

Band 6 Knowledge Organiser

6/1 Place value in numbers to 10million

The position of the digit gives its size

Ten millions	Millions	Hundred thousands	Ten thousands	thousands	hundreds	tens	ones
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

6/1 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

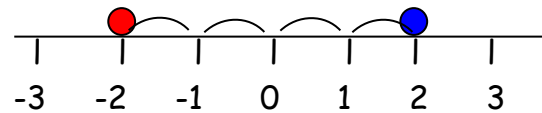
Example 2 - Round 345 679 to the nearest 10 000

- 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

6/2 Negative numbers



$2 > -2$ → We say 2 is bigger than -2

$-2 < 2$ → 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 $8 + 2 = 10$

6/3 Multiply and divide numbers

Multiplication
e.g. 152×34

Use this in your book to help you:

- $O \times O$ - ones x ones
- $O \times T$ - ones x tens
- $O \times H$ - ones x hundreds
- PH - Place holder as now multiplying by tens
- $T \times O$ = tens multiplied by ones
- $T \times T$ = tens multiplied by tens
- $T \times H$ = tens multiplied by H

$$\begin{array}{r}
 \text{HTO} \\
 152 \\
 \times \quad 34 \\
 \hline
 608 \\
 4560 \\
 \hline
 5168
 \end{array}$$

Multiply by the 4 (ones) first then multiply by the 30 (tens).

When multiplying by a tens, a place holder is needed as the number is 10 times larger.

Division

e.g. $4928 \div 32$

First write out key multiples:

$$1 \times 32 = 32$$

$$2 \times 32 = 64$$

$$5 \times 32 = 160$$

$$10 \times 32 = 320$$

If you know $2 \times 32 = 64$, you know that 20×32 is 640.

If you know $5 \times 32 = 160$, you know that 50×32 is 1600.

If you know $10 \times 32 = 320$, you know that 100×32 is 3200.

$$\begin{array}{r} 0 \ 154 \\ 32 \overline{) 4928} \\ \underline{- 3200} \times 100 \\ 1728 \\ \underline{- 1600} \times 50 \\ 128 \\ \underline{- 64} \times 2 \\ 64 \\ \underline{- 64} \times 2 \\ 00 \end{array}$$

Take off chunks of the number using your key multiples.

Once you get to zero, or a number LOWER than the divisor, you need to add the chunks to find your answer.

$$4928 \div 32 = \underline{154}$$

Division with a remainder

e.g. $432 \div 15$

BUS STOP METHOD

$$\begin{array}{r} 028 \\ 15 \overline{) 432} \\ \underline{- 300} \times 20 \\ 132 \\ \underline{- 120} \times 8 \\ 12 \end{array}$$

$$15 \overline{) 432} \text{ r } 12$$

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

With a remainder expressed as a decimal

$$5 \overline{) 432.0} = 86.4$$

When dividing, use a place holder after the decimal point to continue the division to express the remainder as a decimal.

$$\text{ANSWER} - 432 \div 5 = 86.4$$

6/4 Factors, multiples & primes

- **FACTORS** are what divides exactly into a number

e.g. Factors of 12 are:

$$\begin{array}{|c|c|} \hline 1 & 12 \\ \hline 2 & 6 \\ \hline 3 & 4 \\ \hline \end{array}$$

Factors of 18 are:

$$\begin{array}{|c|c|} \hline 1 & 18 \\ \hline 2 & 9 \\ \hline 3 & 6 \\ \hline \end{array}$$

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:

$$\begin{array}{|c|c|} \hline 1 & 7 \\ \hline \end{array}$$

Factors of 13 are:

$$\begin{array}{|c|c|} \hline 1 & 13 \\ \hline \end{array}$$

So 7 and 13 are both prime numbers

- **MULTIPLES** are the times table answers

e.g. Multiples of 5 are:

$$5 \ 10 \ 15 \ 20 \ 25 \ \dots$$

Multiples of 4 are:

$$4 \ 8 \ 12 \ 16 \ 20 \ \dots$$

The Lowest Common Multiple of 5 and 4 is: 20

6/5 Order of operations

B Bracket

O Orders

D Divide

M Multiply

A Add

S Subtract

} Do these in the order they appear

} Do these in the order they appear

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

↑ first (M)

$$(2 + 1) \times 3 = 9$$

↑
first (B)

$$9^2 - 36 \div 9 =$$

↑ ↙
first (O) second (D)

6/6 Addition and Subtraction

Add - e.g. 74735 add 22386

	T	T	H	T	O
	7	4	7	3	5
	2	2	3	8	6
+	1	1	1		
	9	7	1	2	1

Miss a line to carry numbers from one column to the next when needed.

Subtract - e.g. 82476 take away 58637

	T	T	H	T	O
	8	2	4	7	6
	5	8	6	3	7
	2	3	8	3	9

Miss a line to borrow or exchange numbers when needed.

With this method, you cannot take a bigger number from a smaller number. 6 - 7 would equal -1 which does not work here. So we borrow or exchange from the next column. We turn 7 tens into 6 tens and 6 ones into 16 ones.

6/7 Equivalent fractions

- To simplify a fraction

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

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

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

$$\frac{3^{x3}}{4^{x3}} = \frac{9}{12} \text{ and } \frac{2^{x4}}{3^{x4}} = \frac{8}{12}$$

6/8 Add & subtract fractions

- Make the denominators the same

e.g. $\frac{1}{5} + \frac{7}{10}$

$$= \frac{2}{10} + \frac{7}{10}$$

(x2)

$$= \frac{9}{10}$$

e.g. $\frac{4}{5} - \frac{2}{3}$

$$= \frac{12}{15} - \frac{10}{15}$$

(x3) (x5)

$$= \frac{2}{15}$$

6/9 Multiply fractions

Multiply fractions by whole numbers

$$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$$

Multiply the numerator by the whole number. Do not change the denominator.

Multiply fractions by fractions

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

Multiply the numerators - $4 \times 2 = 8$
 Multiply the denominators - $5 \times 3 = 15$

Multiply fractions by fractions

$$\frac{4}{7} \times \frac{3}{4} = \frac{12}{28} = \frac{6}{14} = \frac{3}{7}$$

Multiply the numerators - $4 \times 3 = 12$
 Multiply the denominators - $7 \times 4 = 28$

6/10 Divide fractions

$$\frac{8}{15} \div 4 = \frac{2}{15}$$

Divide the numerator by the whole number - $8 \div 4 = 2$.
Do not change the denominator.

$$\frac{3}{7} \div 5 = \frac{3}{35}$$

If the numerator cannot be equally divided by the whole number then multiply the denominator by the whole number.
 $3 \div 5 = 0.6$ (not a whole) so...
 $7 \times 5 = 35$
In this case, do not change the numerator.

6/12 Multiply decimals

$$\begin{array}{r} \text{HTO} \cdot \frac{1}{10} \frac{1}{100} \\ 0.31 \\ \quad 34 \\ \times 1. \\ \hline 09.30 \\ + 1. \\ \hline 10.54 \end{array}$$

When multiplying by a tens, a place holder is needed as the number is 10 times larger.

6/13 Fraction, decimal, percentage equivalents

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

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

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

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

6/11 Multiply/divide decimals by 10, 100

thousands	hundreds	tens	ones	•	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	Ones	•	tenths
	3	5	•	6
3	5	6	•	

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

e.g. $35.6 \div 10 = 3.56$

Tens	Ones	•	tenths	hundredths
3	5	•	6	
	3	•	5	6

To multiply or divide by 100, move each digit 2 places.

To multiply or divide by 1000, move each digit 3 places to the right

- 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

$$\frac{3}{8} = 3 \div 8 = 8) \overset{0.375}{3.000} = 0.375 = 37.5\%$$

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

Cancel by 3

6/14 Fraction of quantity

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

e.g. To find $\frac{4}{5}$ of £40

$$£40 \div 5 \times 4 = £32$$

6/15 Finding the whole

Sam spent **two thirds** of his money. If he'd spent **£60**, how much did he **start off** with?

If two thirds = £60, then one third = £30.
If one third = £30, then three thirds (or the whole) = £90

6/16 Percentage of quantity

Always start off by finding 10%

To find 10%, divide the number by 10.
To find 1%, divide the number by 100.

Example : To find 35% of £400

$$10\% = £40$$

$$20\% = £80$$

$$5\% = £20$$

$$35\% = £140$$

Example : To find 98% of £250

$$10\% = £25$$

$$1\% = £2.50$$

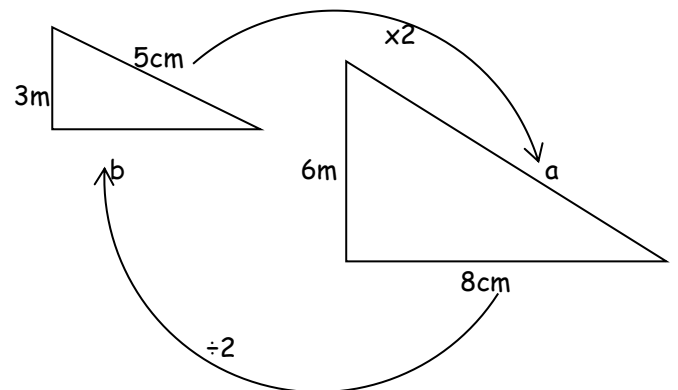
$$2\% = £5$$

$$98\% = 245$$

As 98% is two less than 100%, just subtract £5 from the total £250 - £5 = £245

6/17 Similar shapes

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



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

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

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

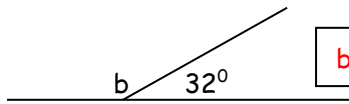
6/18 Express missing numbers algebraically

An unknown number is given a letter

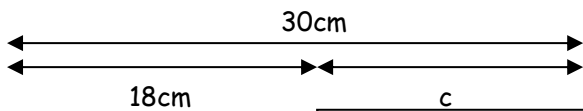
Examples

$2a - 4 = 8$

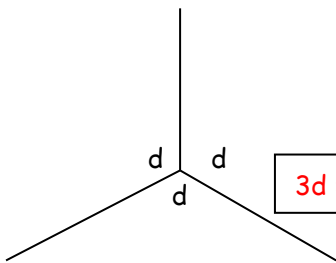
$2a = 12$ so $a = 6$



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



$18 + c = 30$ so $c = 12$



$3d = 360^\circ$ so $d = 120^\circ$

6/19 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:

$45 \text{ min} \times 6 + 45 \text{ min}$
 $= 270 \text{ min} + 45 \text{ min}$
 $= 315 \text{ min}$
 $= 5\text{h } 15\text{min}$

6/20 Number sequences

- Understand position and term

Position	1	2	3	4
Term	3	7	11	15



Term to term rule = **+4**

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

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

n th term = $n \times 4 - 1 = 4n - 1$

- Generate terms of a sequence

If the n th term is $5n + 1$

1st term ($n=1$) = $5 \times 1 + 1 = 6$

2nd term ($n=2$) = $5 \times 2 + 1 = 11$

3rd term ($n=3$) = $5 \times 3 + 1 = 16$

6/21 Possible solutions of a number sentence

Example: x and y are numbers

Rule: $x + y = 5$

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

$x = 1$ and $y = 4$

$x = 2$ and $y = 3$

$x = 3$ and $y = 2$

$x = 4$ and $y = 1$

$x = 5$ and $y = 0$

6/22 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

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

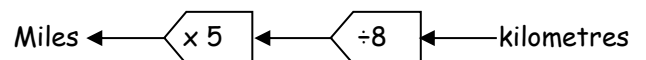
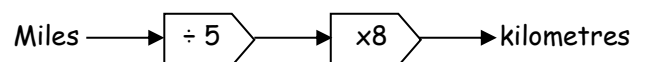
$60\text{min} = 1\text{hour}$

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

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

6/23 Convert units of measure METRIC/IMPERIAL

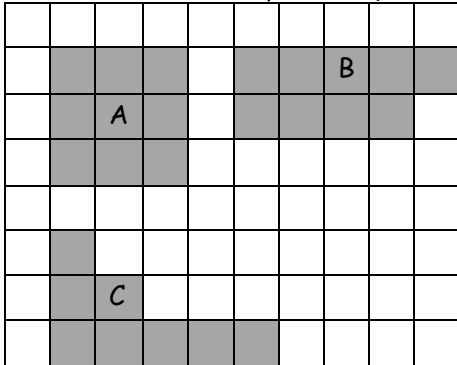
LEARN: 5 miles = 8km



6/24 Perimeter and area of shapes

Shapes can have the SAME area but different perimeters

The area of each shape is 9 squares

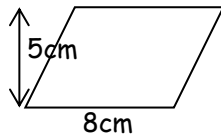


Perimeter of each shape is different
A - 12; B - 14; C - 16

6/25 Area of parallelogram & triangle

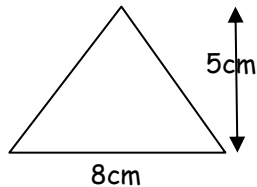
- Area of parallelogram

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



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

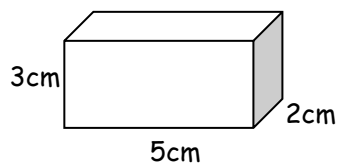
$$\begin{aligned} \text{Area of triangle} &= \frac{b \times h}{2} \\ &= \frac{8 \times 5}{2} \\ &= \underline{20\text{cm}^2} \end{aligned}$$



6/26 Volume

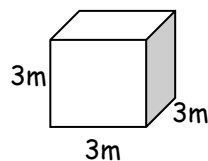
- Volume of cuboid

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



- Volume of cube

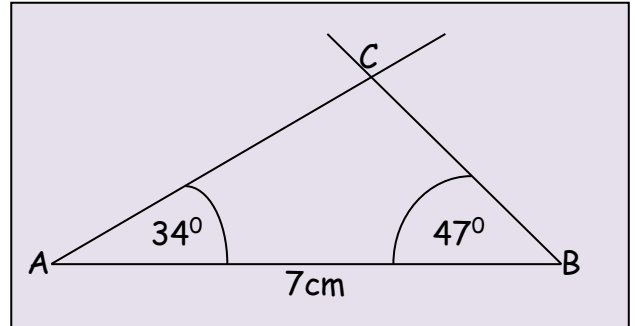
$$\begin{aligned} \text{Volume} &= l \times w \times h \\ &= 3 \times 3 \times 3 \\ &= 27\text{m}^3 \end{aligned}$$



6/27 Construct 2D shapes

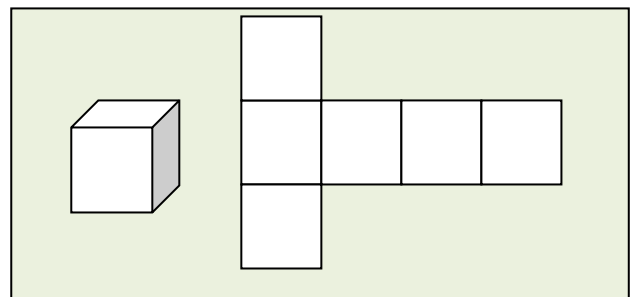
Example : Triangle with side and angles given

- Draw line $AB = 7\text{cm}$
- 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

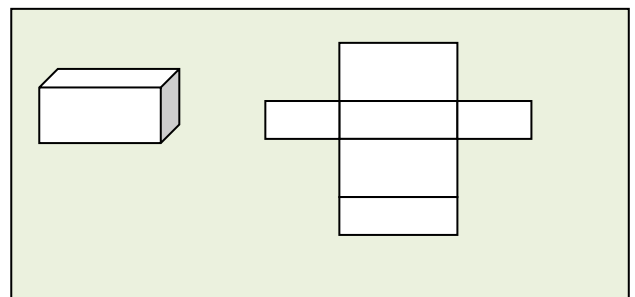


6/28 Construct 3D shapes

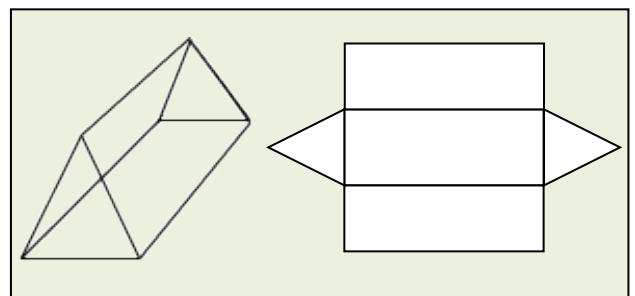
CUBE & its net



CUBOID & its net



TRIANGULAR PRISM & its net

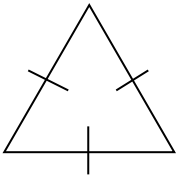


6/29 Properties of shapes

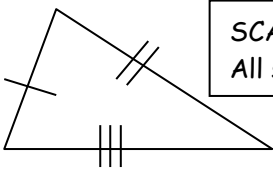
TRIANGLES - sum of angles = 180°



ISOSCELES triangle
2 equal sides & 2 equal angles

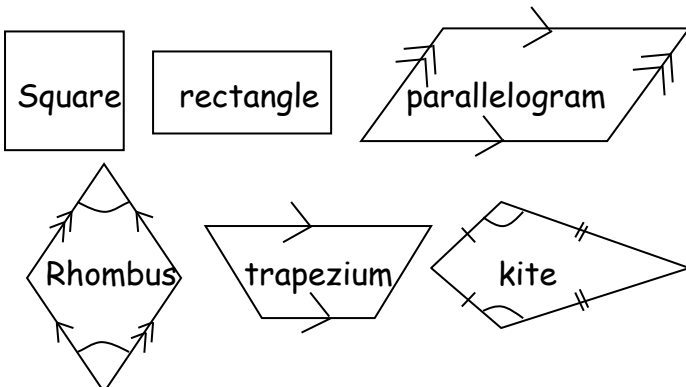


EQUILATERAL triangle
3 equal sides & ALL angles 60°



SCALENE triangle
All sides & angles different

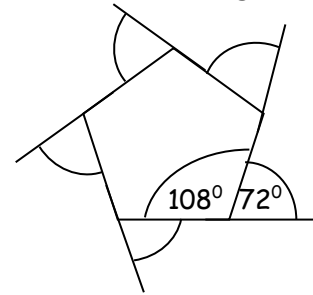
QUADRILATERALS - sum of angles = 360°



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

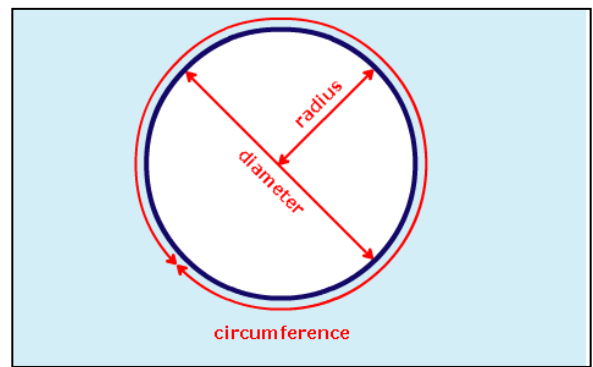
Quadrilateral = $2 \times 180^\circ = 360^\circ$

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

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

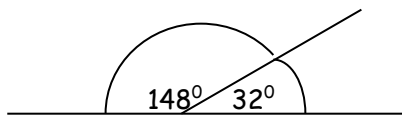
6/30 Parts of a circle

- 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 ($r = \frac{1}{2} \times d$)



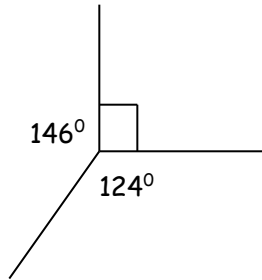
6/31 Angles and straight lines

- Angles on a straight line add up to 180°



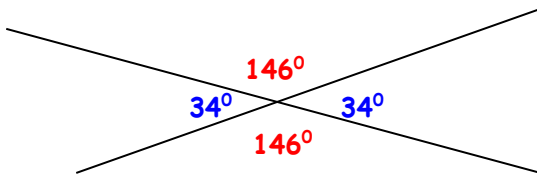
$$148^\circ + 32^\circ = 180^\circ$$

- Angles about a point add up to 360°

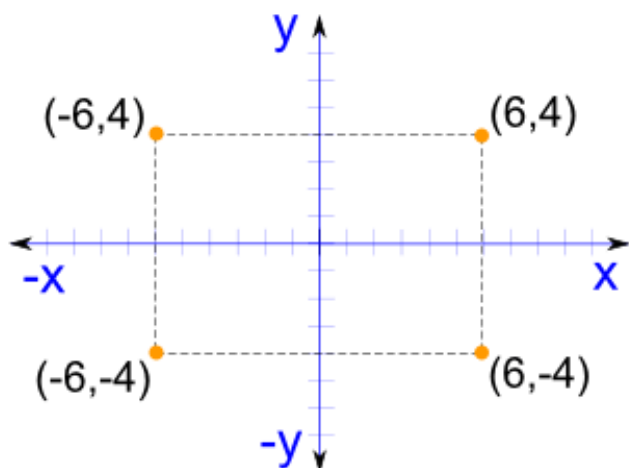


$$146^\circ + 90^\circ + 124^\circ = 360^\circ$$

- Vertically opposite angles are equal

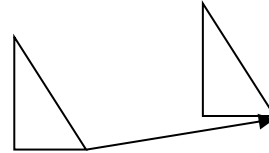


6/32 Position on a co-ordinate grid



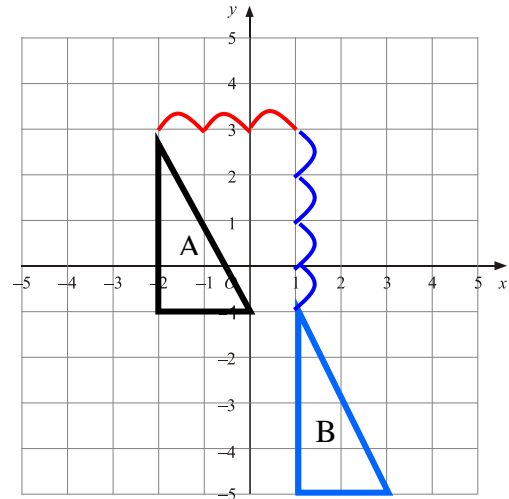
6/33 Transformations

- Translation** - A shape moved along a line



Example - Move shape A 3 right & 4 down

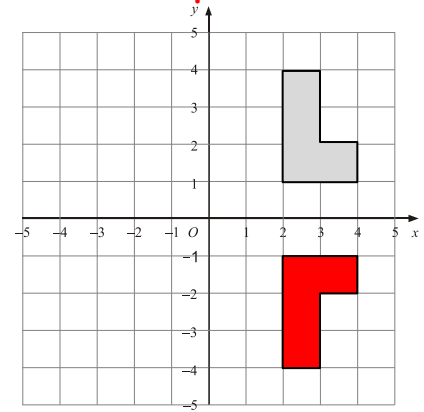
Can also be written as a vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ Right Down



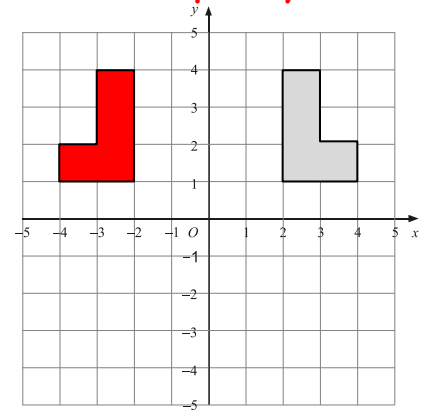
Notice:

- 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**

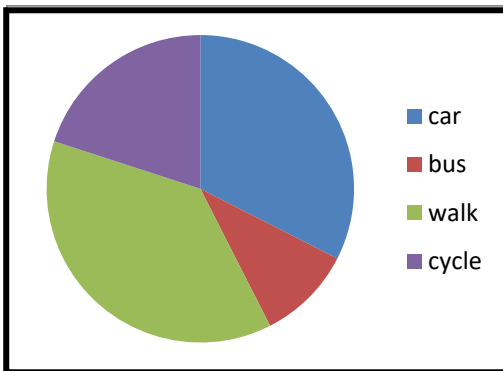


6/34 Graphs

○ Pie chart

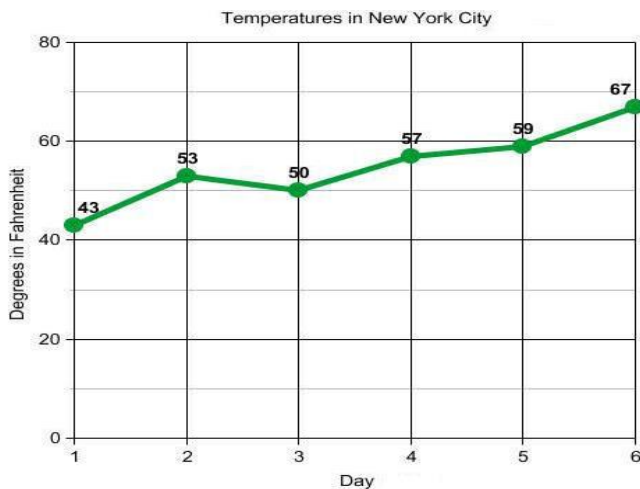
Transport	Frequency	Angle
Car	13	$13 \times 9 = 117^\circ$
Bus	4	$4 \times 9 = 36^\circ$
Walk	15	$15 \times 9 = 135^\circ$
Cycle	8	$8 \times 9 = 72^\circ$

↑
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.



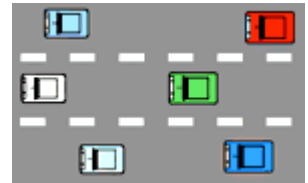
6/35 The mean

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



$$\begin{aligned} \text{Mean} &= \frac{66+57+71+54+69+58}{6} \\ &= \frac{375}{6} \\ &= 62.5\text{mph} \end{aligned}$$

Mean average speed was 62.5mph