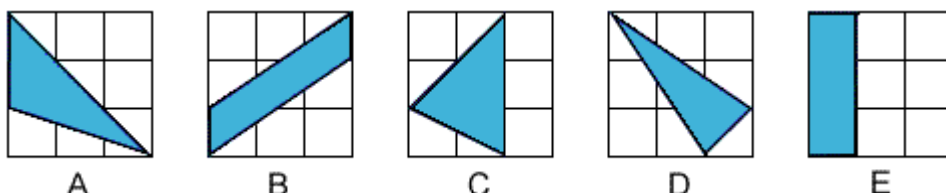




Stage 3 ★ Mixed Selection 1

1. 3x3 areas

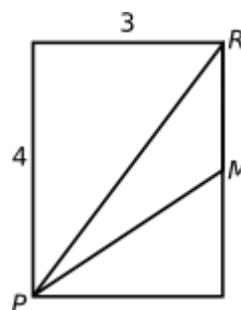
Which of the following shaded regions has an area different from the other shaded regions?



2. Mid-point area

M is the midpoint of the side of the rectangle.

What is the area (in square units) of the triangle PMR ?



3. Rectangle cutting

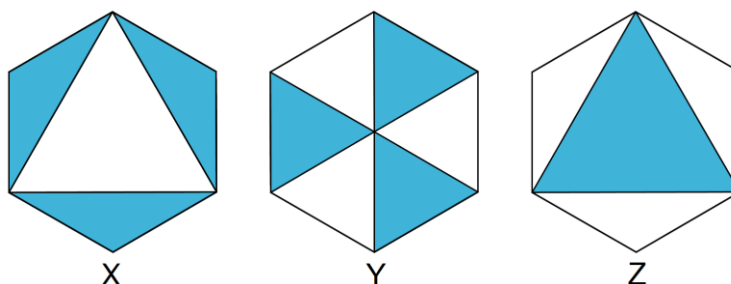
Tom and Jerry started with identical rectangular sheets of paper. Each of them cut his sheet in half. Tom obtained two rectangles, each with a perimeter of 40 cm while Jerry obtained two rectangles, each with a perimeter of 50 cm.

What was the perimeter of Tom's original sheet of paper?

4. Hexa-split

The three regular hexagons are all the same size. X , Y and Z denote the values of the shaded areas in the hexagons as shown.

Which of these areas are equal to each other?



These problems are adapted from UKMT Mathematical Challenge problems (ukmt.org.uk)



Stage 3 ★
Mixed Selection 2

1. Shaded end

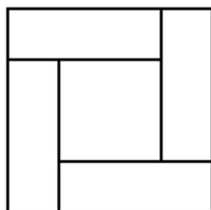
The diagram shows a cuboid in which the area of the shaded face is one quarter of the area of each of the two visible unshaded faces.



The total surface area of the cuboid is 72cm^2 .

What is the area of one of the unshaded faces of the cuboid?

2. Square ratio



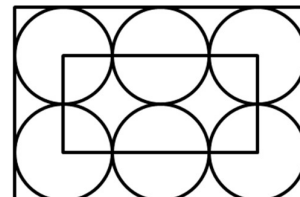
A square is divided into four congruent rectangles and a smaller square, as shown in the diagram.

The area of the small square is $\frac{1}{4}$ of the area of the whole square.

What is the ratio of the length of a short side of one of the rectangles to the length of a long side?

3. Six circles

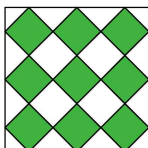
In the diagram, six circles of equal size touch adjacent circles and the sides of the large rectangle. Each of the corners of the small rectangle is the centre of one of the large circles.



The perimeter of the small rectangle is 60cm .

What is the perimeter of the large rectangle?

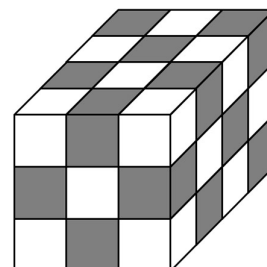
4. Squares in a square



In the diagram, all the small squares are of the same size. What fraction of the large square is shaded?

5. Chequered cuboid

A cuboid is made from cubes of equal size, coloured alternately white and black as shown.



What fraction of the surface area of the cuboid is coloured black?

These problems are adapted from UKMT Mathematical Challenge problems (ukmt.org.uk)



Stage 3 ★
Mixed Selection 3

1. Cuboid faces

The faces of a cuboid have areas of 12, 18 and 24 square centimetres.

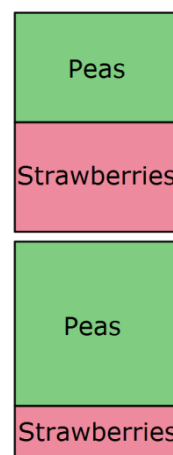
What is the volume of the cuboid?

2. Strawberries and peas

Yasmin has beds for peas and strawberries in her garden, as shown in the diagram on the right.

This year, Yasmin moved the boundary. She decided to change the rectangular pea bed into a square, by lengthening one of its sides by 3m. As a result of this, the area of the strawberry patch was reduced by 15m^2 .

What was the original area of the pea bed, before the change in the boundary?



3. Giant Rubik's cube

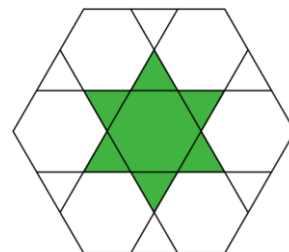
A Rubik's cube is made of 3 by 3 by 3 smaller cubes – so 27 in total – but only 26 of them are visible.

How many cubes would be visible in a 12 by 12 by 12 Rubik's cube?

4. Star in a hexagon

The diagram shows a design formed by drawing six lines in a regular hexagon. The lines divide each edge of the hexagon into three equal parts.

What fraction of the hexagon is shaded?



These problems are adapted from UKMT (ukmt.org.uk) and SEAMC (seamc.asia) problems.