



Year 6

Place value in numbers to 10million

The position of the digit gives its size

Ten millions	Millions	Hundred thousands	Ten thousands	thousands	hundreds	tens	units
1	2	3	4	5	6	7	8

Example

The value of the digit '1' is 10 000 000

The value of the digit '2' is 2 000 000

The value of the digit '3' is 300 000

The value of the digit '4' is 40 000

Round whole numbers

Example 1- Round 342 679 to the nearest 10 000

- Step 1 - Find the 'round-off digit' - 4
- Step 2 - Move one digit to the right - 2

4 or less? YES - leave 'round off digit' unchanged
 - Replace following digits with zeros

ANSWER - 340 000

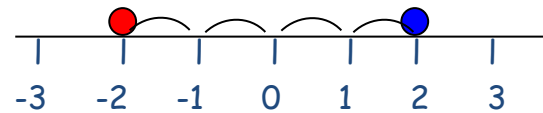
Example 2- Round 345 679 to the nearest 10 000

- Step 1 - Find the 'round-off digit' - 4
- Step 2 - Move one digit to the right - 5

5 or more? YES - add one to 'round off digit'
 - Replace following digits with zeros

ANSWER - 350 000

Negative numbers



$2 > -2 \rightarrow$ We say 2 is bigger than -2

$-2 < 2 \rightarrow$ We say -2 is less than 2

The difference between 2 and -2 = 4 (see line)

Remember the rules:

- When subtracting go down the number line
- When adding go up the number line
- $8 + -2$ is the same as $8 - 2 = 6$
- $8 - +2$ is the same as $8 - 2 = 6$
- $8 - -2$ is the same as $8 + 2 = 10$

Multiply numbers & estimate to check

e.g. 152×34

COLUMN METHOD

$$\begin{array}{r}
 152 \\
 34 \times \\
 \hline
 608 \quad (\times 4) \\
 4560 \quad (\times 30) \\
 \hline
 5168
 \end{array}$$

Use estimates to check calculations

$$\begin{array}{l}
 152 \times 34 \\
 \approx 150 \times 30 \\
 \approx 4500
 \end{array}$$

$\approx$ is the
symbol for
'roughly equals'

Divide numbers & estimate to check

With a remainder also expressed as a fraction

e.g. $4928 \div 32$

BUS SHELTER METHOD

$$\begin{array}{r}
 028 \\
 15 \overline{) 432} \\
 \underline{-30} \downarrow \\
 132 \\
 \underline{-120} \\
 12
 \end{array}$$

ANSWER - $432 \div 15 = 28 \text{ r } 12$

$$= 28 \frac{12}{15}$$

continued

With a remainder expressed as a decimal

$$\begin{array}{r} 028.8 \\ 15 \overline{)432.0} \\ \underline{-30} \\ 132 \\ \underline{-120} \\ 12 \end{array}$$

ANSWER - $432 \div 15 = 28.8$

Use estimates to check calculations

$$\begin{aligned} 432 \div 15 \\ \approx 450 \div 15 \\ \approx 30 \end{aligned}$$

Factors, multiples & primes

- FACTORS** are what divides exactly into a number

e.g. Factors of 12 are: Factors of 18 are:

1	12
2	6
3	4

1	18
2	9
3	6

The common factors of 12 & 18 are: 1, 2, 3, 6,
The Highest Common Factor is: 6

- PRIME NUMBERS** have only TWO factors

e.g. Factors of 7 are: Factors of 13 are

1	7
---	---

1	13
---	----

So 7 and 13 are both prime numbers

- MULTIPLES** are the times table answers

e.g. Multiples of 5 are:

5 10 15 20 25

Multiples of 4 are:

4 8 12 16 20

The Lowest Common Multiple of 5 and 4 is: 20

Order of operations

Bracket

Indices

Divide

Multiply

Add

Subtract

} Do these in the order they appear

} Do these in the order they appear

$$\text{e.g. } 3 + 4 \times 6 - 5 = 22$$

$$\begin{array}{c} \uparrow \text{first} \\ (2+1) \times 3 = 9 \\ \uparrow \\ \text{first} \end{array}$$

Addition

- Line up the digits in the correct columns

$$\text{e.g. } 48p + \text{£}2.84 + \text{£}9$$

$$\begin{array}{r} 0.48 \\ 2.84 \\ 9.00+ \\ \hline \text{£}12.32 \\ 1 \quad 1 \quad 1 \end{array}$$

Subtraction

- Line up the digits in the correct columns

$$\text{e.g. } 645 - 427$$

$$\begin{array}{r} \text{H T U} \\ 6 \cancel{4}^{3} 5 \\ - 4 2 7 \\ \hline 2 1 8 \end{array}$$

Equivalent fractions

- To simplify a fraction

$$\text{Example: } \frac{27}{36}$$

First find the highest common factor of the numerator and denominator - which is 9, then divide

$$\frac{27 \div 9}{36 \div 9} = \frac{3}{4}$$

- To change fractions to the same denominator

$$\text{Example: } \frac{3}{4} \text{ and } \frac{2}{3}$$

Find the highest common multiple of the denominators - which is 12, then multiply:

$$\frac{3 \times 3}{4 \times 3} = \frac{9}{12} \quad \text{and} \quad \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

Add & subtract fractions

- Make the denominators the same

$$\begin{aligned} \text{e.g. } \frac{1}{5} + \frac{7}{10} \\ = \frac{2}{10} + \frac{7}{10} \\ = \frac{9}{10} \end{aligned}$$

$$\begin{aligned} \text{e.g. } \frac{4}{5} - \frac{2}{3} \\ = \frac{12}{15} - \frac{10}{15} \\ = \frac{2}{15} \end{aligned}$$

Do not add denominators

Multiply fractions

- Write 5 as $\frac{5}{1}$
- Multiply numerators & denominators

$$\begin{aligned} \text{e.g. } 5 \times \frac{2}{3} \\ = \frac{5}{1} \times \frac{2}{3} \\ = \frac{10}{3} = 3\frac{1}{3} \end{aligned}$$

$$\begin{aligned} \text{e.g. } \frac{4}{5} \times \frac{2}{3} \\ = \frac{8}{15} \end{aligned}$$

Divide fractions

- Write 5 as $\frac{5}{1}$
- Invert the fraction after $\div$ sign
- Multiply numerators & denominators

$$\begin{aligned} \text{e.g. } \frac{2}{3} \div 5 \\ = \frac{2}{3} \times \frac{1}{5} \\ = \frac{2}{15} \end{aligned}$$

$$\begin{aligned} \text{e.g. } \frac{4}{5} \div \frac{2}{3} \\ = \frac{4}{5} \times \frac{3}{2} \\ = \frac{12}{10} = 1\frac{2}{10} = 1\frac{1}{5} \end{aligned}$$

Multiply/divide decimals by 10, 100

thousands	hundreds	tens	units	•	tenths	hundredths	thousandths
4	3	5	2	•	6	1	7

- To **multiply by 10**, move each digit one place to the left
e.g. $35.6 \times 10 = 356$

Hundreds	Tens	Units	•	tenths
	3	5	•	6
3	5	6	•	

- To **divide by 10**, move each digit one place to the right

$$\text{e.g. } 35.6 \div 10 = 3.56$$

Tens	Units	•	tenths	hundredths
3	5	•	6	
	3	•	5	6

- To **multiply by 100**, move each digit 2 places to the left
- To **divide by 100**, move each digit 2 places to the right

Multiply decimals

Step 1 - remove the decimal point

Step 2 - multiply the two numbers

Step 3 - Put the decimal back in

Example: 0.06×8

$$\begin{aligned} \Rightarrow 6 \times 8 \\ \Rightarrow 48 \\ \Rightarrow 0.48 \end{aligned}$$

Divide decimals

Use the bus shelter method

Keep the decimal point in the same place

Add zeros for remainders

Example: $6.28 \div 5$

$$\begin{array}{r} 1.256 \\ 5 \overline{) 6.2830} \end{array}$$

Fraction, decimal, percentage equivalents

LEARN THESE:

$$\frac{1}{4} = 0.25 = 25\%$$

$$\frac{1}{2} = 0.5 = 50\%$$

$$\frac{3}{4} = 0.75 = 75\%$$

$$\frac{1}{10} = 0.1 = 10\%$$

• Percentage to decimal to fraction

$$27\% = 0.27 = \frac{27}{100}$$

$$7\% = 0.07 = \frac{7}{100}$$

$$70\% = 0.7 = \frac{70}{100} = \frac{7}{10}$$

• Decimal to percentage to fraction

$$0.3 = 30\% = \frac{3}{10}$$

$$0.03 = 3\% = \frac{3}{100}$$

$$0.39 = 39\% = \frac{39}{100}$$

• Fraction to decimal to percentage

$$\frac{4}{5} = \frac{80}{100} = 80\% = 0.8$$

Change to 100

$$\frac{3}{8} = 3 \div 8 = 8) \overline{3.306040} = 0.375 = 37.5\%$$

$$\frac{9}{12} = \frac{3}{4} = 0.75 = 75\%$$

Cancel by 3

Fraction of quantity

- $\frac{4}{5}$ means $\div 5 \times 4$

e.g. To find $\frac{4}{5}$ of £40

$$£40 \div 5 \times 4 = £40$$

Percentage of quantity

Use only

- 50% - $\frac{1}{2}$
- 10% - $\frac{1}{10}$
- 1% - $\frac{1}{100}$

Example : To find 35% of £400

$$10\% = £40$$

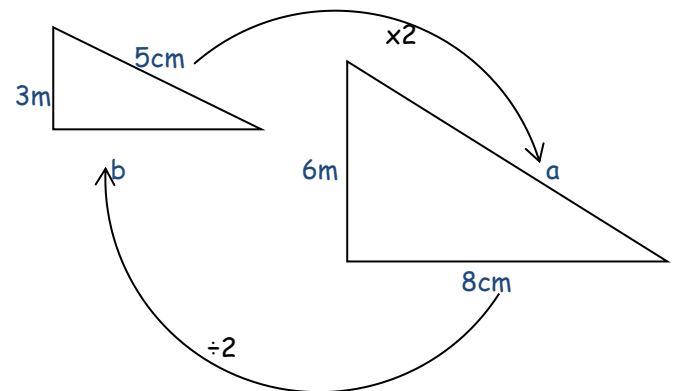
$$20\% = £80$$

$$5\% = £20$$

$$35\% = £140$$

Similar shapes

When a shape is enlarged by a scale factor the two shapes are called **SIMILAR** shapes



$$\text{Scale factor} = 6 \div 3 = 2$$

$$\text{Length } a = 5 \times 2 = 10\text{cm}$$

$$\text{Length } b = 8 \div 2 = 4\text{cm}$$

Unequal sharing

Example- unequal sharing of sweets

A gets

B gets

3 shares

4 shares

$\Rightarrow$ 3 sweets

4 sweets

$\Rightarrow$ 12 sweets $\times 4$

16 sweets $\times 4$

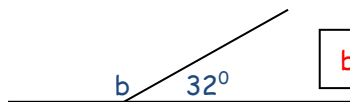
Express missing numbers algebraically

An unknown number is given a letter

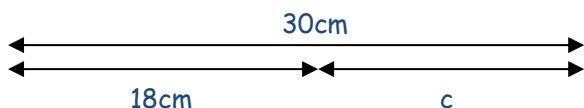
Examples

$$2a - 4 = 8$$

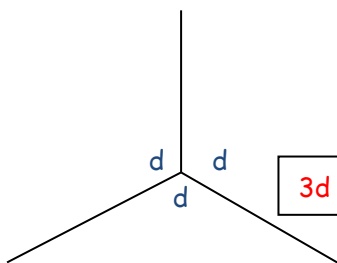
$$2a = 12 \text{ so } a = 6$$



$$b + 32 = 180 \text{ so } b = 148^\circ$$



$$18 + c = 30 \text{ so } c = 12$$



$$3d = 360^\circ \text{ so } d = 120^\circ$$

Use a word formula

Example: - Time to cook a turkey

Cook for 45min per kg weight
Then a further 45min

For a 6kg turkey, follow the formula:

$$45\text{min} \times 6 + 45\text{min}$$

$$= 270\text{min} + 45\text{min}$$

$$= 315\text{min}$$

$$= \underline{5\text{h } 15\text{min}}$$

Number sequences

• Understand position and term

Position	1	2	3	4
Term	3	7	11	15



+4

Term to term rule = +4

Position to term rule is $\times 4 - 1$

(because position $1 \times 4 - 1 = 3$)

$$n\text{th term} = n \times 4 - 1 = 4n - 1$$

• Generate terms of a sequence

If the nth term is $5n + 1$

$$1^{\text{st}} \text{ term } (n=1) = 5 \times 1 + 1 = 6$$

$$2^{\text{nd}} \text{ term } (n=2) = 5 \times 2 + 1 = 11$$

$$3^{\text{rd}} \text{ term } (n=3) = 5 \times 3 + 1 = 16$$

Possible solutions of a number sentence

Example: x and y are numbers

$$\text{Rule: } x + y = 5$$

Possible solutions: $x = 0$ and $y = 5$

$$x = 1 \text{ and } y = 4$$

$$x = 2 \text{ and } y = 3$$

$$x = 3 \text{ and } y = 2$$

$$x = 4 \text{ and } y = 1$$

$$x = 5 \text{ and } y = 0$$

Convert units of measure

METRIC

When converting measurements follow these rules:

• When converting from a **larger unit to a smaller unit** we **multiply** ($\times$)

• When converting from a **smaller unit to a larger unit** we **divide** ($\div$)

UNITS of LENGTH

$$10\text{mm} = 1\text{cm}$$

$$100\text{cm} = 1\text{m}$$

$$1000\text{m} = 1\text{km}$$

UNITS of MASS

$$1000\text{g} = 1\text{kg}$$

$$1000\text{kg} = 1\text{tonne}$$

UNITS of VOLUME

$$1000\text{ml} = 1\text{litre}$$

$$100\text{cl} = 1\text{litre}$$

UNITS of TIME

$$60\text{sec} = 1\text{min}$$

$$60\text{min} = 1\text{hour}$$

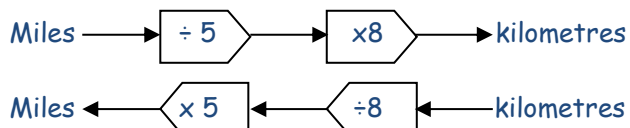
$$24\text{h} = 1\text{day}$$

$$365\text{days} = 1\text{year}$$

Convert units of measure

METRIC/IMPERIAL

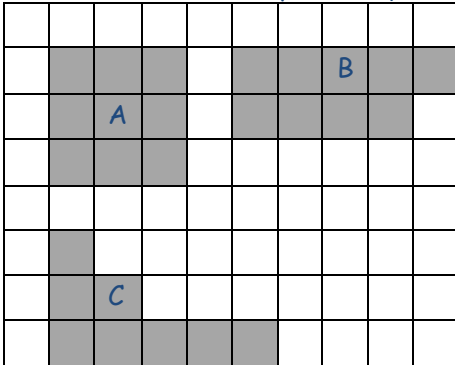
LEARN: 5 miles = 8km



Perimeter and area of shapes

Shapes can have the SAME area but different perimeters

The area of each shape is 9 squares

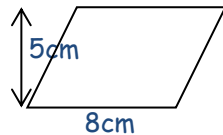


Perimeter of each shape is different
A - 12; B - 14; C - 16

Area of parallelogram & triangle

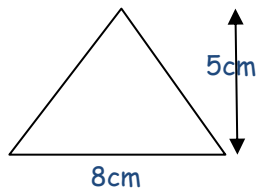
- Area of parallelogram

$$\begin{aligned}\text{Area of parallelogram} &= b \times h \\ &= 8 \times 5 \\ &= \underline{40\text{cm}^2}\end{aligned}$$



- Area of triangle ($\frac{1}{2}$ a parallelogram)

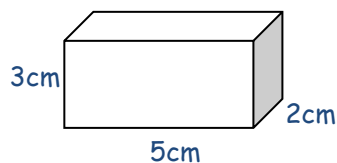
$$\begin{aligned}\text{Area of triangle} &= \frac{b \times h}{2} \\ &= \frac{8 \times 5}{2} \\ &= \underline{20\text{cm}^2}\end{aligned}$$



Volume

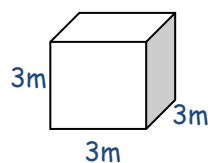
- Volume of cuboid

$$\begin{aligned}\text{Volume} &= l \times w \times h \\ &= 5 \times 3 \times 2 \\ &= \underline{30\text{cm}^3}\end{aligned}$$



- Volume of cube

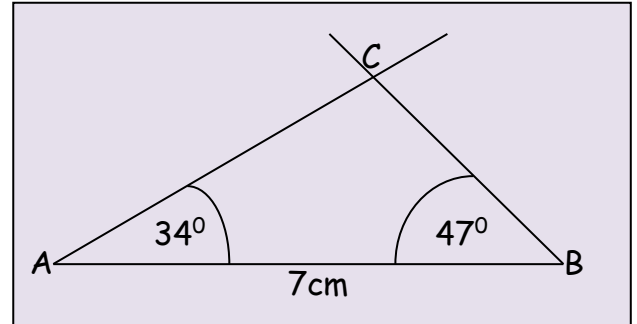
$$\begin{aligned}\text{Volume} &= l \times w \times h \\ &= 3 \times 3 \times 3 \\ &= \underline{27\text{m}^3}\end{aligned}$$



Construct 2D shapes

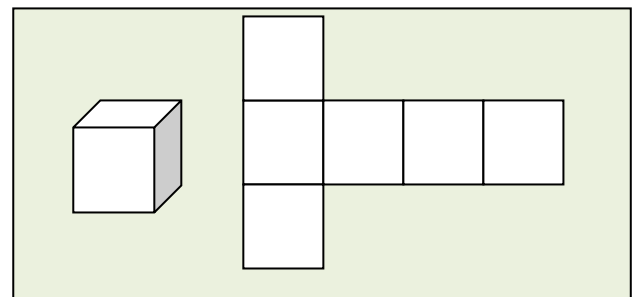
Example : Triangle with side and angles given

- Draw line AB = 7cm
- Draw angle 34° at point A from line AB
- Draw angle 47° at point B from line AB
- Extend to intersect the lines at C

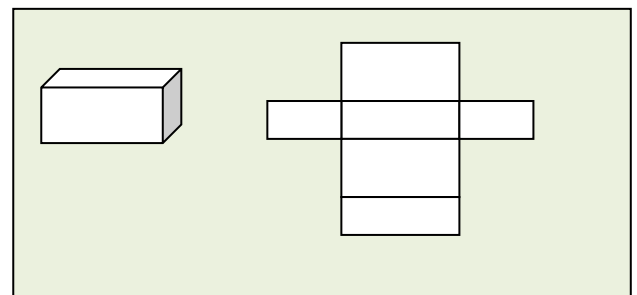


Construct 3D shapes

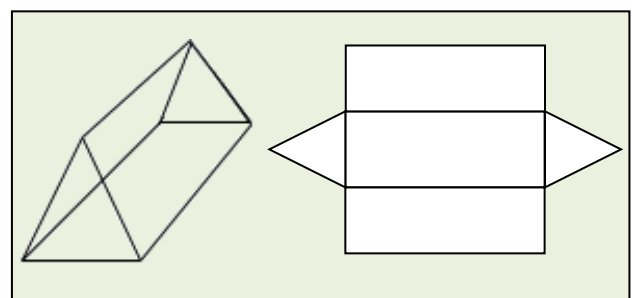
CUBE & its net



CUBOID & its net



TRIANGULAR PRISM & its net

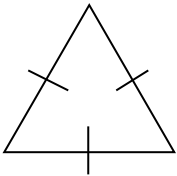


Properties of shapes

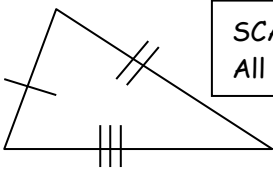
TRIANGLES - sum of angles = 180°



ISOSCELES triangle
2 equal sides & 2 equal angles

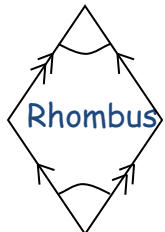
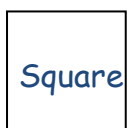


EQUILATERAL triangle
3 equal sides & ALL angles 60°



SCALENE triangle
All sides & angles different

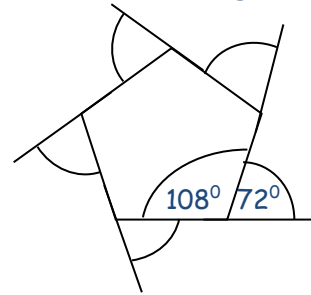
QUADRILATERALS - sum of angles = 360°



REGULAR POLYGONS - all sides the same

- Polygons have straight sides
- Polygons are named by the number sides
 - 3 sides - triangle
 - 4 sides - quadrilateral
 - 5 sides - pentagon
 - 6 sides - hexagon
 - 7 sides - heptagon
 - 8 sides - octagon
 - 9 sides - nonagon
 - 10 sides - decagon

- Sum of exterior angles is always 360°



- interior & exterior angle add up to 180°

- the interior angles add up to:

Triangle $= 1 \times 180^\circ = 180^\circ$

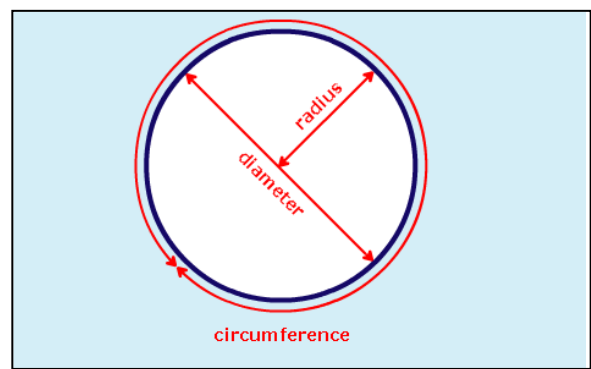
Quadrilateral $= 2 \times 180^\circ = 360^\circ$

Pentagon $= 3 \times 180^\circ = 540^\circ$

Hexagon $= 4 \times 180^\circ = 720^\circ$ etc

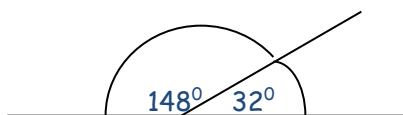
Parts of a circle

- The circumference is the distance all the way around a circle.
- The diameter is the distance right across the middle of the circle, passing through the centre.
- The radius is the distance halfway across the circle.
- The radius is always half the length of the diameter. ($d = 2 \times r$) or ($r = \frac{1}{2} \times d$)



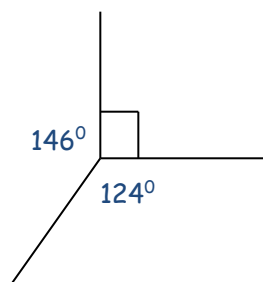
Angles and straight lines

- Angles on a straight line add up to 180°



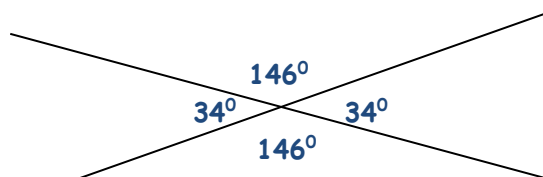
$$148^\circ + 32^\circ = 180^\circ$$

- Angles about a point add up to 360°

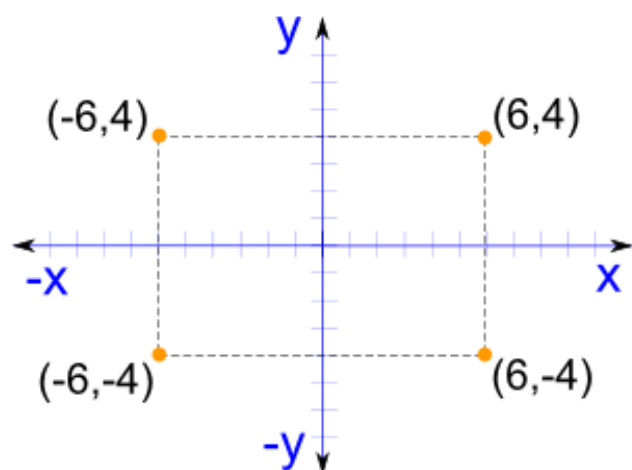


$$146^\circ + 90^\circ + 124^\circ = 360^\circ$$

- Vertically opposite angles are equal

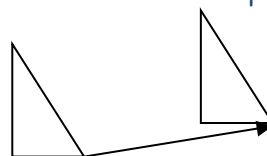


Position on a co-ordinate grid



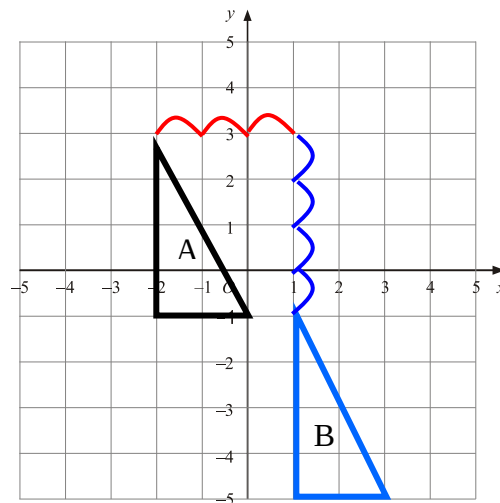
Transformations

- Translation** - A shape moved along a line



Example - Move shape A 3 right & 4 down

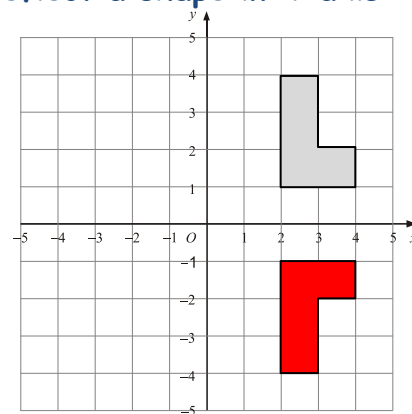
Can also be written as a vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ Right Down



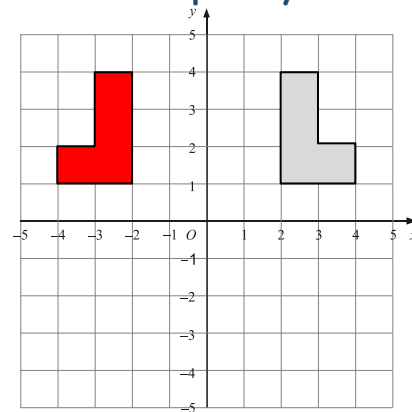
Notice:

- The new shape stays the same way up
- The new shape is the same size

- Reflect a shape in x-axis**



- Reflect a shape in y-axis**

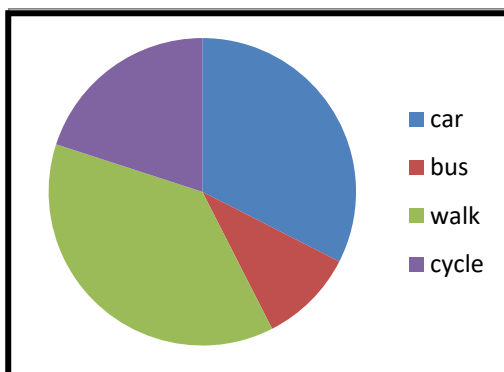


Graphs

○ Pie chart

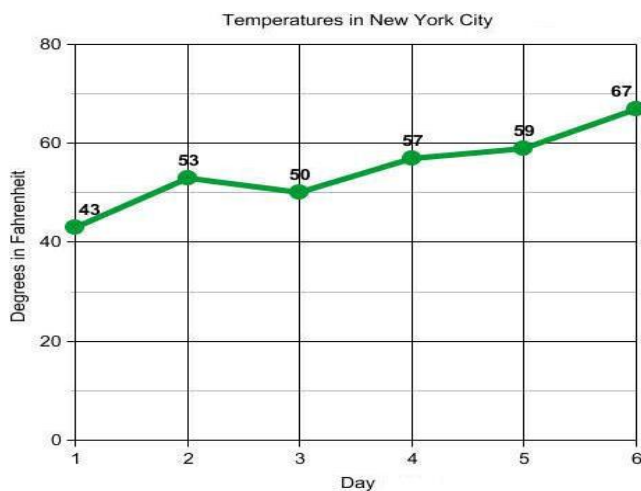
Transport	Frequency	Angle
Car	13	$13 \times 9 = 117^\circ$
Bus	4	$4 \times 9 = 36^\circ$
Walk	15	$15 \times 9 = 135^\circ$
Cycle	8	$8 \times 9 = 72^\circ$

↑
Total frequency = 40
 $360^\circ \div 40 = 9^\circ$ per person



○ Line graph

Line graphs show changes in a single variable - in this graph changes in temperature can be observed.



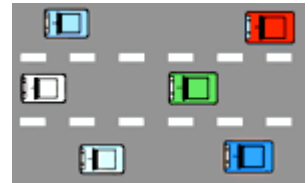
The mean

The mean is usually known as the average.
The mean is not a value from the original list.
It is a typical value of a set of data

Mean = total of measures $\div$ no. of measures

e.g.- Find mean speed of 6 cars travelling on a road

Car 1 - 66mph
Car 2 - 57mph
Car 3 - 71mph
Car 4 - 54mph
Car 5 - 69mph
Car 6 - 58mph



$$\text{Mean} = \frac{66+57+71+54+69+58}{6}$$

$$= \frac{375}{6}$$

$$= 62.5\text{mph}$$

Mean average speed was 62.5mph