

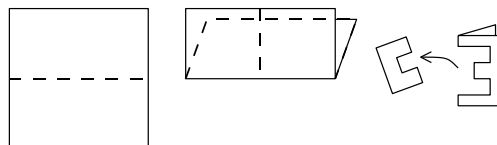
Shape (Intermediate UKMT)

These questions must be attempted ***without a calculator***

Topics covered in the questions below may not necessarily be from the topic of the title.

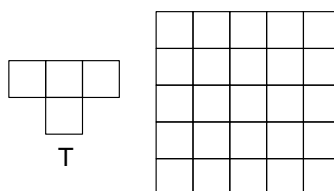
1. I fold a piece of paper in half, then in half again before cutting a shape from the folded paper as shown.

When I unfold the paper, what do I see?



- A B C D E

2. What is the maximum number of pieces with the shape T which can be placed within the 5×5 grid shown, without overlapping, and with their edges along the lines of the grid?



- A 3 B 4 C 5 D 6 E 7

3. The diagram shows seven metal rings linked together.

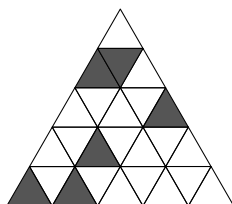
What is the smallest number of rings that need to be cut in order to separate all the rings?



- A 2 B 3 C 4 D 5 E 6

4. The figure shows an equilateral triangle divided into small equilateral triangles, all equal.

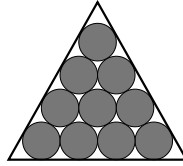
What is the lowest number of small triangles which must now be shaded to produce a figure which has a line of symmetry?



- A 2 B 3 C 4 D 5 E 6

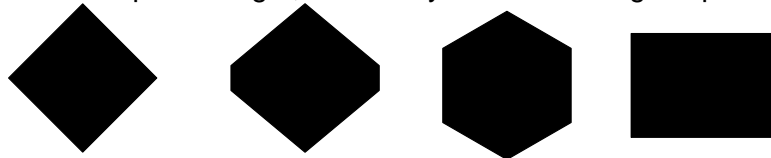
5. The diagram shows 10 identical coins which fit exactly inside a wooden frame. As a result each coin is prevented from sliding.

What is the largest number of coins that may be removed so that each remaining coin is still unable to slide?



- A 1 B 2 C 3 D 4 E 5

6. When a solid cube is held up to the light, how many of the following shapes could its shadow have?



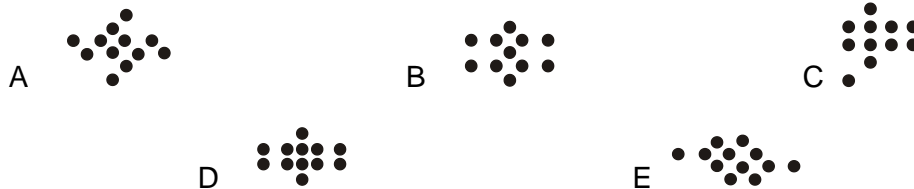
- A 0 B 1 C 2 D 3 E 4

7. In how many ways can a square be cut in half using a single straight line cut?

- A 1 B 2 C 4 D 8 E Infinitely many

8. A designer wishes to use two copies of the logo shown below to create a pattern, without any of the dots overlapping.

Which one of the following could be made?

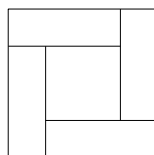


9. Shape A is made from 6 unit squares; shape B is made from 8, C from 4, D from 8 and E from 3 unit squares. For four of these shapes, four exact copies can be fitted together to make a rectangle.

Which is the odd one out?



10. A square is divided into four congruent rectangles and a smaller square, as shown. 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? (The diagram is not to scale.)



- A $1:\sqrt{2}$ B $1:\sqrt{3}$ C 1:2 D 1:3 E 1:4