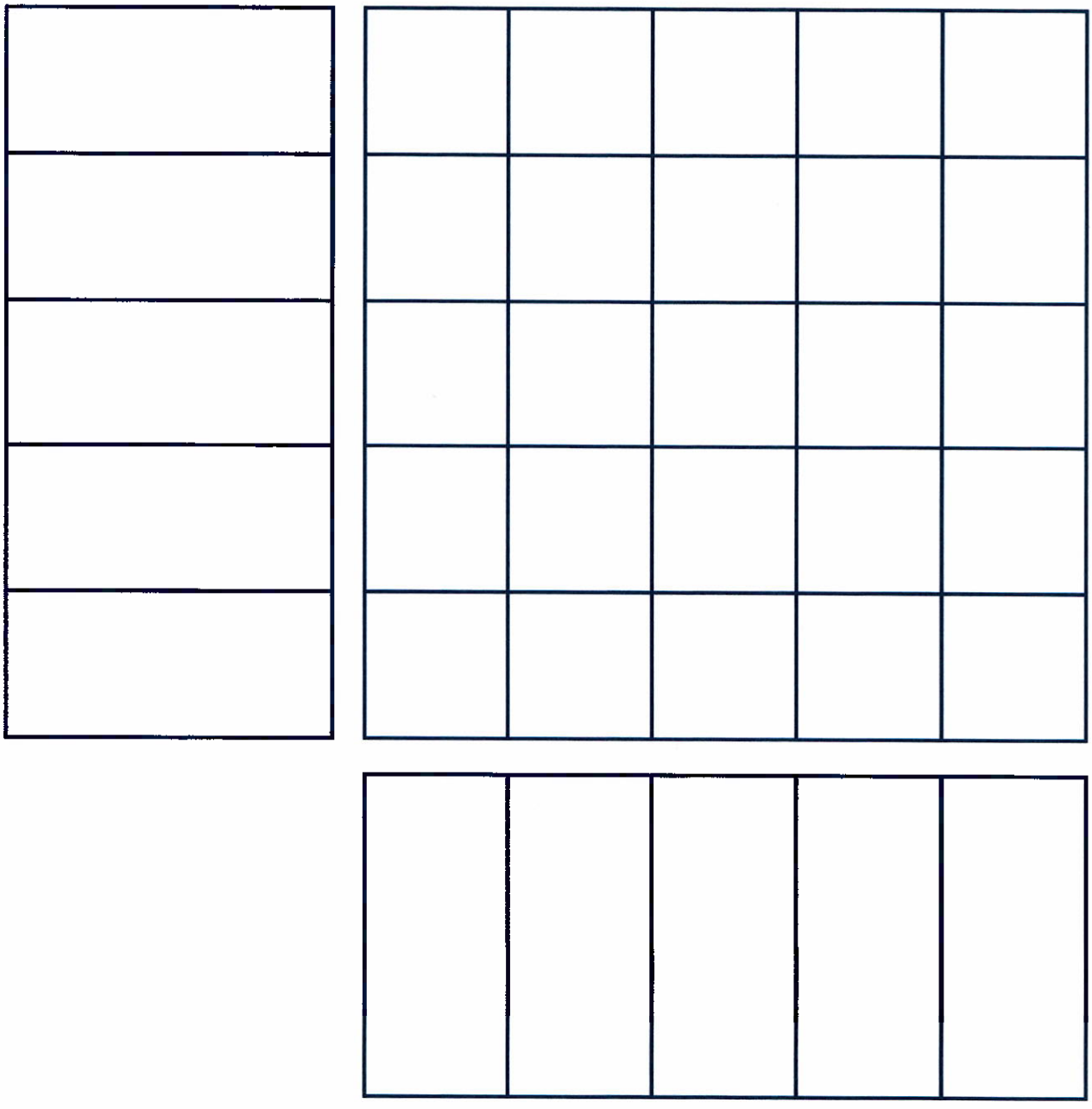
Factors and Multiples Puzzle

Cut out the 10 heading cards and put one in each of the 10 spaces round the playing board.

Cut out the 25 number cards and place each one in a different square on the playing board so that the number satisfies the condition given by the heading card for that row *and* the condition given by the heading card for that column.

By rearranging the heading cards and the number cards, try to fill as many squares on the playing board as possible.

Is it possible to fill all the squares at once?



Factors and Multiples Puzzle

Number cards

1	2	3	4	5
6	7	9	10	11
12	15	16	18	20
21	23	24	25	30
35	36	45	55	60

Heading cards

PRIME NUMBERS	TRIANGULAR NUMBERS
SQUARE NUMBERS	FACTORS OF 60
NUMBERS LESS THAN 20	MULTIPLES OF 3
NUMBERS MORE THAN 20	MULTIPLES OF 5
ODD NUMBERS	EVEN NUMBERS

Performance Assessment Task

The Frozen Yogurt Sale

Your class has decided to raise money by selling frozen yogurt cones at recess for the next week. All the profit, after paying for supplies, will be donated to the local food bank.

Supplies will be purchased before the sale. Here are the prices:

Frozen yogurt (2 litres – enough for about 15 scoops): $5.00
Cones (box of 20): $2.25

Think about the price you'll charge for each frozen yogurt cone, about how many cones you think you can sell, and how much you'll need to spend on supplies. If you do sell that many cones, how much money will you have left to donate to the food bank after you pay for the supplies?

For this activity, you will:

- Use multiples to share information about the cost of supplies.
- Describe the strategy you used to solve the problem.
- Defend your solution. How would you convince someone that your answer is reasonable for this situation?

Optional Student Page: The Frozen Yogurt Sale

Name _____ **Date** _____

How much will you charge for each single-scoop cone? _____

How many cones do you think you can sell? _____

How much money will you be able to raise for the food bank? Make your strategy for finding the profit as easy to understand as possible. You may need to use the back of the page.

Explain why your answer is a reasonable one. How would you convince someone that your answer makes sense?

The T-Shirt Order

You and your classmates have just received brand new school t-shirts. You want to find out how much it would cost to get your names embroidered on the back of your shirts. The cost of stitching each name depends on how long the name is. There are 3 different prices:

Number of Letters	Cost
Up to 4 letters	$4
5 or 6 letters	$8
7 or more letters	$12

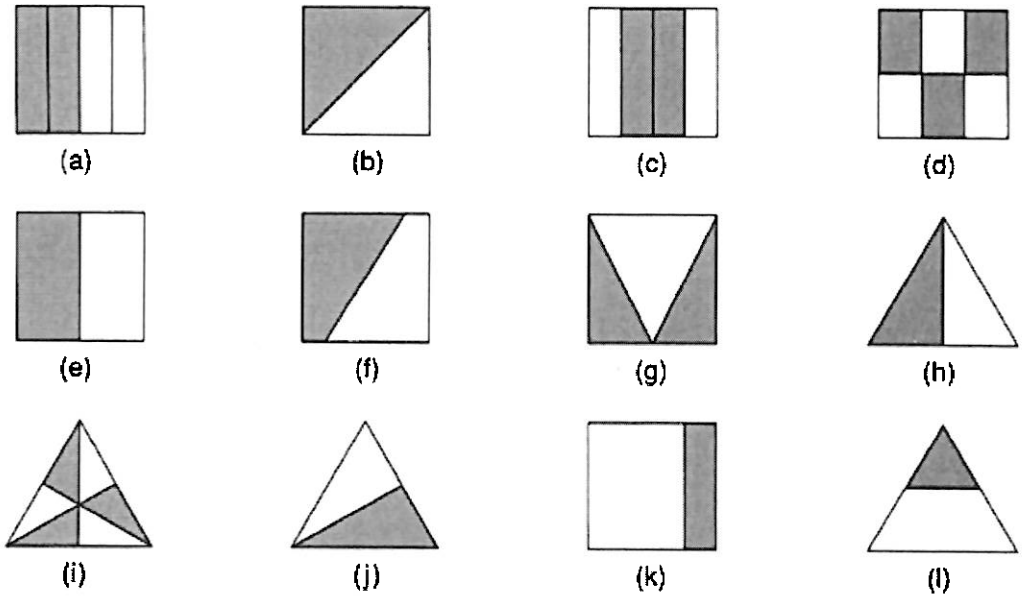
Your job is to find out how many names fit into each category, and how much it will cost to stitch all the names on t-shirts.

For this activity:

- **Organize the data** from the class list.
- **Use multiplication and addition** to solve a problem.
- **Describe your strategies** for adding and multiplying the numbers.

The Half of a Whole Task

Identify all of the figures that have one half shaded. Be prepared to explain how you know that one half of the figure is shaded. Write a written description giving your reason why a figure is showing halves. If a figure does not show one half shaded explain why the figure is not showing halves.

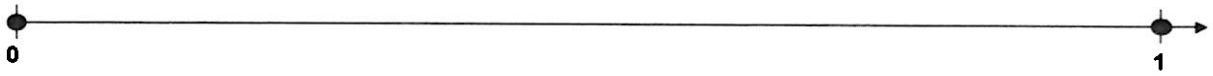


Adapted from: Watanabe, T. (1996). Ben's understanding of one-half. *Teaching Children Mathematics*, *2*(8), 460-464.

Bubble Gum Task

Four friends each bought a roll of bubble gum tape. Carlos chewed $\frac{3}{4}$ of his gum. Helen chewed $\frac{5}{6}$ of her gum. Jamal chewed $\frac{6}{8}$ of his gum. Lizbeth chewed $\frac{3}{5}$ of her gum.

1. Use the number line below to illustrate:
   - Which friend chewed the most gum?
   - Which friend chewed the smallest piece?
   - Which 2 friends chewed the same sized piece?



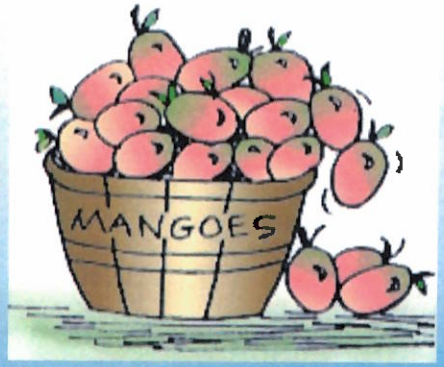
2. Explain how you can use 3/4 to help you determine which value is greater, 5/6 or 3/5, if each fraction refers to the same whole.

3. Explain why a/b = (a/b) x (n/n) and connect this equation to a visual diagram.

Adapted from: Schifter, D., Bastable, V., & Russell, S. J. (1999). *Developing mathematical ideas: Making meaning for operations. Parsippany, NJ: Dale Seymour.*

The Mangoes Problem

One night the King couldn't sleep, so he went down into the Royal kitchen, where he found a bowl full of mangoes. Being hungry, he took 1/6 of the mangoes. Later that same night, the Queen was hungry and couldn't sleep. She, too, found the mangoes and took 1/5 of what the King had left.
Still later, the first Prince awoke, went to the kitchen, and ate 1/4 of the remaining mangoes.
Even later, his brother, the second Prince, ate 1/3 of what was then left.
Finally, the third Prince ate 1/2 of what was left, leaving only three mangoes for the servants.
How many mangoes were originally in the bowl?



~NCTM, Illuminations, 2008

Can You Make 100?

How many ways can you find to put operation signs (+, −, ×, ÷) between the digits make 100?

1 2 3 4 5 6 7 8 9 = 100

Use these lines to have a go:

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

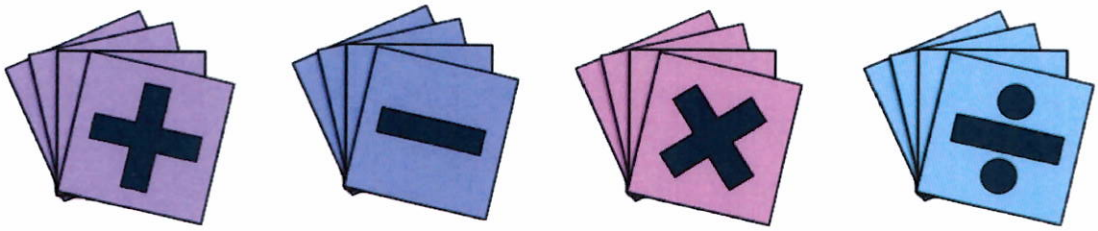
1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____

1 2 3 4 5 6 7 8 9 = _____



NRICH

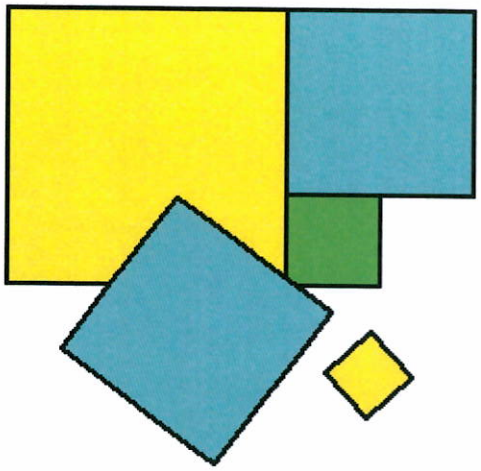
Fitted

Age 7 to 11

If you are a teacher click here /1854&part=note for a version of the problem suitable for classroom use, together with supporting materials. Otherwise, read on ...

Nine squares with side lengths $1, 4, 7, 8, 9, 10, 14, 15$ and 18 cm can be fitted together with no gaps and no overlaps, to form a rectangle.

What are the dimensions of the rectangle?



Once you've had a chance to think about it, click below to see how three different pupils began working on the task.

This is how Anna started:

Show

Here is what Brendan tried:

Show

Here is Chandra's initial approach to the problem:

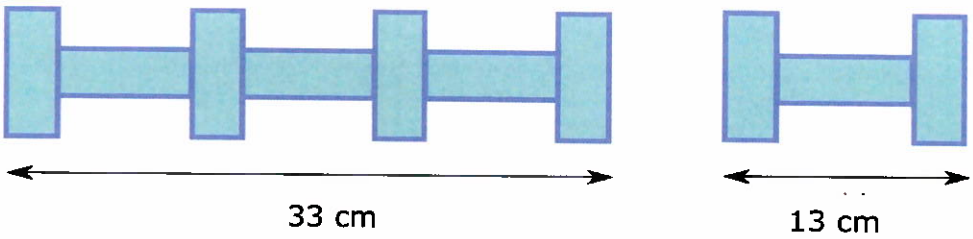
Show

Can you take each of these starting ideas and develop them into a solution?

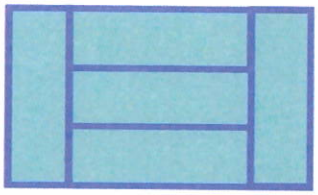
Perimeter Challenge

In each problem, work out the perimeter of one of the small rectangles:

(a)

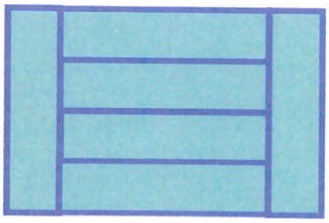


(b)



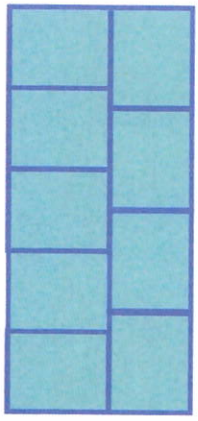
Area of whole rectangle
$= 60\ cm^2$

(c)



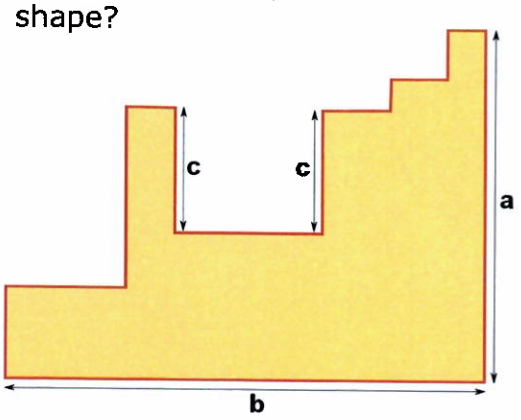
Area of whole rectangle
$= 600\ mm^2$

(d)



Area of the whole rectangle
$=180\ cm^2$

Can you find the perimeter of this shape?



Always, Sometimes or Never?

Always, Sometimes or Never? – Statement cards

Are the following statements always true, sometimes true or never true?

A hexagon has six equal length sides	Triangles have a line of symmetry
Squares have two diagonals that meet at right angles	Cutting a corner off a square makes a pentagon
The base of a pyramid is a square	A cuboid has two square faces

What about these statements?

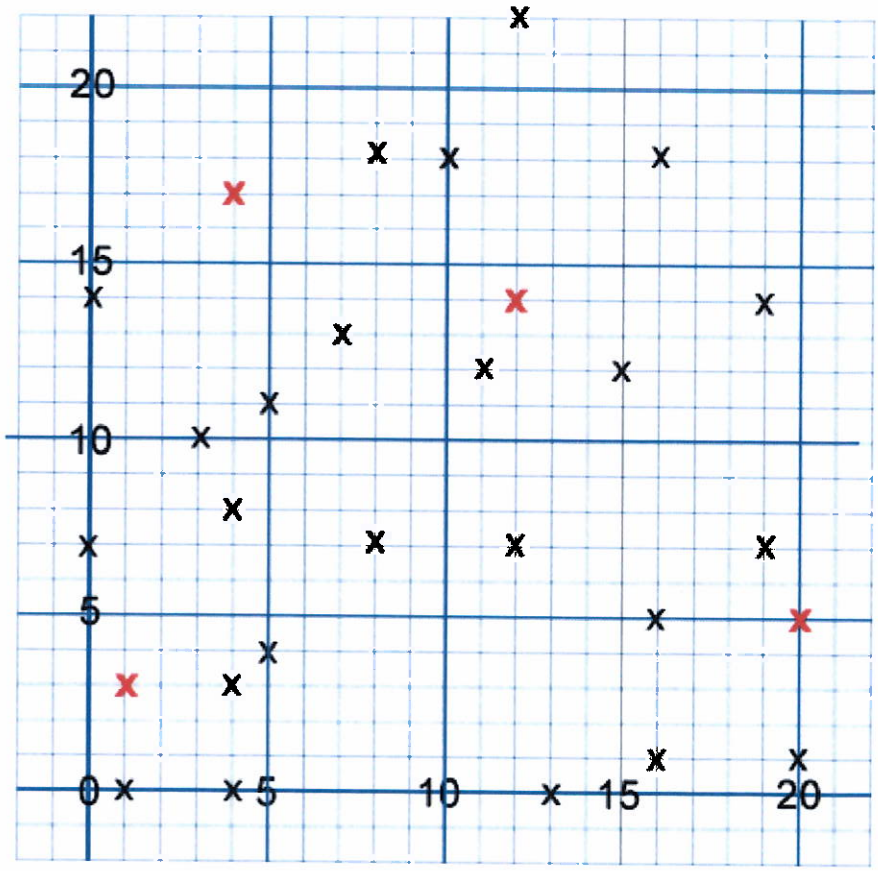
When you cut off a piece from a 2D shape you reduce the area and perimeter	Triangles tessellate
The number of lines of symmetry in a regular shape is equal to the number of sides	Quadrilaterals can be cut into two equal triangles

NRICH

Eight Hidden Squares

Age 7 to 14 Challenge Level:

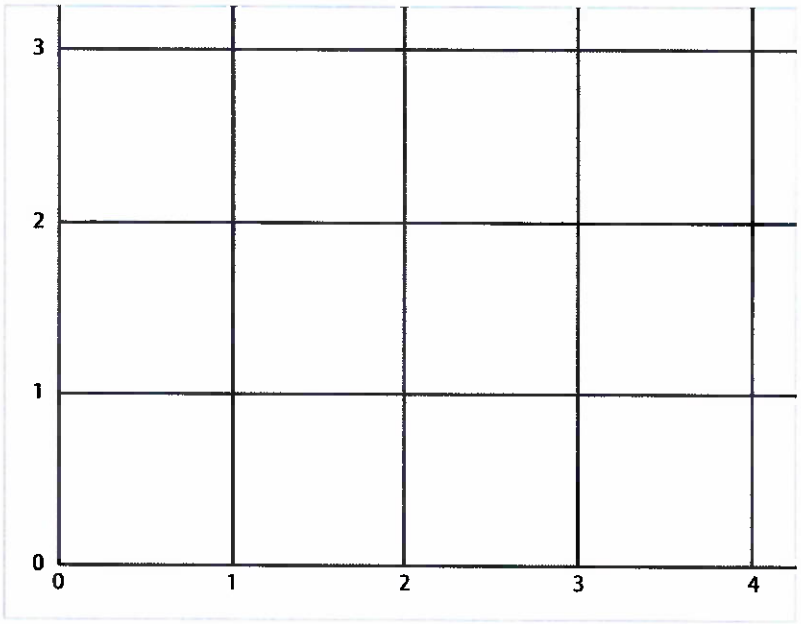
On the graph below there are 28 marked points.



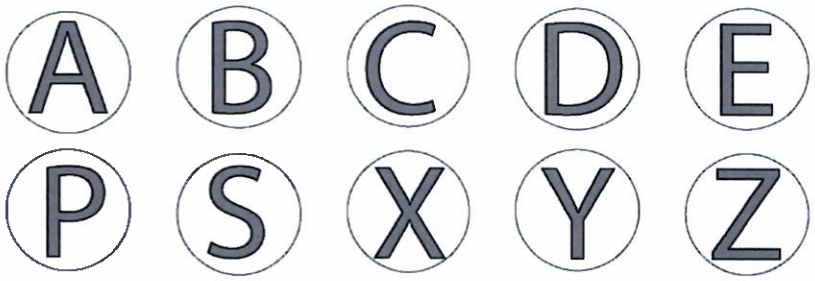
These points all mark the vertices (corners) of eight hidden squares.
Each of the 4 red points is a vertex shared by two squares.
The other 24 points are each a vertex of just one square.
All of the squares share just one vertex with another square.
All the squares are different sizes.
There are no marked points on the sides of any square, only at the vertices.

Can you find the eight hidden squares?

Coordinate Challenge

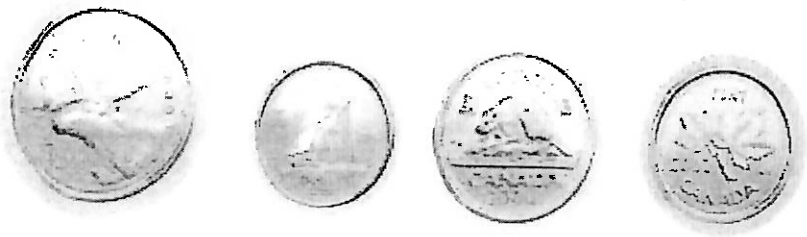


- The letters at (1,1), (1,2) and (1,3) are all symmetrical about a vertical line.
- The letter at (4,2) is not symmetrical in any way.
- The letters at (1,1), (2,1) and (3,1) are symmetrical about a horizontal line.
- The letters at (0,2) and (2, 0) have rotational symmetry.
- The letter at (3,1) consists of just straight lines.
- The letters at (3,3) and (2,0) consist of just curved lines.
- The letters at (3,3), (3,2) and (3,1) are consecutive in the alphabet.
- The letters at (0,2) and (1,2) are the two ends of the alphabet.



Problem: 1001 Pennies

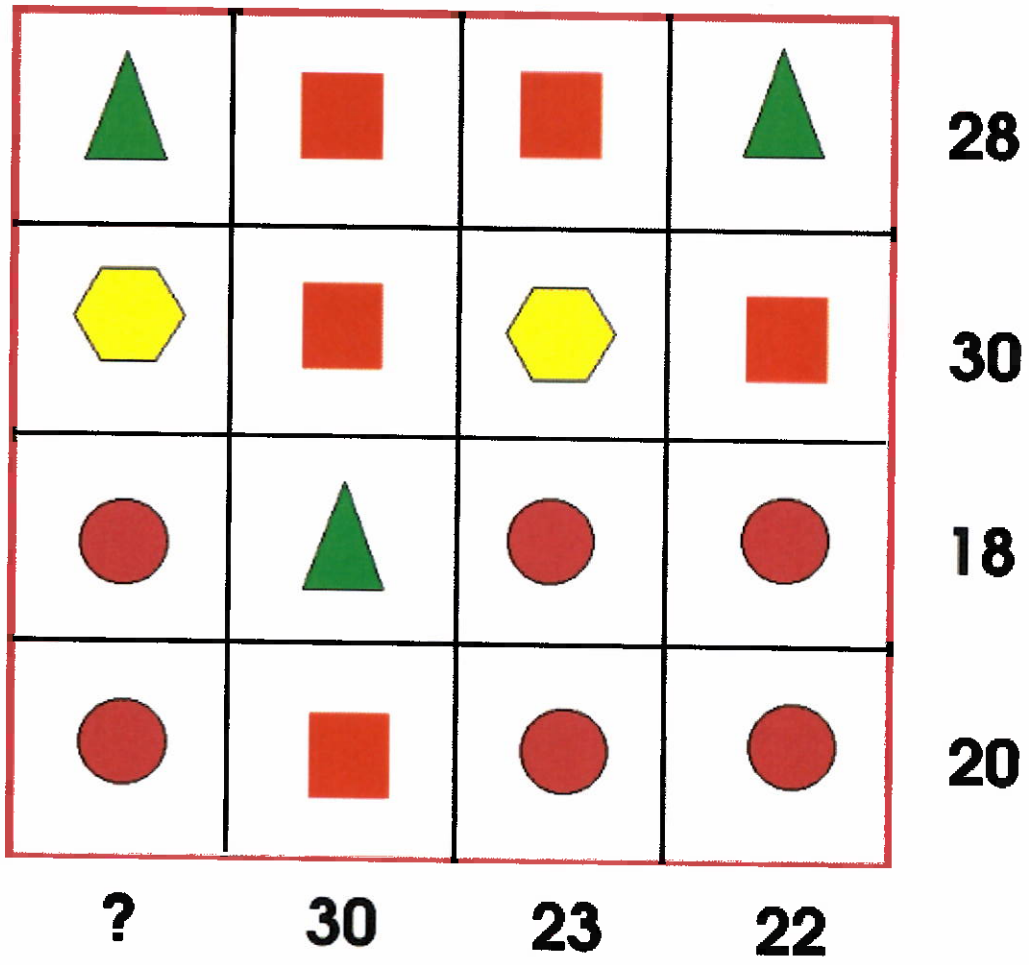
There are 1001 pennies lined up on a table. I come along and replace every second coin with a nickel. Then I replace every third coin with a dime. Finally, I replace every fourth coin with a quarter. How much money is on the table?



What's it Worth?

Each symbol has a numerical value. The total for the symbols is written at the end of each row and column.

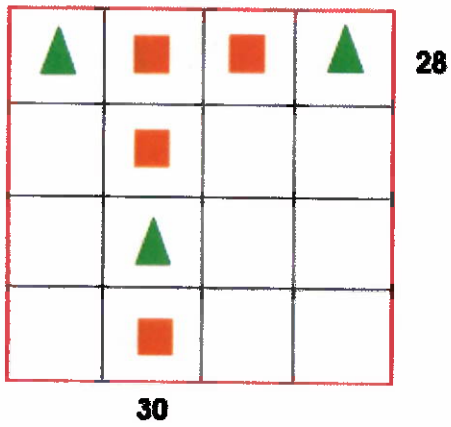
Can you find the missing total that should go where the question mark has been put?



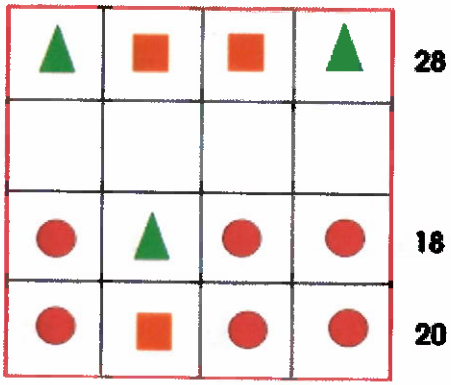
Can you find more than one way to do it?

What's it Worth?

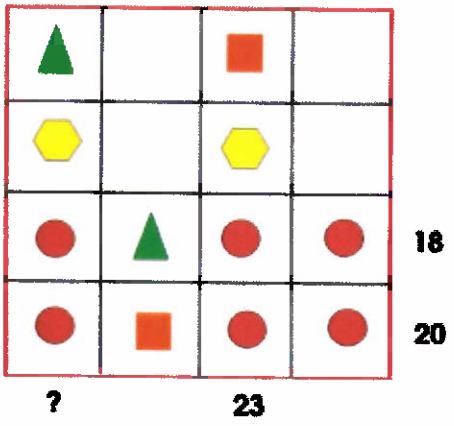
Method 1



Method 3



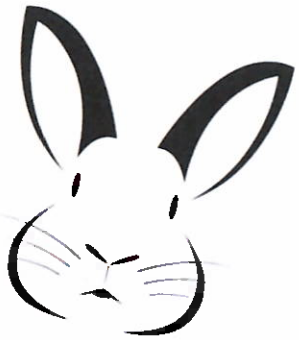
Method 5



youcubed
at Stanford University

Leo the Rabbit

Leo the Rabbit is climbing up a flight of 10 steps. Leo can only hop up 1 or 2 steps each time he hops. He never hops down, only up. How many different ways can Leo hop up the flight of 10 steps? Provide evidence to justify your thinking.



nrich
Specialists in rich mathematics

Seven Flipped

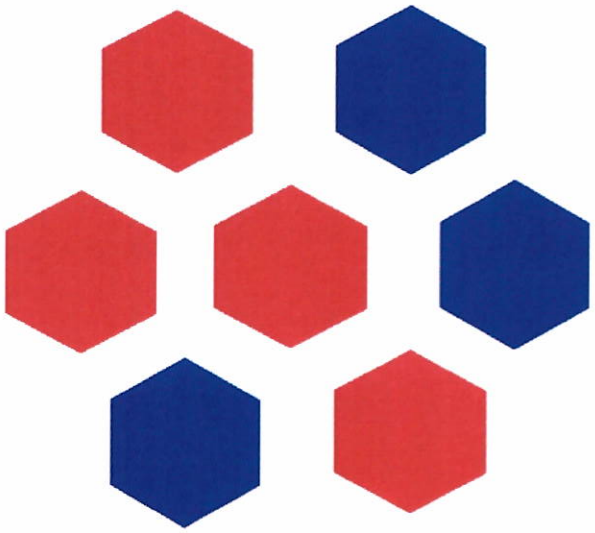
You have seven hexagonal-shaped mats – each with one side red and one blue. Starting red side up – these mats all have to be turned over, but you can only turn over exactly three at a time.

What is the smallest number of moves you can do this in?

Try with other numbers of mats.

Do you notice any patterns in your findings?

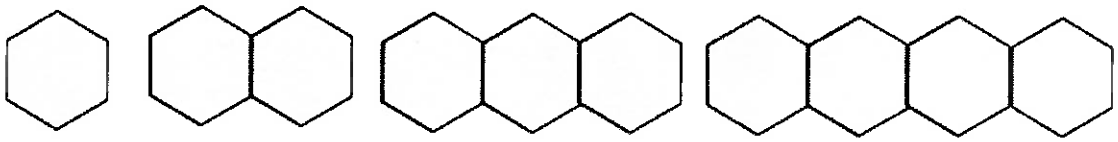
Can you explain why these patterns occur?



Thousands more problems can be found on the NRICH Maths website:
http://nrich.maths.org

Hexagon Task[1]

Trains 1, 2, 3 and 4 (shown below) are the first 4 trains in the hexagon pattern. The first train in this pattern consists of one regular hexagon. For each subsequent train, one additional hexagon is added.



Train 1 Train 2 Train 3 Train 4

1. Compute the perimeter for each of the first four trains.
2. Draw the fifth train and compute the perimeter of the train.
3. Determine the perimeter of the 10th train without constructing it.
4. Write a description that could be used to compute the perimeter of any train in the pattern.
5. Determine which train has a perimeter of 110.

---

[1] This task was adapted from *Visual Mathematics Course 1, Lessons 16-30* published by the Math Learning Center.

You Never Get a Six

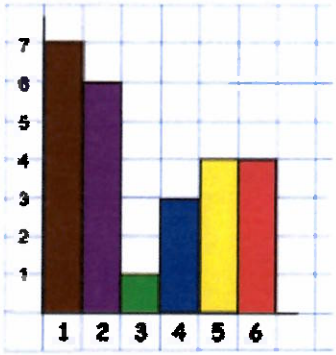
Tom, Vincent, Charlie and Edward were playing with dice.

They made lists of all their throws and then drew graphs of their results. They decided to make each of the numbers on the dice a different colour on the graphs.

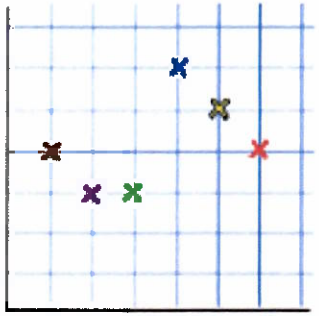
Who threw the most sixes?

How many of each number were thrown altogether?

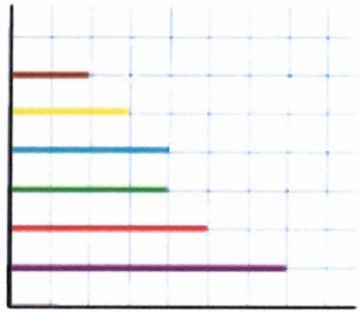
What percentage of the throws were sixes?



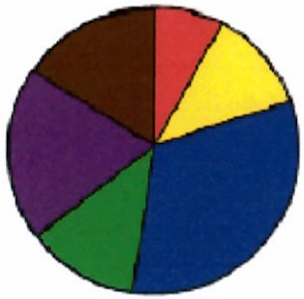
Edward's finished graph



Tom's unfinished graph



Charlie's unfinished graph



Vincent's unfinished pie chart

Mixed Up Socks

Start with three pairs of socks.

Now mix them up so that no mismatched pair is the same as another mismatched pair.

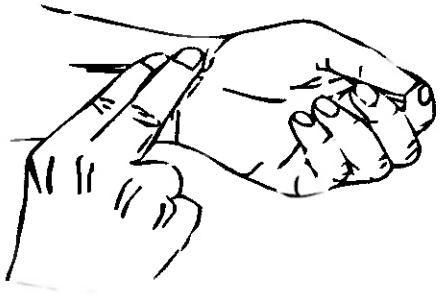
Now try it with four pairs of socks.
Is there more than one way to do it?

Every Beat of Your Heart

NAME _____

The heart of a child below the age of twelve beats about 100 times a minute.

Try the following experiment: Check your heartbeat by pressing your fingers as shown below to find your pulse. The pulse is the throbbing, or beating, felt when blood is pumped by the heart. Once you can feel your pulse, count how many times your heart beats in one minute.



1. Determine the following:

   a. Number of heart beats in one minute while at rest _____

   b. Number of heart beats in one minute after exercise:

      Stepping up and down _____ Walking _____ Running in place _____

2. Does the heart beat faster at rest or after exercise?

3. Which exercise caused the heart to beat the fastest: stepping up and down, walking, or running?

4. Would the heart beat faster if you exercised for more than one minute? Why?

5. Do you think the heart would beat faster after running, or after biking? How could you test your prediction?

6. Whose heart would beat faster: a person who has just run a long race, or someone who has just played a baseball game? How could you find out?