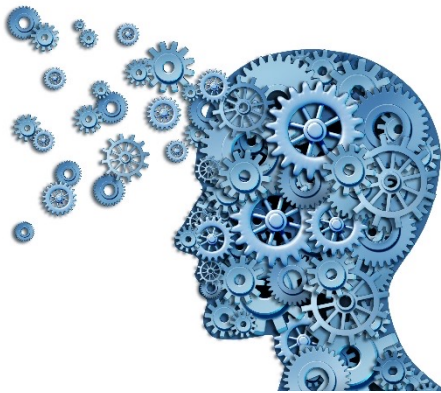


Kettlethorpe HIGH SCHOOL

MATHS
Year 8 | Pi

Name:

Set:



Unit	Topic	Complete
1	Factors and multiples	
2	Shapes and measures in 3D	
3	Expressions and equations	
4	Number properties	
5	Experimental probability	
6	Angles	
7	Transformations	
8	Measuring and shapes	
9	Analysing and displaying data	
10	Statistics	

Pi Unit 1: Factors and Multiples

Multiples

A **multiple** is the result of multiplying a number by an integer.

E.g. a multiple of 8 could be, 8, 16, 24, 32, ...

A **Common Multiple** is a number that is a multiple of both.

E.g. Find a common multiple of 8 and 10:

multiples of 8 = 8, 16, 24, 32, 40, 48, 56, ...

multiples of 10 = 10, 20, 30, 40, 50, 60, ...

Factors

A factor is a number that divides into another number exactly, leaving no remainder.

E.g. factors of 40 = 1, 2, 4, 5, 8, 10, 20, 40

A **Common Factor** is a number that is a factor of both.

E.g. Find the common factors of 40 and 24:

factors of 40 = 1, 2, 4, 5, 8, 10, 20, 40

factors of 24 = 1, 2, 3, 4, 6, 8, 12, 24

Prime Numbers

A **prime number** is a number that has exactly two different factors, which are 1 and the number itself.
The prime numbers up to 30:

2	3	5	7	11	13	17	19	23	29
---	---	---	---	----	----	----	----	----	----

Order of Operations

We must calculate multi-step questions in the correct order to ensure we get the right answer.

We can use BIDMAS to help us remember the order:

Brackets

Indices (powers)

Divide and Multiply

Add and Subtract

E.g. Work out $3 + 7 \times 5$

$$\begin{aligned} & 3 + 7 \times 5 \\ &= 3 + 21 \\ &= 24 \end{aligned}$$

E.g. Work out $(2 + 5) \times 9$

$$\begin{aligned} & (2 + 5) \times 9 \\ &= 7 \times 9 \\ &= 63 \end{aligned}$$

Literacy

Write down a definition for each of the following words:

Multiple

Factor

Problem Solving

Two flashing lights flash every **8 seconds** and every **12 seconds**. If they start flashing at the same time at 9am, find another time when they will all flash together again at the same time.

Fluency

1) Write the first 5 multiples of each of these numbers:

3, __, __, __, __

7, __, __, __, __

8, __, __, __, __

10, __, __, __, __

2) A common multiple is a number that is a multiple of both.

e.g. A common multiple of 4 and 6 could be 12, 24, 36, etc...

Find 3 common multiples of each pair of numbers below:

a) 2 and 5

b) 6 and 8

c) 9 and 12

Reasoning

The list below shows the years in which the Cricket World Cup was held since 1992:

1992, 1996, 1999, 2003, 2007, 2011, 2015

Adam says,

“The Cricket World Cup has been held every four years since 1992.”

Adam is not correct. Explain how you know.

Pi Unit 2: Measuring and Shapes

Triangle Properties

Equilateral Triangles:

- All sides are of equal length.
- All angles are the same size (60°).

Isosceles Triangles:

- The base angles are equal.
- Two of the sides are the same size.

Scalene Triangles:

- All angles and sides are different sizes.

Area and Perimeter

Area:

- The number of squares inside the rectangle.
- Length x Width = $3\text{cm} \times 5\text{cm} = 15\text{cm}^2$

Perimeter:

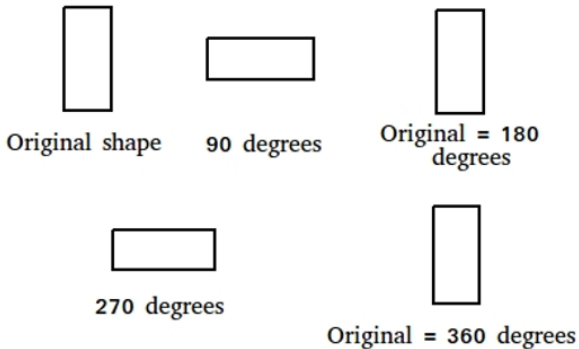
- The distance around the outside.
- $3\text{cm} + 5\text{cm} + 3\text{cm} + 5\text{cm} = 16\text{cm}$



Rotational Symmetry

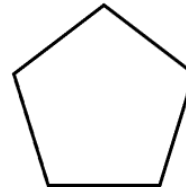
When rotating 360° , how many times will the image look identical to the original shape?

E.G.
A rectangle
has order 2.

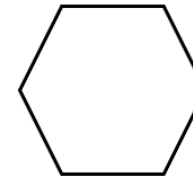


Polygons

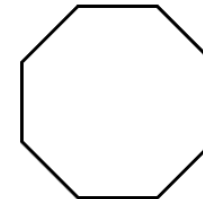
Pentagon
5 sides



Hexagon
6 sides



Octagon
8 sides



Literacy

What is the perimeter of a shape?

What is the area of a shape?

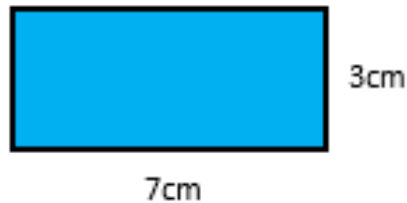
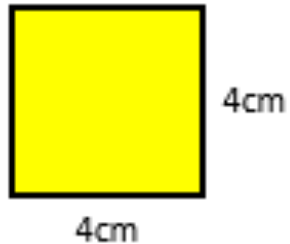
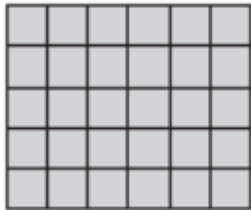
Problem Solving

The area of the rectangle below is 32cm^2 .
The width of the rectangle is 8cm .
What is the length of the rectangle?



Fluency

Find the area and perimeter of each of these squares and rectangles:



Reasoning

Farmer MacDonald has 2 rectangular fields.
Each field has length 40m and width 50m .
Farmer MacDonald has got 350m of fencing,
does he have enough fence to put round
each field? Explain your answer.

Pi Unit 3: Expressions and Equations

Simplifying expressions (adding/subtracting)

'Collect like terms', you cannot collect terms that are not the same e.g. x and y.
Always include the sign in front of the term.

$$7h + 2m - 3h + 4m = 4h + 6m$$

Simplifying expressions (multiplying)

Multiply the coefficients (numbers in front), then list the letters.
E.g. $3a \times 5b = 15ab$

Solving equations

To solve an equation you must do the **inverse** while **balancing** both sides to find the value of the unknown.

e.g. Solve $4a = 20$

$$\begin{aligned} 4a &= 20 \\ \div 4 \quad \div 4 & \\ a &= 5 \end{aligned}$$

Solve $d - 6 = 5$

$$\begin{aligned} d - 6 &= 5 \\ +6 \quad +6 & \\ d &= 11 \end{aligned}$$

Expanding a Single Bracket

Expanding means to multiply. For a single bracket you multiply each term inside of the bracket by the term in front of the bracket. Use a grid to multiply.

e.g. Expand $6(8v - 2) = 48v - 12$

X	8v - 2
6	48v - 12

e.g. Expand $2(4x + 5) = 8x + 10$

X	4x + 5
2	8x + 10

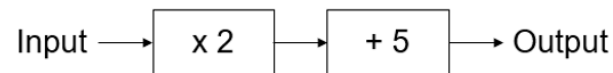
Function machines

Input are the numbers that go in to the machine.

Output are the numbers that come out of the machine.

If you are given the output, you need to use inverse operations to find the input

E.g. Find the output when the input is 6.



$$6 \times 2 + 5 = 12 + 5 = 17$$

Literacy

Explain what a 'function machine' is, if you need to you can draw an example.

Problem Solving

Hamish uses the function machine below.

He gets his output to be 45.

What was Hamish's input?



Fluency

Simplify each of the following:

$3a \times 5b$

$4c \times 8d$

$5 \times m \times 2 \times h \times 7$

Expand each of the following:

$3(2t + 4)$

$6(5m - 10)$

$5(9v + 7)$

Reasoning

Maggie simplifies $5x + 2y$ to be $7xy$.

Explain the mistake Maggie has made.

Pi Unit 4: Number Properties

Square Numbers

A **square number** is the product of a number multiplied by itself.

E.G.

$$1^2 = 1 \times 1 = 1$$

$$2^2 = 2 \times 2 = 4$$

$$3^2 = 3 \times 3 = 9$$

$$4^2 = 4 \times 4 = 16$$



Cube Numbers

A **cube number** is the answer when you multiply a number by itself twice.

$$1^3 = 1 \times 1 \times 1 = 1$$

$$3^3 = 3 \times 3 \times 3 = 27$$

$$5^3 = 5 \times 5 \times 5 = 125$$

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

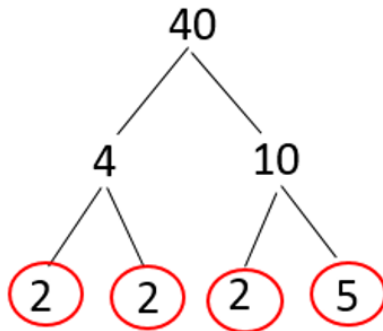
$$4^3 = 4 \times 4 \times 4 = 64$$

$$10^3 = 10 \times 10 \times 10 = 1000$$

Prime Factorisation

Write the number as a product of primes (prime numbers that multiply together to make the number)

E.G. $40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$



Lowest Common Multiple

Lowest Common Multiple (LCM) is the smallest number that is a multiple of both.

E.G. Find the LCM of 8 and 10:

multiples of 8 = 8, 16, 24, 32, 40, 48, 56, ...

multiples of 10 = 10, 20, 30, 40, 50, 60, ...

Highest Common Factor

Highest Common Factor (HCF) is the largest number that is a factor of both.

E.G. Find the HCF of 40 and 24:

factors of 40 = 1, 2, 4, 5, 8, 10, 20, 40

factors of 24 = 1, 2, 3, 4, 6, 8, 12, 24

Literacy

What is the difference between the **Highest Common factor** and the **Lowest Common Multiple**?

Problem Solving

Can you find 2 numbers that are both square numbers and cube numbers?

Fluency

1) Find the Highest Common Factor of 42 and 28.

2) Find the Lowest Common Multiple of 4 and 15.

3) Write 40 as a product of primes.

Reasoning

Is 1 a prime number? Explain your answer.

Pi Unit 5: Experimental Probability

Calculating Probability

$$P(\text{event}) = \frac{\text{Number of ways the event can occur}}{\text{Total number of outcomes}}$$

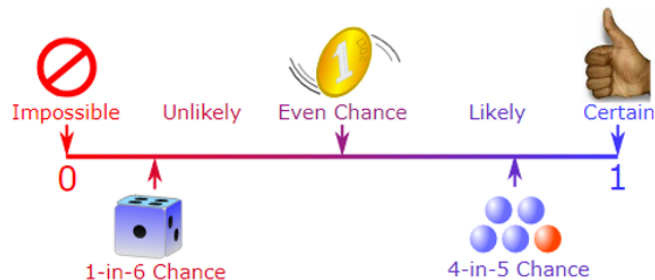
E.G.

The probability of getting a heads when flipping a coin is $\frac{1}{2}$.

The probability of picking a heart (13 cards) from a full deck of cards (52 cards) = $\frac{13}{52} = \frac{1}{4}$.

The Probability Scale

The probability scale is between 0 and 1. Probabilities may be written as fractions, decimals or percentages.



Experimental Probability:

Calculating the probability of an outcome based on data that has been collected. E.G. A dice has been rolled 60 times.

Result	1	2	3	4	5	6
Frequency	20	5	12	10	7	6
Experimental Probability	$\frac{20}{60}$	$\frac{5}{60}$	$\frac{12}{60}$	$\frac{10}{60}$	$\frac{7}{60}$	$\frac{6}{60}$

$$\text{Probability} = \frac{\text{Number of times event occurred}}{\text{Total number of trials}}$$

A **biased** event means that it is not fair. One outcome is more likely than the others.

E.G. Is this experiment fair?

No, the dice isn't fair. All numbers should appear around 10 times, but the number 1 appears 20 times.

The dice is **biased** towards the number 1.

Literacy

What does the word biased mean?

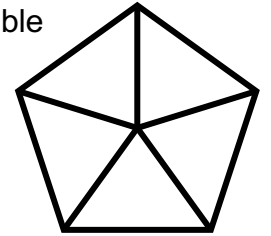
Problem Solving

Complete the spinner below so that:

Even number is impossible

3 is likely

5 is unlikely



Fluency

A spinner is spun 900 times and the colour it lands on is recorded in the table below.

Use the results in the table to work out the relative frequency for each colour.

colour	frequency	P(colour)
red	108	<input type="text"/>
green	306	<input type="text"/>
blue	81	<input type="text"/>
pink	189	<input type="text"/>
yellow	216	<input type="text"/>

Reasoning

A spinner is spun a large number of times and the outcomes recorded in the table. Is this spinner fair? Explain your answer.

Number	Frequency
1	27
2	35
3	94
4	33
5	28

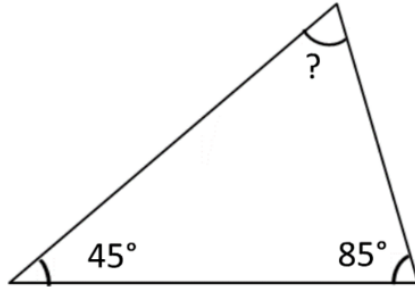
Pi Unit 6: Angles

Angles in a Triangle

The angles in a triangle sum to 180° .

- 1) Add together the angles you are given.
- 2) Subtract this from 180° .

E.g.
 $45^\circ + 85^\circ = 130^\circ$
 $180^\circ - 130^\circ = 50^\circ$
 $x = 50^\circ$

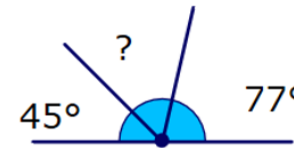


Angles on a straight line

Angles on a straight line sum to 180° .

- 1) Add together the angles you are given.
- 2) Subtract this from 180° .

e.g.
 $45^\circ + 77^\circ = 122^\circ$
 $180^\circ - 122^\circ = 58^\circ$
 $? = 58^\circ$

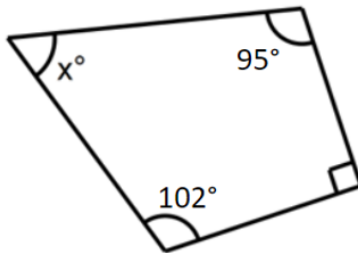


Angles in a Quadrilateral

The angles in a quadrilateral sum to 360° .

- 3) Add together the angles you are given.
- 4) Subtract this from 360° .

E.g.
 $95^\circ + 102^\circ + 90^\circ = 287^\circ$
 $360^\circ - 287^\circ = 73^\circ$
 $x = 73^\circ$

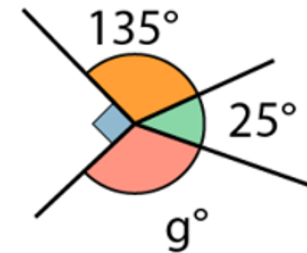


Angles round a point

Angles round a point sum to 360° .

- 1) Add together the angles you are given.
- 2) Subtract this from 360° .

e.g.
 $135^\circ + 25^\circ + 90^\circ = 250^\circ$
 $360^\circ - 250^\circ = 110^\circ$
 $g = 110^\circ$

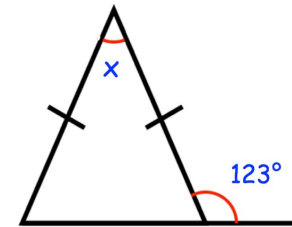


Literacy

Write down 2 angle facts that you know using **full sentences**.

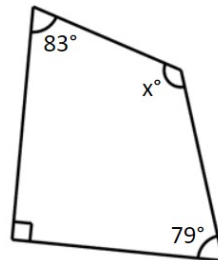
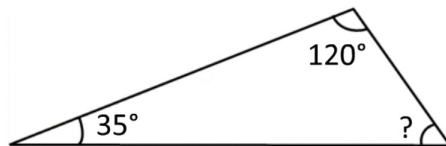
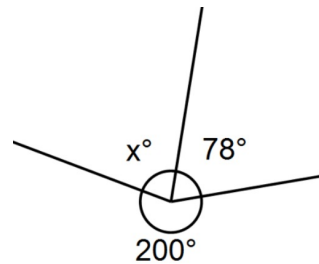
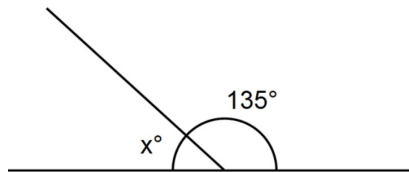
Problem Solving

Find the size of angle x .
Give **full** reasons for your working.



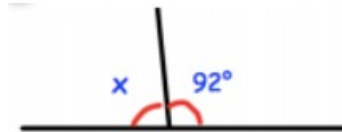
Fluency

Find the missing angle in each diagram below:



Reasoning

Fraser says angle x is 98° .
Is Fraser right? Explain your answer.

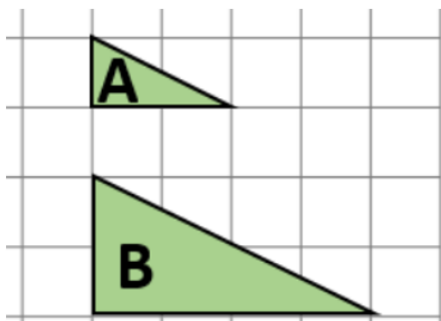


Pi Unit 7: Transformations

Enlargement

Multiply the length of each side by the given scale factor.

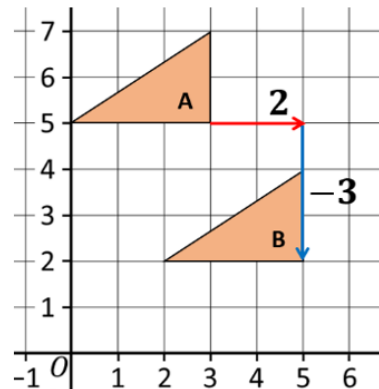
E.G. enlarge triangle A by scale factor 2.



Translation

Slide the shape by the given directions.

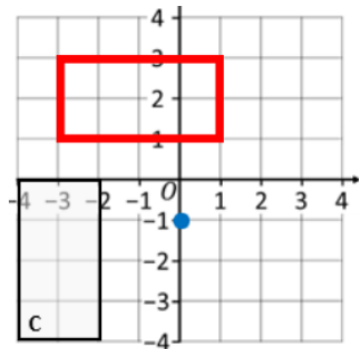
E.G. Translate triangle A by 2 squares right and 3 squares down.



Rotation

Use tracing paper to turn the shape the correct angle in the given direction keeping the given centre point still.

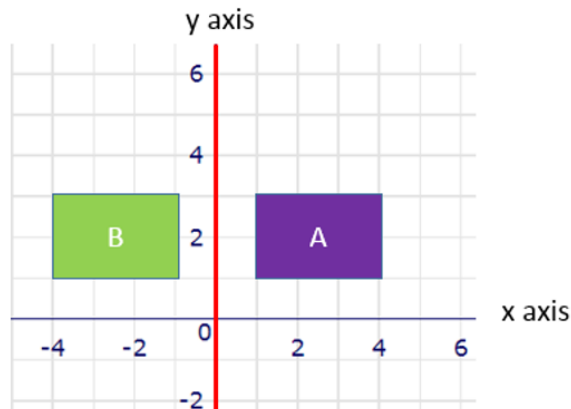
E.G. Rotate shape C 90° clockwise about the given point.



Reflection

Reflect (flip) the shape in the given mirror line.

E.G. Reflect shape A in the y axis.



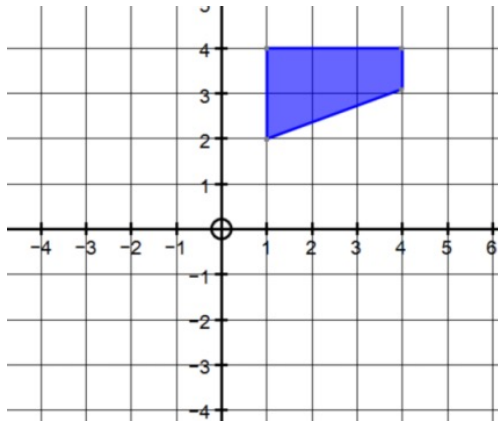
Literacy

What does rotate mean?

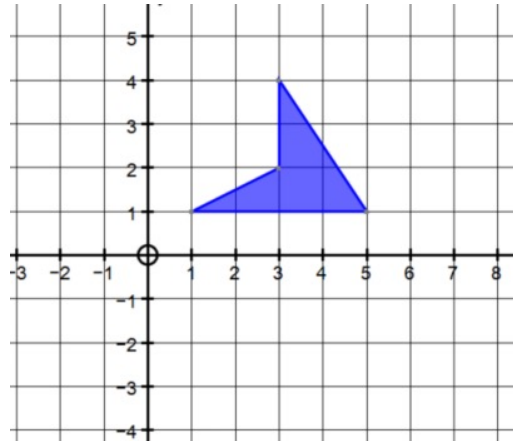
What does translate mean?

Fluency

Translate the shape 4 left and 3 down.

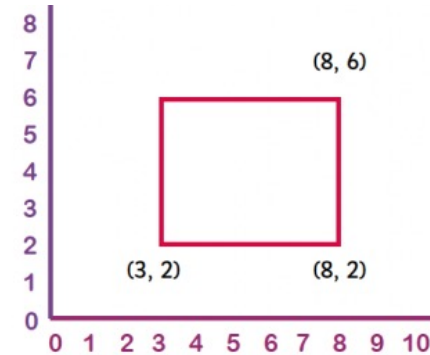


Reflect the shape in the x-axis.



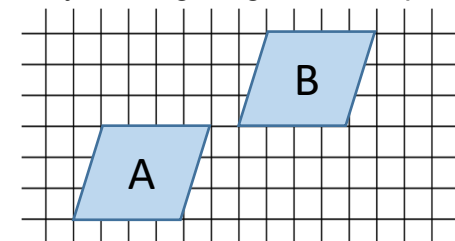
Problem Solving

The rectangle below is translated by 2 right and 1 down. What are the new coordinates for the given corners?



Reasoning

John is describing this transformation, he says
“Shape A has been transformed to shape B
by moving 1 right and 3 up.



Make a comment about John's answer.

Pi Unit 8: Shapes and Measures in 3D

Surface Area

The total area of all faces on a 3D solid.
You may find it useful to draw the net of the shape first.

E.g.

$$\text{Front} = 3 \times 6 = 18\text{cm}^2$$

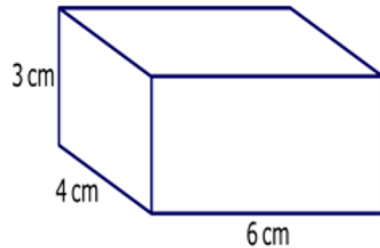
$$\text{Back} = 3 \times 6 = 18\text{cm}^2$$

$$\text{Left} = 3 \times 4 = 12\text{cm}^2$$

$$\text{Right} = 3 \times 4 = 12\text{cm}^2$$

$$\text{Top} = 4 \times 6 = 24\text{cm}^2$$

$$\text{Bottom} = 4 \times 6 = 24\text{cm}^2$$



$$\begin{aligned} \text{Total Surface area} &= 18 + 18 + 12 + 12 + 24 + 24 \\ &= 108\text{cm}^2 \end{aligned}$$

3D Solids

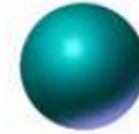
Cube



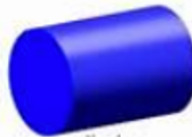
Cuboid



Sphere



Cylinder



Cone

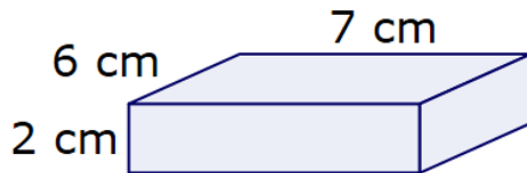


Pyramid



VOLUME OF CUBE/CUBOID

Volume is the space inside of a 3D shape.

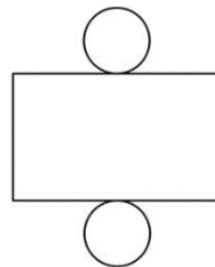


$$\begin{aligned} \text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ &= 6\text{cm} \times 2\text{cm} \times 7\text{cm} = 84\text{cm}^3 \end{aligned}$$

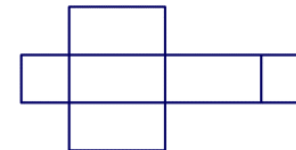
Nets

To draw a net you need to 'Unfold the Shape'.

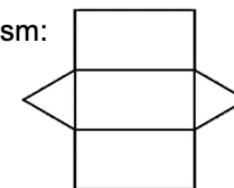
Cylinder:



Cuboid:



Triangular Prism:

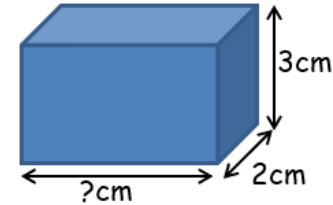


Literacy

Write down the names of as many 3D shapes as you know.

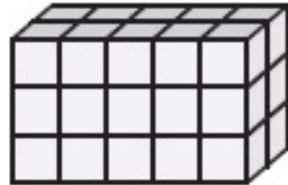
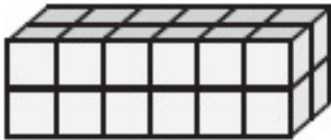
Problem Solving

The cuboid below has a volume of 42cm^3 . Can you work out the missing measurement?

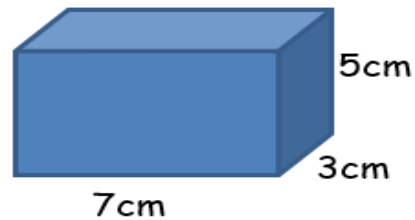
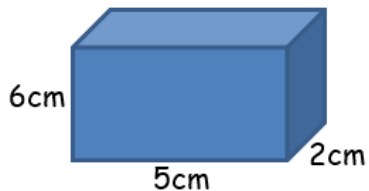


Fluency

Find the volume of each of these cubes/cuboids made of centimetre cubes.

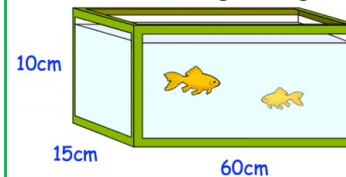


Find the volume of each of these cubes/cuboids. Include units in your answers.



Reasoning

Ameera owns a cuboid fish tank, 10cm x 15cm x 60cm. She has 2 fish, each fish needs 2500cm^3 of space. Is her tank big enough to get a third fish?



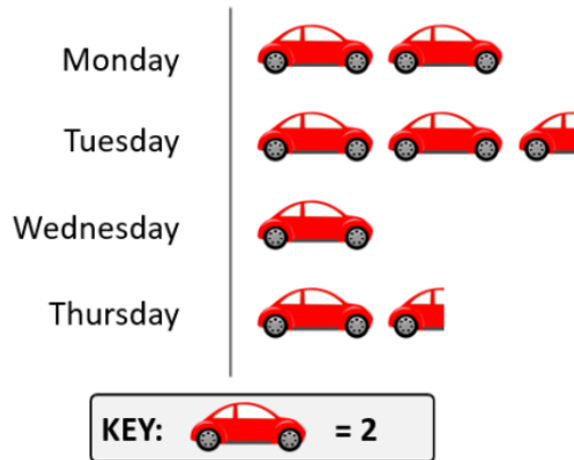
Pi Unit 9: Analysing and Displaying Data

Pictograms

Pictograms use pictures to portray data, with each symbol representing an amount.
Part of a picture can be used to represent different frequency.

E.G. Put the following information into a pictogram

Day	Number of cars sold
Monday	4
Tuesday	5
Wednesday	1
Thursday	3



Note: 1 car represents 2 cars sold, so $\frac{1}{2}$ of a car must represent 1 car sold.

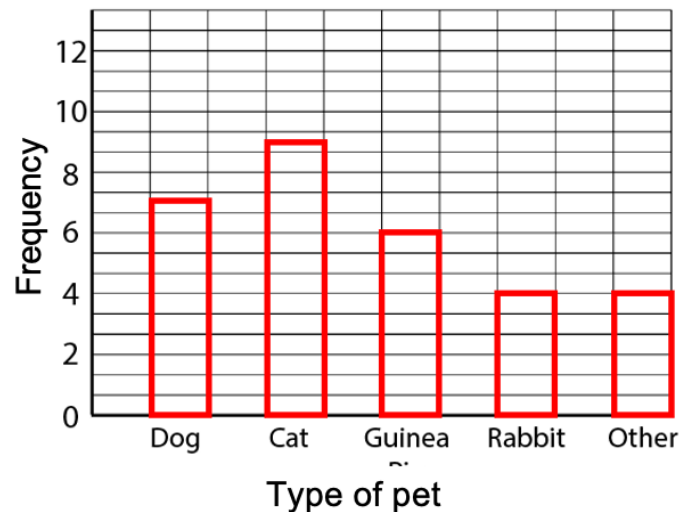
Bar Charts

Remember to stick to the rules of a bar chart:

1. Gaps between bars.
2. Scale goes up in the same amount.
3. Labels for both axis.
4. Bars are same width.
5. Have a title.

Type of Pet	Frequency
Dog	7
Cat	9
Guinea Pig	6
Rabbit	4
Other	4

Bar chart showing the type of pet people own.



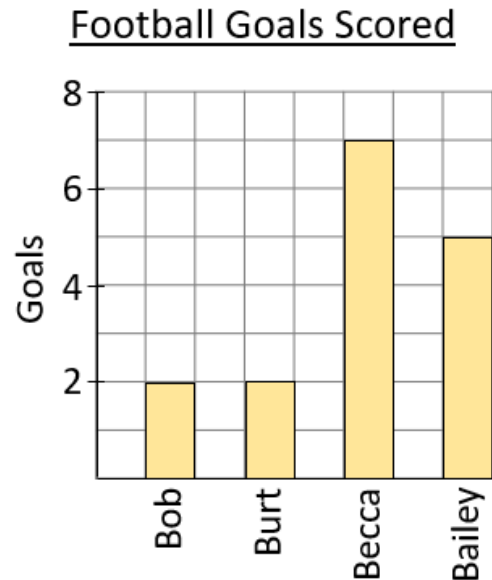
Literacy

Write down 3 rules you must follow for drawing a bar chart.

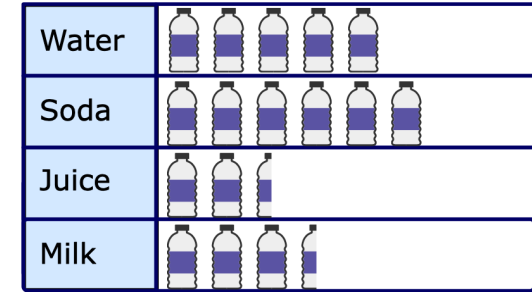
Fluency

The bar chart shows the number of goals scored by 4 people.

- 1) Who scored the most goals?
- 2) How many goals did Bailey score?
- 3) How many more goals did Becca score than Burt?
- 4) How many goals were scored in total?



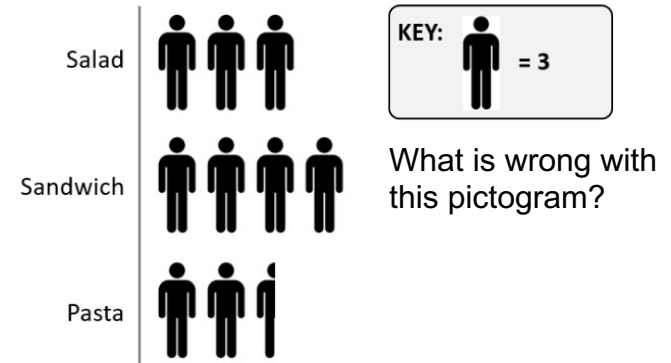
Problem Solving



The pictogram above represents the preferred drink for a group of people. From the survey 9 people preferred water. How many people prefer juice?

Reasoning

Student's Lunch Choices



What is wrong with this pictogram?

Pi 10: Statistics

Stem-and-leaf diagram

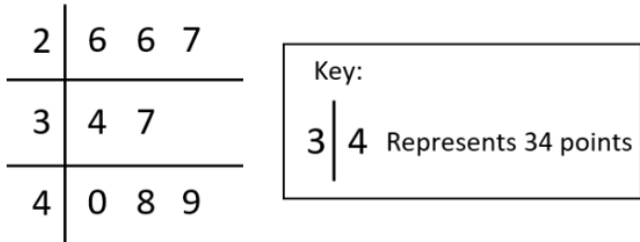
A stem and leaf diagram is used to represent data by grouping it to make it easier to read.

A key must be included for how to read the numbers.

E.G. 8 people went bowling, there scores were:

48 26 27 34 49 40 37 26

The ordered stem-and-leaf diagram below represents their scores.



Pie Chart

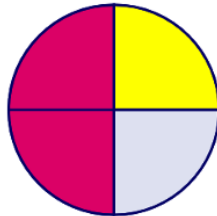
The pie chart shows the favourite drink of 20 people.

1) How many prefer cola?

$$\frac{1}{2} \text{ of people} = 20 \div 2 = 10$$

2) How many prefer squash?

$$\frac{1}{4} \text{ of people} = 20 \div 4 = 5$$



- cola
- lemonade
- squash

Two-way table

A two-way table is used to link 2-variables to make it easier to interpret the information.

E.G.

Pupils were surveyed about their **gender** (male or female) and how they **travelled to school** (walk, bus, cycle).

- 5 males walked.
- 9 females walked.
- 12 males took a bus.
- 7 females took a bus.
- 8 males cycled.
- 9 females cycled.

	Walk	Bus	Cycle	Total
Male	5	12	8	25
Female	9	7	9	25
Total	14	19	17	50

Q1) How many pupils take the bus?

19 people

Q2) What fraction of pupils cycle?

$\frac{17}{50}$

Literacy

What is the frequency?

What is the mode?

Fluency

1) The ages of people who work for a company are:

25 36 32 21 44 40 51 38

Draw an ordered stem-and-leaf diagram to represent the ages of the employees.

Key:

2) Vinny asked 60 people about their favourite breakfast food.

19 adults prefer cereal

5 children prefer cereal

16 adults prefer toast

20 children prefer toast

8 adults prefer pancakes

12 children prefer pancakes

Complete the two-way table below:

	Adult	Child	Total
Cereal			
Toast			
Pancakes			
Total			

Problem Solving

49 people were asked if they prefer going to the gym or playing a sport.

Complete the two-way table to show if people preferred the gym or playing a sport.

	Sport	Gym	Total
Adults	9		
Children		8	
Total	24		49

Reasoning

6 people took part in a long jump competition. Their distances are shown in the stem-and-leaf diagram below.

1		8
2		1 1 4 7
3		2

Key:

2 | 4 Represents 2.4 m

What distance is the mode? Why?