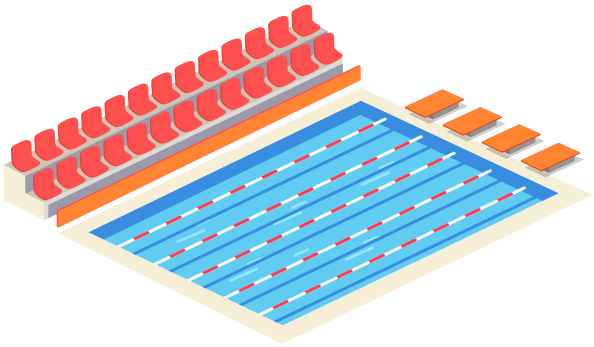
Junior Cycle Mathematics - Questions

NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

The sample material presented here had been prepared to support teacher professional development. It offers a broad indication of types and formats of assessment items that might be used to assess the learning outcomes in the Junior Cycle Mathematics specification, but it is not a complete set of the types and formats that may be used. The items included focus on the newer aspects of the specification and should be read as examples of individual pieces of assessment material; they do not constitute full or partial examination papers. They are not full or partial questions from an examination paper, neither do they attempt to replicate how the examination paper might be laid out, for example, as an integrated booklet that includes the questions and the space for the student's responses.

Q. Sophie is training for a triathlon.

On New Year's Day, Thursday January 1st she went to the pool and swam some lengths.
The next day she began a training programme and swam 7 more lengths than she had on Thursday.
Each day after that, she swam 7 more lengths than the day before.
By the following Wednesday night she had swam a total of 161 lengths for the whole week.



(a.) How many lengths did Sophie swim on New Year's Day?

(b.) Although it's probably not possible but if Sophie were to continue this pattern, each day swimming 7 more lengths than the day before , on which day would she swim 499 lengths for her daily total?

Use words, tables/charts and generalised expressions to justify your answer.

Q. A gardener looking at a rectangular flower bed in his garden commented

If I had made that bed 2 m wider and 3m longer it would have been 64m² larger,
but if I had made it 3m wider and 2m longer it would have been 68m² larger.
What is the length and width of the garden?

Represent the situation using diagrams and use mathematics to solve the problem.

Q. Students in a mathematics class made up a secret code where unfamiliar symbols stand for five different mathematical operations (×, ÷, +, - , ^). Crack the code used in the following equations:

(5 ❤ 40) ♦ 3 =15
(14 ♦ 2 ♠ 5) * 2 = 4
4 ∋ (14 ♠ 6) ∋ 2 = 64

The students results will be verified by asking them to evaluate this expression:

2 * 3 ♦ (4 ∋ 3 ♠ 10) ❤ 6 * 2 ∋ (4 ❤ 1) ♦ (1 * 4 ∋ 20)

What answer should the group get?
Justify your answer and use words to explain your thinking.

Q. Fully factorise the following polynomials

$12x^2 - 27$ $18x^2 - 60x + 50$ $12x^2 + 23x - 24$

Q. Marianna enjoys paragliding.
She decides to make her first jump from a 10m cliff.
She glides along a straight line, covering 40m of ground.

Represent this information in a diagram. Label the cliff, the point from where Marianna takes her jump, the ground distance and the flight path. What assumptions have you made?

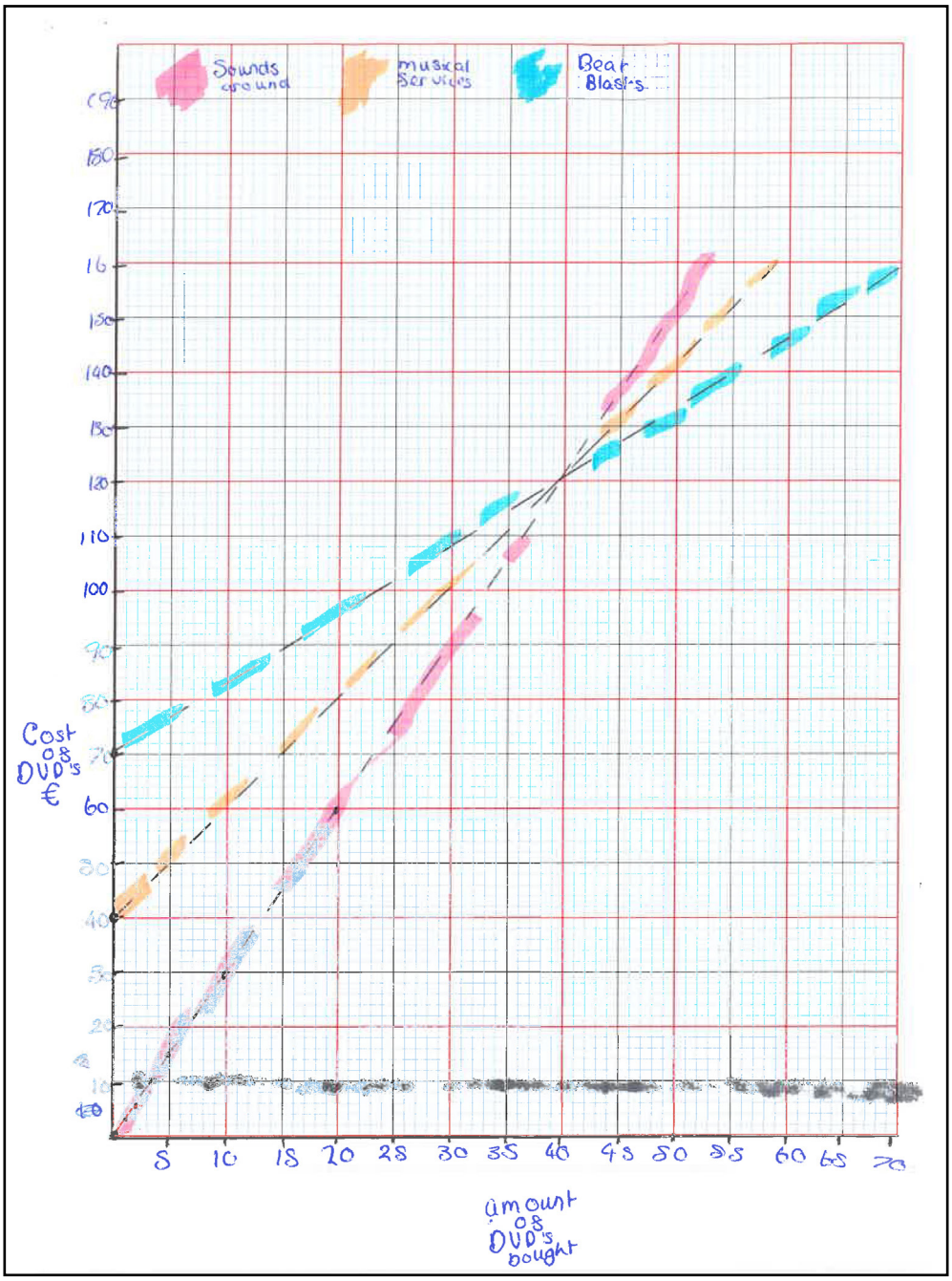
(a.) After several successful flights, she decides to go to a higher cliff. The cliff is 15m high. How much ground distance does the glider cover from the higher cliff? *Assume the steepness of the flight path remains the same.*

(b.) Marianna makes flights from three cliffs that are 20m, 50m and 100m high. How much ground distance does the glider cover on each flight?

Use your representation, other helpful diagrams and mathematics to justify your solution in each situation.

Q. Lucy was investigating the cost of DVDs from three different suppliers Sounds Around, Musical Services and Beat Blasts.

She Represented the information in the graph below.



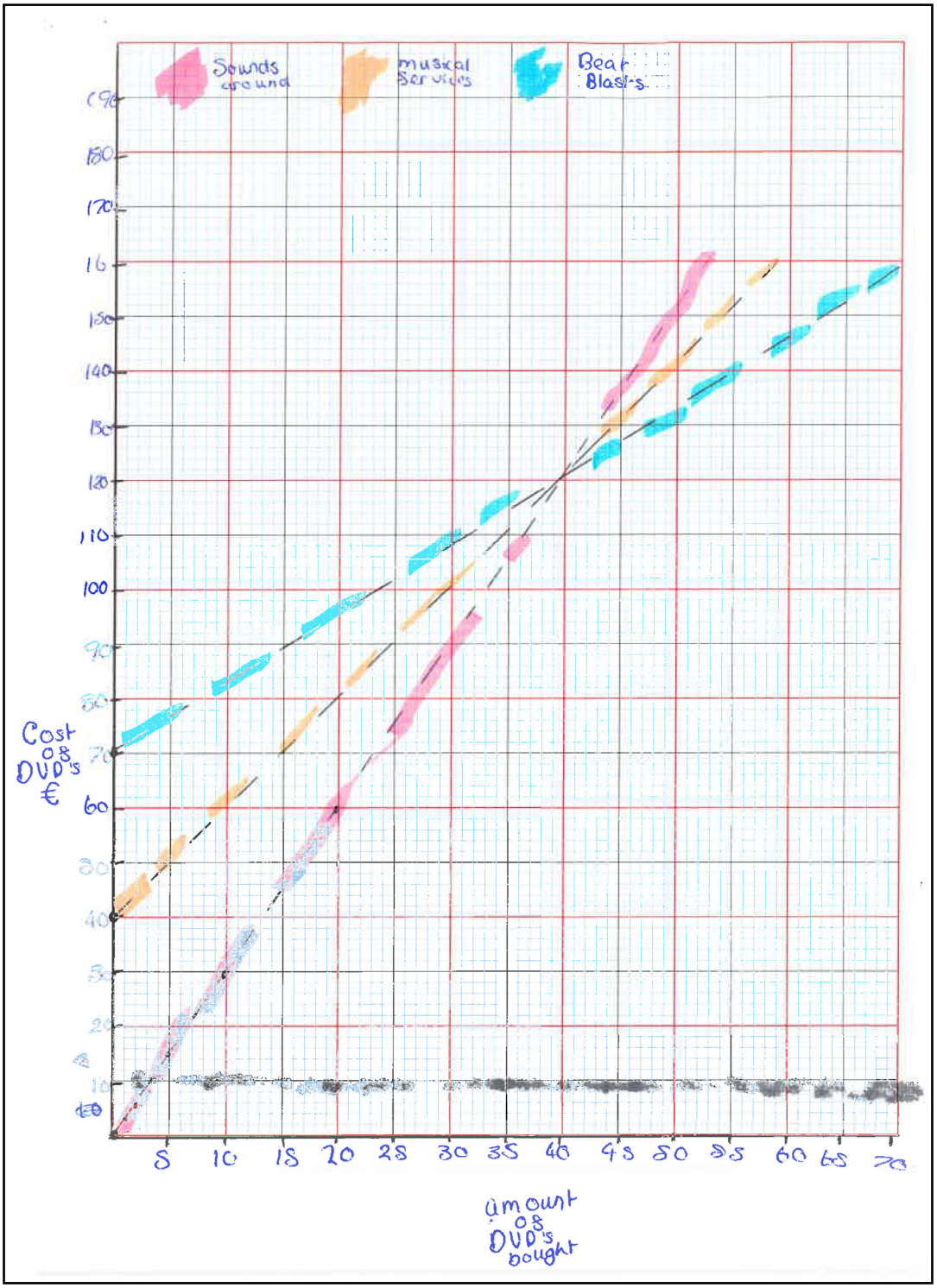
Interpret the graph to help you decide which company offers the best value justify your answer with words and mathematics.

How much would 1000 DVDs cost in BeatBlasts?

Scaffolded version

Lucy was investigating the cost of DVDs from three different suppliers Sounds Around, Musical Services and Beat Blasts.

She Represented the information in the graph below.

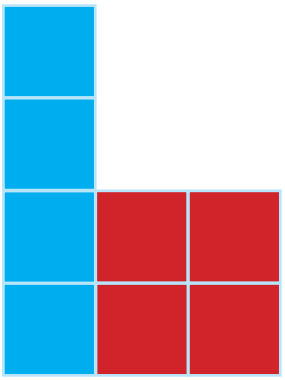


How much would you pay for 20 DVDs in Sounds Around?

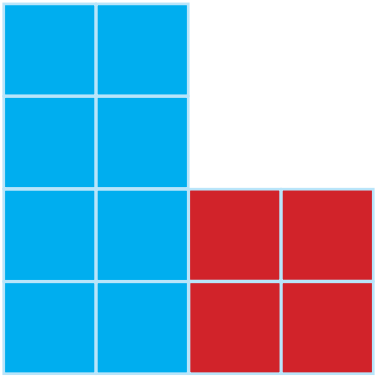
If you had to buy 25 DVDs where would you buy them? Why would you buy them there?

If you had to buy 100 DVDS where would you buy them ? Give a reason for your answer

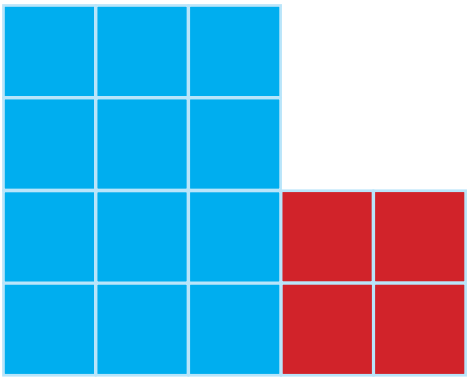
Q. Students in a mathematics class make a sequence of shapes using red and blue tiles.



Shape Number 1

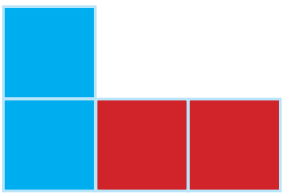


Shape Number 2

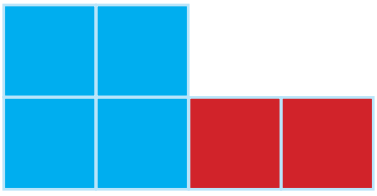


Shape Number 3

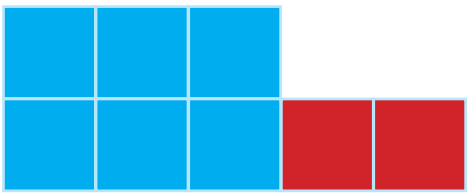
What is the total number of tiles in Shape number *n*?



Shape Number 1



Shape Number 2



Shape Number 3

What is the total number of tiles in Shape number *n* now?

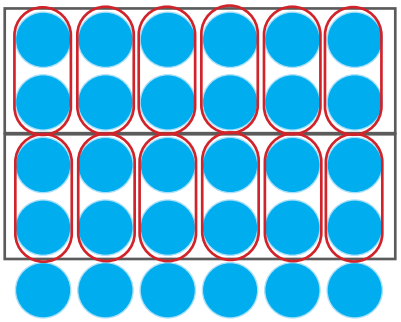
Complete the sentence if I remove half the tiles again the number of tiles in shape n is

_____

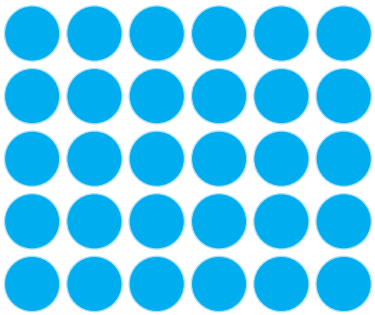
_____

What would the tile sequence look like now?

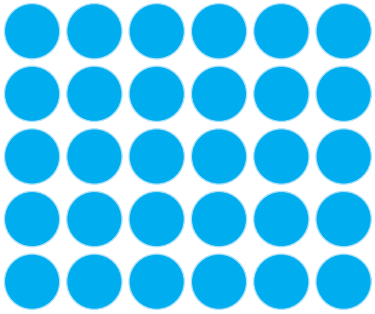
Q. Use the diagrams below to illustrate the mathematical expressions. The first one has been done for you.



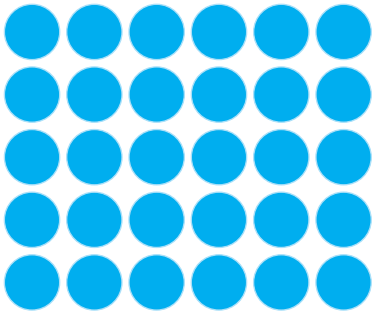
2(6 x 2) + 6



2(3 x 5)



(2 x 2) + (4 x 2) + (6 x 3)



2 x 6 + 2 (3 x 3)

Q. In a school lessons are 55 minutes long

A mathematics lesson starts at 9:15am. What time does the lesson end?

A PE lesson ends at 3:30pm. At what time does the lesson start?

Lunch break is 1 ¼ hours long. Lunch break ends at 1:30pm. At what time does is start?

Q. Work out the answer

3 + (24 ÷ 3) + 5 =

Put brackets in the calculation below to make it correct

$$3 + 24 \div 3 + 5 = 6$$

Q. When y=1, which expression below has the largest value?

Circle it

$3 + y$ $\quad$ $10 - y$ $\quad$ y^2

$3y$ $\quad$ $\frac{y}{2}$

When y = 4 which expression has the largest value?

$3 + y$ $\quad$ $10 - y$ $\quad$ y2

$3y$ $\quad$ $\frac{y}{2}$

Q. How many sixths are there in $3\frac{1}{3}$

Justify your answer with a diagram

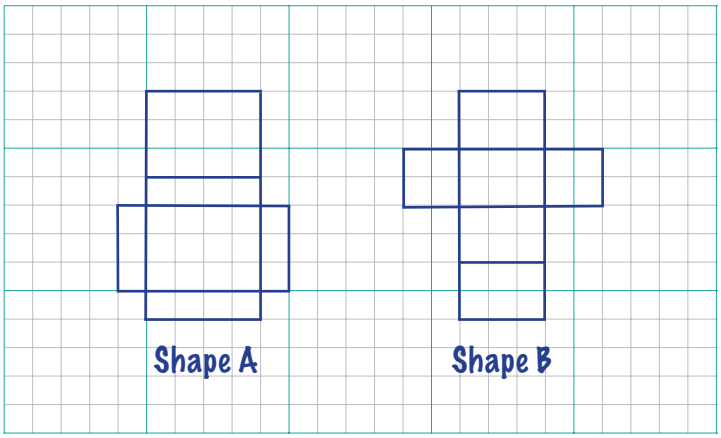
Q. A, B and C, are points on a circle, centre O. AC is a diameter of the circle.

Represent this information in a diagram

Angle BAO is x° and angle BCO is y°. Mark this information on your diagram
Explain why angle ABO must be x° and angle CBO must be y°

Use algebra to show that angle ABC must be 90°

Q. The diagram shows two cuboids labelled shape A and Shape B



Do the cuboids have the same surface area? _____

Show calculations to show how you know

Do the cuboids have the same volume? _____

Show calculations to show how you know

Q. A cup of coffee costs €3.20

The table shows how much different people receive from the sale of a cup of coffee.

Growers	€0.09
Retailers	€0.78
Others	€2.33

Use mathematics to work out what percentage of the cost of a cup of coffee goes to retailers, growers and others.

Complete the table with your answers

Growers	%
Retailers	%
Others	%

Some people think that growers should get more. Suppose the percentages changed to

Growers	10%
Retailers	23%
Others	67%

If the retailers still get €0.78 from the sale of a cup of coffee. Use mathematics to work out how much would a cup of coffee cost?

Q. Represent 36 in 8 different ways

As an Array	Using at least one fraction and a multiply symbol	In a way that shows it is an even number
In a way that shows it is a multiple of 3	36	Using 2 "x" symbols
In a way that shows it is a square number	Using a power	Using 2 "x" symbols, brackets and a "+" symbol

Q. Sean asked 30 students if they played GAA.
20 students said yes. 10 students said no.
He started to put this information in a table using the key  represents 5 students.

Complete the table to show Sean's results.

Total 30 Students	
Yes	
No	

Sarah asked 20 students which sport they like best. She put this information in a table but forgot to write the key.

Total 20 Students	
Hurling	
Football	
Soccer	

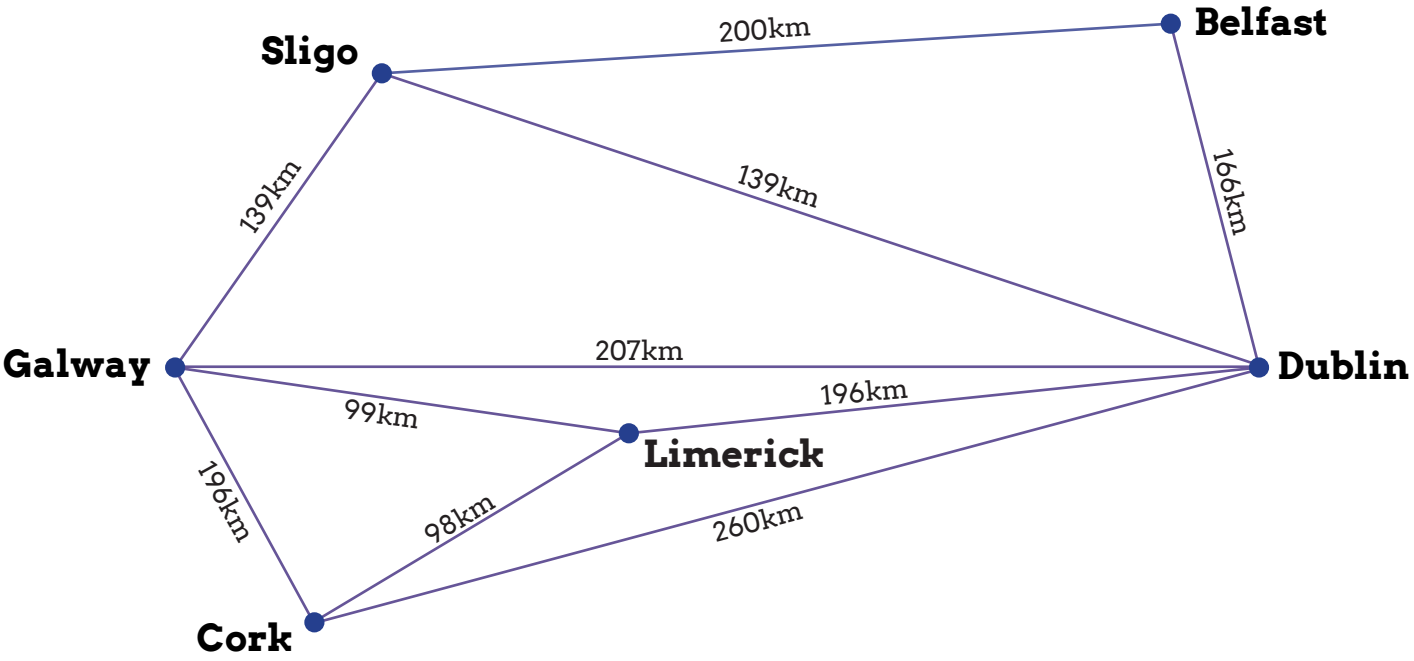
How many students does  represent?

Justify your answer with mathematics

Q. The number chain below is part of a doubling number chain. Fill in the two missing numbers.

The number chain below is part of a halving number chain. Fill in the two missing numbers.

Q. Look at this diagram. It shows distances in kilometres between some cities.



(a.) How far is it from Dublin to Cork ? _____ km

(b.) Which two cities are 98km apart? _____ and _____

Caoimhe lives in Limerick She wants to visit either Dublin or Cork
Which of these cities is nearer to Limerick? Tick (✓) your answer.

☐ Dublin ☐ Cork

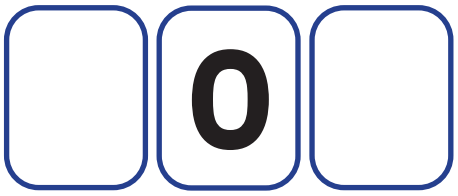
How many km nearer to Limerick is it? _____ km

Conor drives from Dublin to Galway to Limerick and back again to Dublin how many km does he drive altogether? Show how you worked out your answer.

Q. Look at these three number cards.

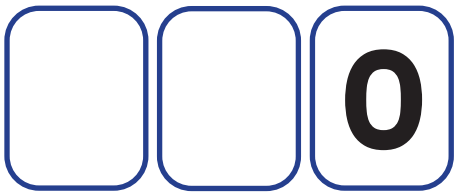
You can put them together to show different numbers. For example: Eighty Six

Put the three cards together in a different way. Write in words what number the cards show.



_____

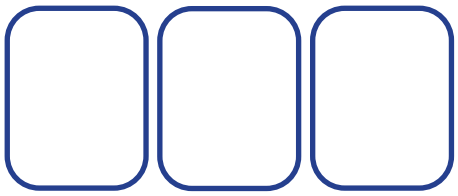
Now put the three cards together in another different way. Write in words



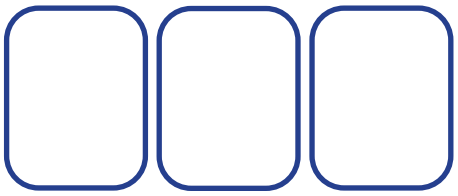
_____

Here are three different number cards.

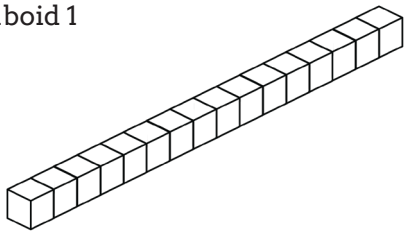
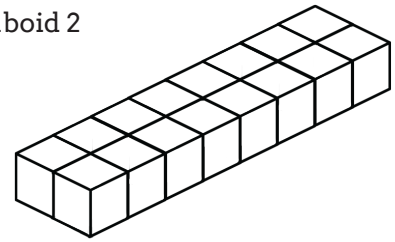
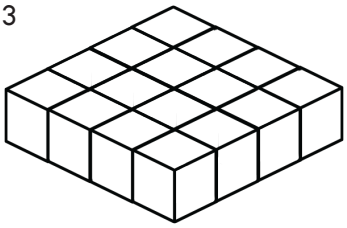
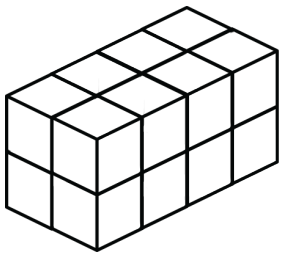
What is the biggest number you can show with these cards?



What is the biggest even number you can show with these cards?



Q. You can make only four different cuboids with 16 cubes. Complete the table below showing the dimensions of each of the cuboids that can be made.

	Dimensions		
Cuboid 1 			
Cuboid 2 			
Cuboid 3 			
Cuboid 4 			

Which of the cuboids 1 and 4 has the larger surface area?

Use words, diagrams and /or numbers to explain how you know.

Write a generalised expression you could use to work out the surface area of any cuboid.

Which of the cuboids has the larger volume?
Use words, diagrams and /or numbers to explain how you know

How many of cuboid 4 will make a cuboid of dimensions 4x4x4 ?
Use words, diagrams and /or numbers to explain how you know

You can only make 6 different cuboids with 24 cubes. Complete the table showing the dimensions of the 6 different cuboids.

	Dimensions		
Cuboid 1	1	1	24
Cuboid 2	1	2	12
Cuboid 3			
Cuboid 4			
Cuboid 5			
Cuboid 6			

Q. Four-fifths of the members of a club are female. Three-quarters of these females are over 20 years old. What fraction of the members of the club are females over 20 years old?.

Use words, diagrams **and** numbers to explain how you know

Q. The table shows a recipe for a fruit drink.

Type of juice	**Amount**
Orange	$\frac{1}{2}$ litre
Apple	$\frac{1}{3}$ litre
Blackcurrant	$\frac{1}{6}$ litre
Total	**1 litre**

I want to make $1\frac{1}{2}$ litres of the same drink.

Complete the table below to show how much of each type of juice to use. Show your working.

Type of juice	**Amount**
Orange	_____ litre
Apple	_____ litre
Blackcurrant	_____ litre
Total	**$1\frac{1}{2}$ litre**

Use words, diagrams and /or numbers to explain how you know.

Q. I start with any two consecutive integers. I square each of them, then I add the two squares together.

Use words, letters , diagrams and /or numbers to prove that the total must be an odd number.

Q. Think about triangles that have

(a.) a perimeter of 15cm,

(b.) two or more equal sides,

(c.) each side a whole number of centimetres

Prove that there are only **four** of these triangles. You do not need to construct the triangles.

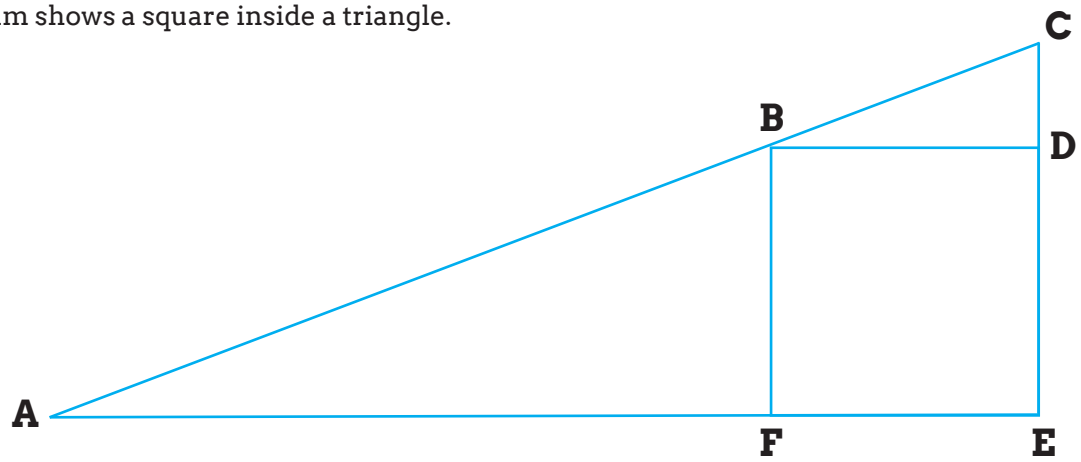
Q. The table shows data about births in Ireland

Year	Number of Births
2002	6.05×10^4
2003	6.15×10^4
2004	6.19×10^4
2005	6.14×10^4
2006	6.54×10^4
2007	7.14×10^4
2008	7.52×10^4
2009	7.56×10^4
2010	7.51×10^4
2011	7.40×10^4
2012	6.17×10^4
2013	6.89×10^4
2014	6.73×10^4
2015	6.55×10^4
2016	6.41×10^4
2017	6.18×10^4
2018	6.10×10^4

In what year was the number of births the highest? _____

How many more births were there in 2012 than in 2002?

Q. The diagram shows a square inside a triangle.



ABC is a straight line. The side length of square **BDEF** is 12cm. The length of **BC** is 15cm.

Show that the length of **AB** is 20cm.