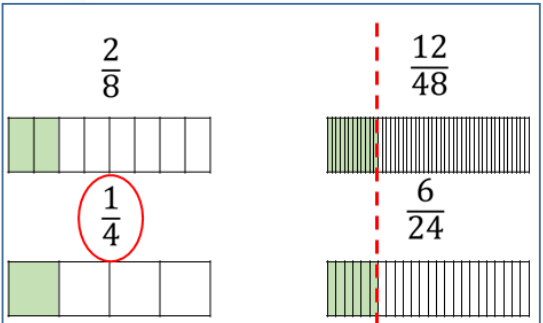
Quotient

Divisor $\rightarrow 5 \overline{) 361} \leftarrow$ Dividend

-35
 11
 -10
 $1 \leftarrow$ Remainder

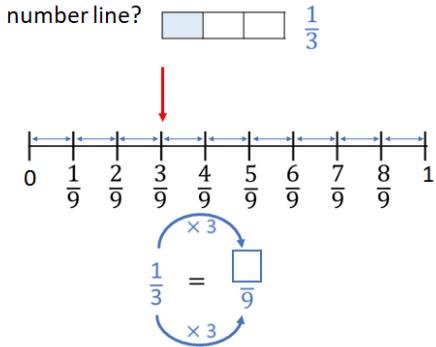


Equivalent fractions and simplest form

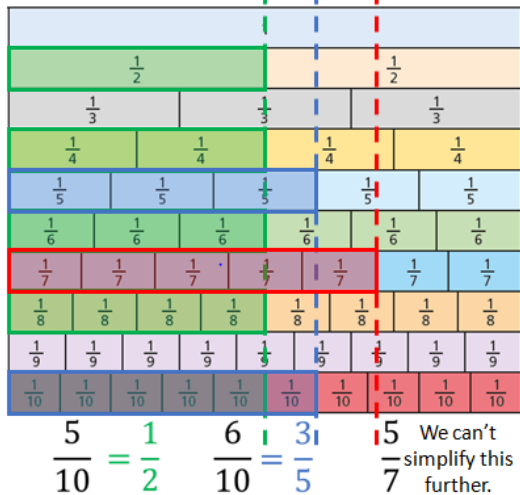


These fractions are all equivalent. $\frac{1}{4}$ is the fraction in its simplest form.

Where would this representation go on the number line?

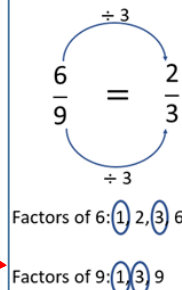


We can use the fraction wall to simplify



$\frac{5}{10} = \frac{1}{2}$ $\frac{6}{10} = \frac{3}{5}$ $\frac{5}{7}$ We can't simplify this further.

A fraction is in its simplest form if the numerator and denominator have no common factors other than one.

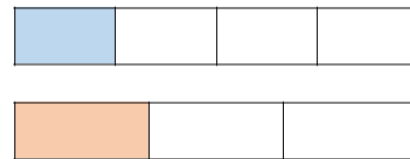


When you simplify fractions, whatever you do to the numerator, you must do to the denominator!

Year 6 Fractions A

Adding fractions with different denominators.

$$\frac{1}{4} + \frac{1}{3}$$

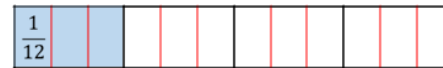


We need to find a common denominator.

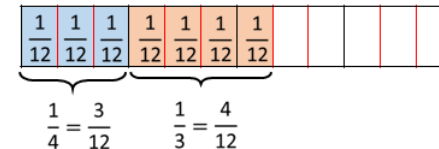
We can find the first common multiple of 4 and 3. We must find equivalent fractions for both fractions.

$$\frac{1}{4} + \frac{1}{3}$$

First divide each quarter into 3 equal parts.



Now divide each third into 4 equal parts.



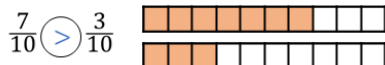
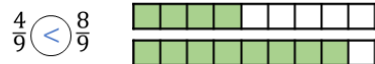
$$\frac{1}{4} + \frac{1}{3} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$$

Adding and subtracting mixed numbers

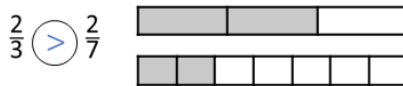
- ### Vocabulary
- Equivalent
 - common factors
 - simplest form
 - simplify
 - numerator
 - denominator
 - mixed number
 - improper fraction
 - interval
 - compare
 - order
 - multiple
 - lowest common multiple
 - add
 - subtract
 - partition
 - convert

Ordering and comparing fractions

Write $>$, $<$ or $=$ to compare the fractions



When the denominators are the same, the greater the numerator, the smaller the fraction.



When the numerators are the same, the smaller the denominator, the greater the fraction.

Add or subtract the whole numbers and fractions separately.

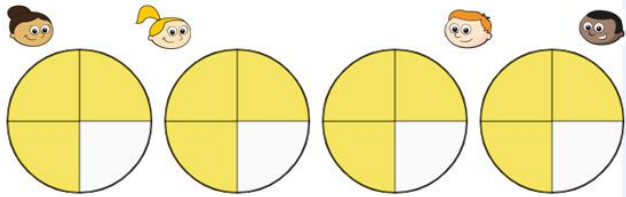
$2\frac{2}{5} + 1\frac{3}{10}$	$2\frac{1}{2} - 1\frac{1}{4}$
$2+1=3$	$2-1=1$
$\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$	$\frac{1}{2} - \frac{1}{4} = \frac{2}{4} - \frac{1}{4} = \frac{1}{4}$
$3 + \frac{7}{10} = 3\frac{7}{10}$	$1 + \frac{1}{4} = 1\frac{1}{4}$

Convert the mixed numbers to improper fractions.

$2\frac{2}{5} = \frac{12}{5}$	$1\frac{3}{10} = \frac{13}{10}$	$2\frac{1}{2} = \frac{5}{2}$	$1\frac{5}{4} = \frac{9}{4}$
$\frac{12}{5} + \frac{13}{10} = \frac{24}{10} + \frac{13}{10} = \frac{37}{10}$	$\frac{37}{10} = 3\frac{7}{10}$	$\frac{5}{2} - \frac{5}{4} = \frac{10}{4} - \frac{5}{4} = \frac{5}{4}$	$\frac{5}{4} = 1\frac{1}{4}$

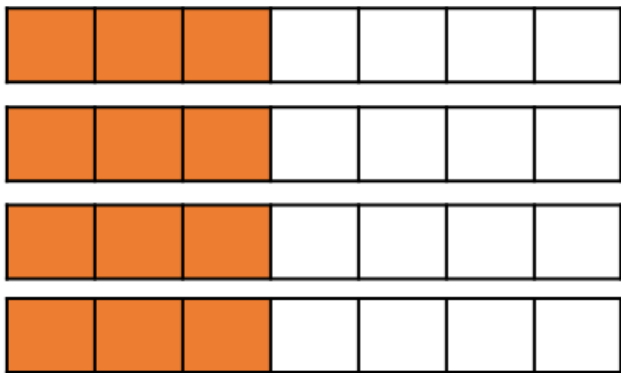


Multiplying fractions by an integer



3 quarters \times 4 = 12 quarters

$$\frac{3}{4} \times 4 = \frac{12}{4}$$

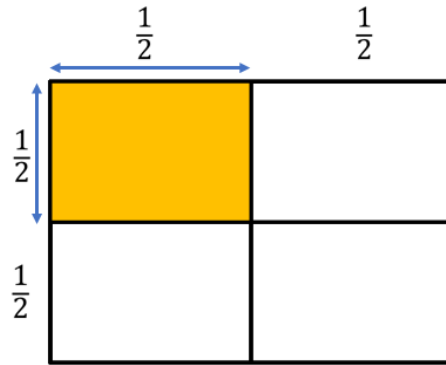


$$\frac{3}{7} \times 4 = \frac{12}{7}$$

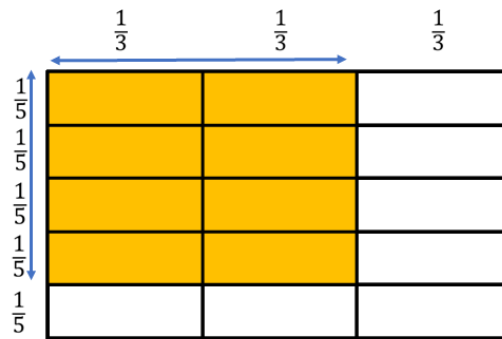
Year 6 Fractions B

Multiplying fractions by fractions

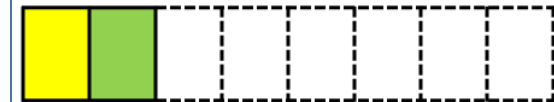
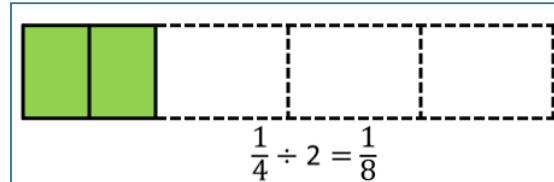
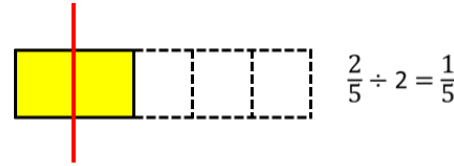
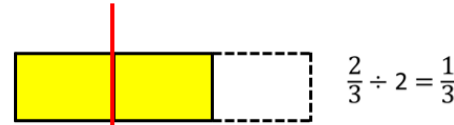
$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$



$$\frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$$



Dividing fractions by an integer



Fraction of an amount

$$\frac{3}{4} \text{ of } 36$$

Divide by the denominator then multiply by the numerator

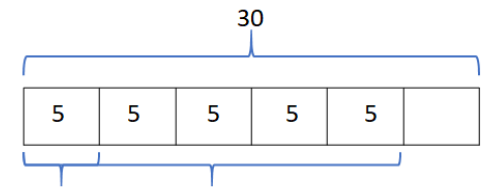
$$36 \div 4 = 9 \times 3 = 27$$

$$\left(\frac{3}{4} \text{ of } 36 = 27\right)$$

Vocabulary

- Fraction
- Integer
- multiply
- divide
- mixed number
- improper fraction
- equal parts
- whole
- worth
- amount
- quantity

$$\frac{5}{6} \text{ of } 30 = 25$$



$$30 \div 6 = 5$$

$$5 \times 5 = 25$$

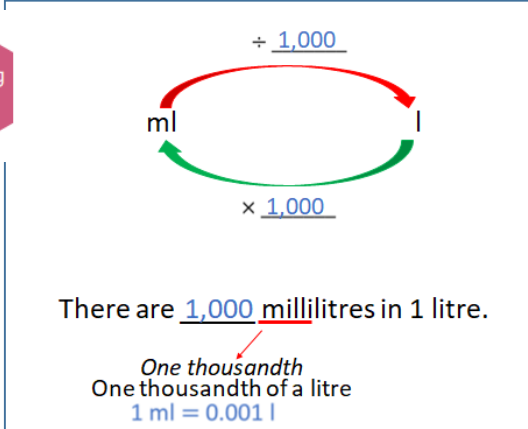
If one-sixth is equal to 5, then five-sixths are equal to 25



Year 6 Converting Units

Length	The measurement of something from end to end
Capacity	The maximum amount that something can contain
Mass	The amount of matter that makes up an object or substance

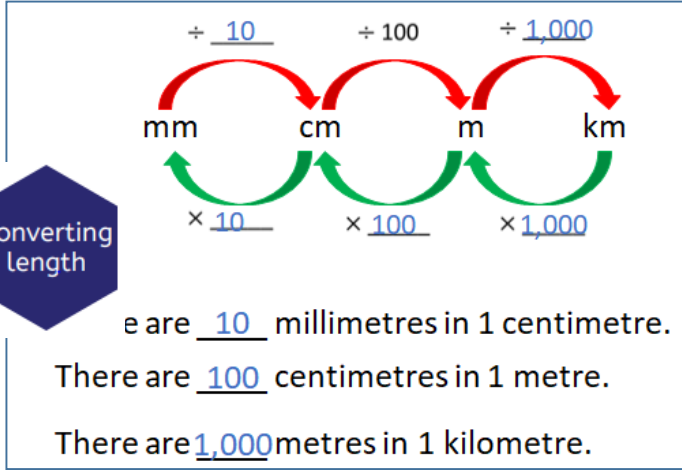
Converting capacity



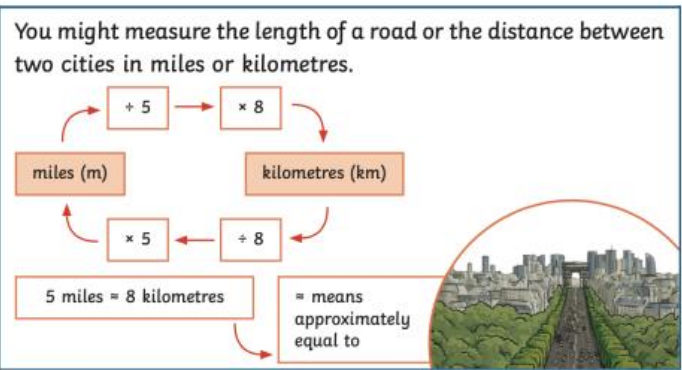
$1000 \text{ ml} = 1 \text{ l}$	$\frac{1}{2} \text{ l} = 0.5 \text{ l} = 500 \text{ ml}$
$\frac{1}{10} \text{ l} = 0.1 \text{ l} = 100 \text{ ml}$	$\frac{3}{4} \text{ l} = 0.75 \text{ l} = 750 \text{ ml}$
$\frac{1}{4} \text{ l} = 0.25 \text{ l} = 250 \text{ ml}$	$\frac{1}{100} \text{ l} = 0.01 \text{ l} = 10 \text{ ml}$

- ### Vocabulary
- Units of measure
 - estimate
 - length
 - mass
 - capacity
 - volume
 - kilometre km
 - metre m
 - kilogram kg
 - gram g
 - millilitre ml
 - litre l
 - inch
 - foot
 - stone
 - gallon
 - pound
 - miles
 - distance
 - approximate \approx
 - greater
 - heavier
 - longer
 - shorter

Converting length

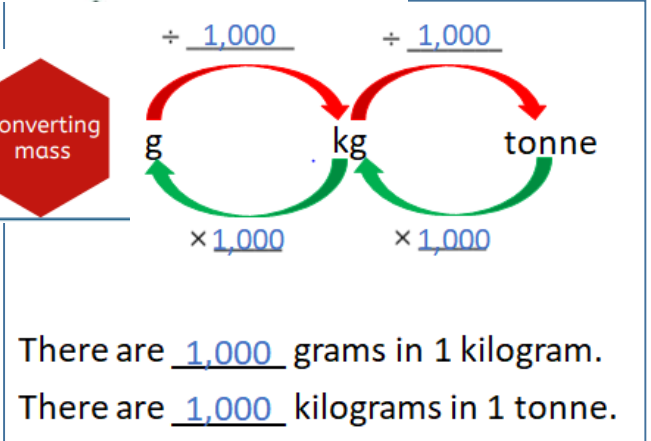


Miles to kilometres



$1000 \text{ m} = 1 \text{ km}$	$\frac{1}{2} \text{ m} = 0.5 \text{ m} = 50 \text{ cm}$	$\frac{3}{4} \text{ m} = 0.75 \text{ m} = 75 \text{ cm}$
$100 \text{ cm} = 1 \text{ m}$	$\frac{1}{4} \text{ m} = 0.25 \text{ m} = 25 \text{ cm}$	$\frac{1}{10} \text{ m} = 0.01 \text{ m} = 10 \text{ cm}$
$10 \text{ mm} = 1 \text{ cm}$		

Converting mass



$1 \text{ tonne} = 1000 \text{ kg}$	$\frac{1}{4} \text{ kg} = 0.25 \text{ kg} = 250 \text{ g}$
$1000 \text{ g} = 1 \text{ kg}$	$\frac{1}{2} \text{ kg} = 0.5 \text{ kg} = 500 \text{ g}$
$\frac{1}{10} \text{ kg} = 0.1 \text{ kg} = 100 \text{ g}$	$\frac{3}{4} \text{ kg} = 0.75 \text{ kg} = 750 \text{ g}$