



Welcome to Whalley Range 11-18 High School

Year 6 Summer Maths Homework

The Maths department have stumbled across 4 problems.
They have come to you for help, as your reputation precedes you as a great Maths detective!

You are known to be ruthless at collecting, analysing and deducing information and backing it up with evidence. This is precisely what you need to do to investigate these problems successfully.

Instructions:

- 1) Start each problem on a new blank piece of paper.
- 2) All detectives make sure their work is neat and tidy so make sure you have a title and a sentence explaining what you are investigating or what you are trying to find.
- 3) Draw a table to put your findings in.
- 4) Answer any questions in full sentences.
- 5) Conclude your work by explaining what you have found out.

Sticks

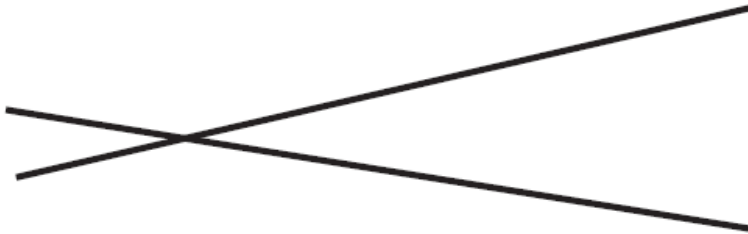
This investigation is to find the maximum number of intersections as the sticks cross.

Collect a number of sticks from your garden or from the park.

With one stick, no sticks cross.



With 2 sticks, there is one intersection.



With 3 sticks, how many intersections are there?

Copy the table below and record the maximum number of intersections for each number of sticks. You decide how many sticks you to try – remember the more evidence you have the better your argument!

Number of Sticks	Number of Intersections
1	
2	
3	

Can you spot the pattern?

Can you explain the reason for the pattern?

Predict the next number of intersections and test your idea.

What is your conclusion?

Letter Tiles

Your aim is to find the two boy names and the girl name which can be made from the tiles.

Here are some letter tiles and their values from a word game.

The tiles are used to create two boys and one girl's name.

If you add up the total scores of the letters in the three names the answer is 39.

All the names are different, but what are they?

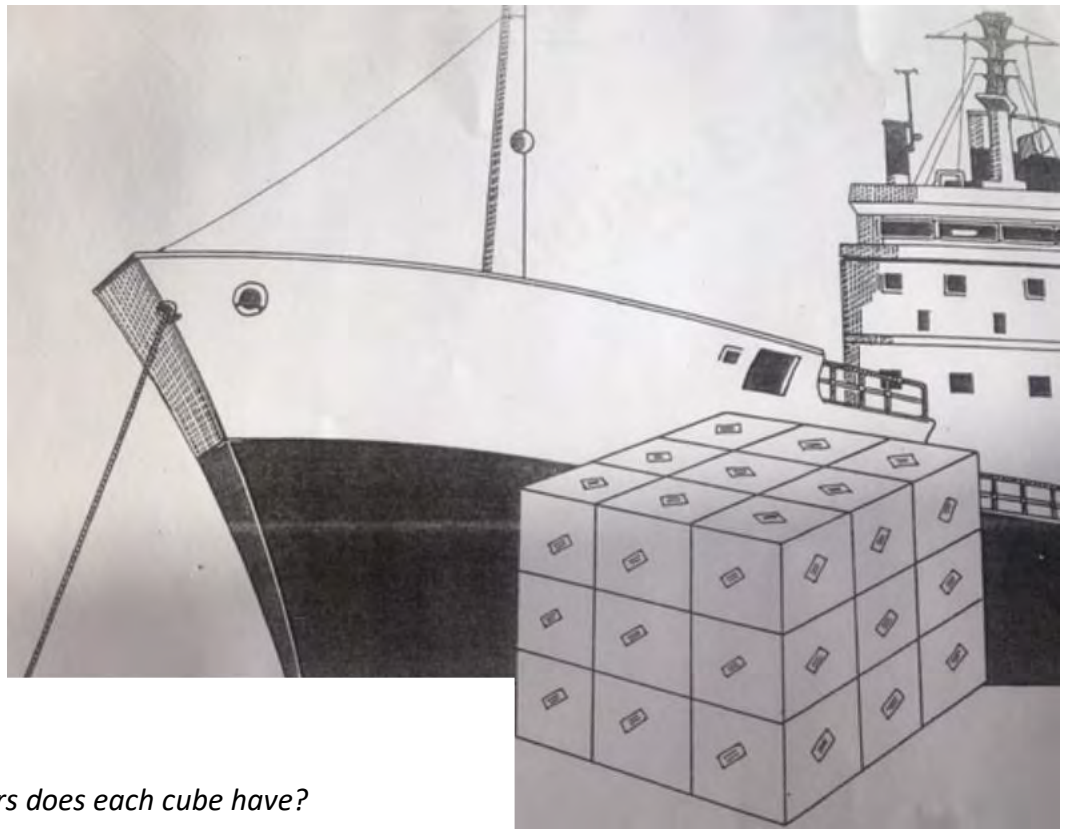
Clues:

- The name of the girl has the same number of letters in it as one of the boys' names.
- If you add together the first letters of the boys' names, the answer is 16.
- The girl's name scores 5 in total.
- Both boys' names have the same scores.
- In all of the names, there are seven letters that score 1.

A ₁	B ₃	C ₃	D ₂	E ₁	F ₄
G ₂	H ₄	I ₁	J ₈	K ₅	L ₁
M ₃	N ₁	O ₁	P ₃	Q ₁₀	R ₁
S ₁	T ₁	U ₁	V ₄	W ₄	X ₈
Y ₄	Z ₁₀				

Use the information provided by the clues above and work out which of the following names fit the criteria:

Aisha	Walt	Zak	Xavier	Xabi	Jeana
Sam	Jacques	Jay	Tina	Joe	Dot
Yvonne	Zachary	Queenie	Jayden	Joachim	Xabier
James	Gabi	Quentin	Gina	Zebedee	Jack
Yanis	Zephaniah	Finn	May	Yeng	Xerxes



Cargo

How many stickers does each cube have?

Boxes are waiting on the quayside to be loaded onto a ship.

27 boxes are made up into a $3 \times 3 \times 3$ cube like this ready for the crane.

The dockers stick labels as shown on each of the 6 exposed faces of the cube.

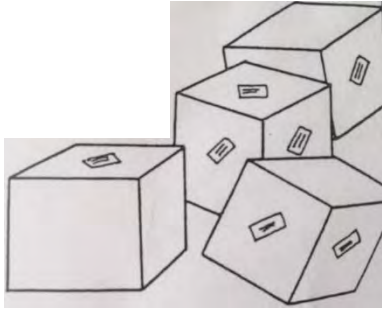
The cube is dropped as it is being loaded, and the boxes are scattered.

- 1) How many boxes have got 3 labels on them?
 How many boxes have got 2 labels?
 How many boxes have got 1 label?
 How many boxes have no labels on?
- 2) Investigate the same problem if boxes are made up into $4 \times 4 \times 4$ cube.
- 3) What about a $5 \times 5 \times 5$ cube?

Hint: Draw a table to show how many boxes have 0/1/2/3 labels on them.

Labels	How many?
0	
1	

Challenge: Can you find a general rule for predicting how many boxes will have 3 labels, 2 labels, 1 label and no label, for any size cube?



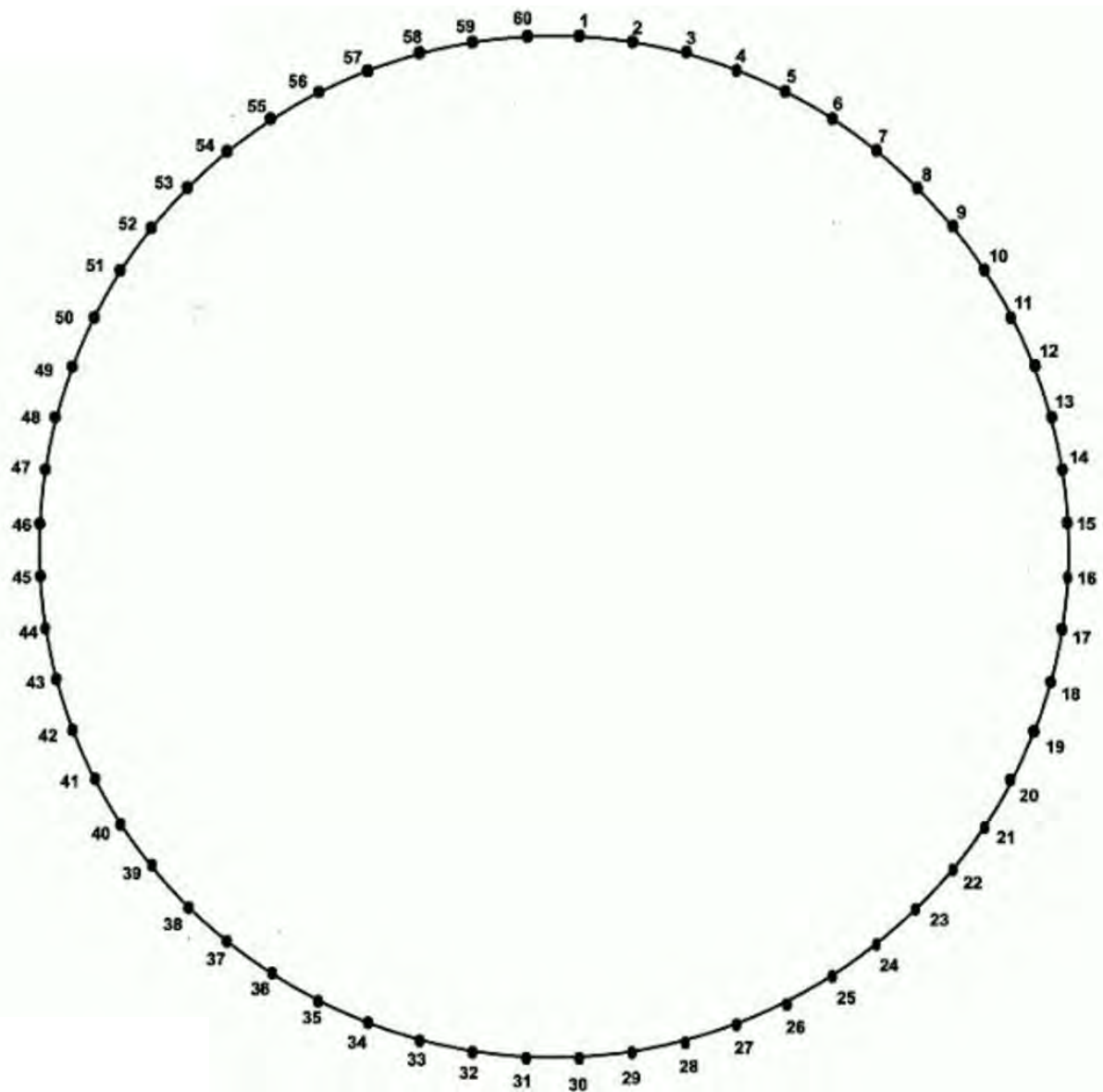
Drawing a Cardioid

Investigate what shapes you can make using only a circle and straight lines.

Copy and complete this table by multiplying each number by 2.
 When your answer is bigger than 60, stop. Eg: stop at $31 \times 2 = 62$.
 Instead of writing 62, 64, etc, start again at 2 and write 2, 4, 6, etc.
 Some of the numbers have been written in for you.

Mapping is										Score out numbers as you draw them									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	4	6	8																
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
										2	4	6							
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

Using the values in your table, with a ruler draw a line between 1 and 2, then another line between 2 and 4, then 3 and 6, 4 and 8, etc on the circle below.



You have drawn a cardioid. Looking at your drawing, what do you think a cardioid is?

What happens if you multiplied each number by 3?

What about if you multiplied each number by 4?

Or if you multiplied by a bigger number?

What about if you made a different rule up?

Use the circle templates below to help you investigate more.

