

## Angles and shape (Junior UKMT)

These questions must be attempted without a calculator

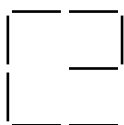
Topics covered in the questions below may not necessarily be from the topic of the title.

1. How many letters of the word **MATHEMATICS** do not have any lines of symmetry?

A 0                      B 1                      C 2                      D 3                      E 4

2. The diagram shows a pattern made from matchsticks stuck to a piece of card.

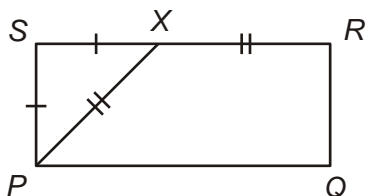
What is the smallest number of matchsticks that need to be added so that the resulting pattern has a line of symmetry?



A 0                      B 1                      C 2                      D 3                      E 4

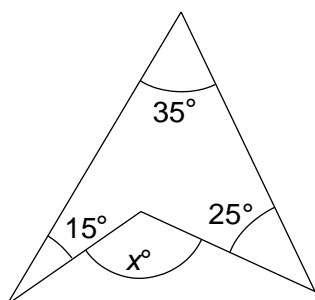
3. A rectangle  $PQRS$  is cut into two pieces along  $PX$ , where  $PX = XR$  and  $PS = SX$  as shown. The two pieces are reassembled without turning either piece over, by matching two edges of equal length.

Not counting the original rectangle, how many different shapes are possible?



A 1                      B 2                      C 3                      D 4                      E 5

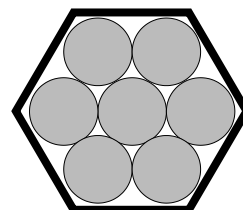
4. What is the value of  $x$ ?



A 75                      B 85                      C 95                      D 105                      E 115

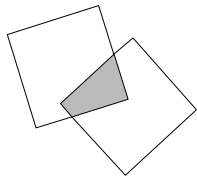
5. The diagram shows 7 identical coins which fit exactly inside a wooden frame. As a result each coin is prevented from sliding.

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



A 0                      B 1                      C 2                      D 3                      E 4

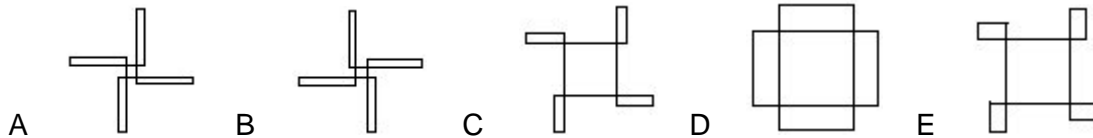
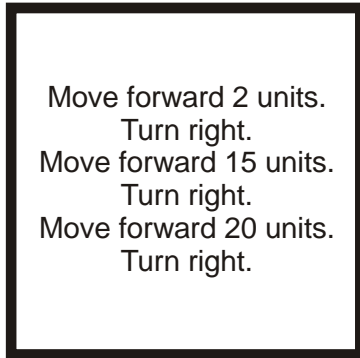
6. Which one of the following shapes could not appear as the overlapping region of two identical squares?



- A equilateral triangle      B square      C kite  
D heptagon      E regular octagon

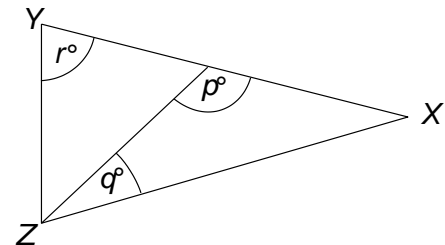
7. The figures below are all drawn to scale.

Which figure would result from repeatedly following the instructions in the box?



8. In the diagram, triangle  $XYZ$  is isosceles, with  $XY = XZ$ .

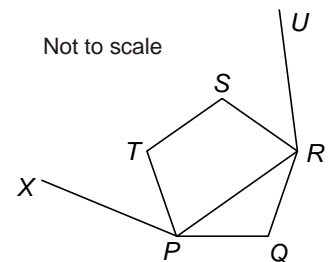
What is the value of  $r$  in terms of  $p$  and  $q$ ?



- A  $\frac{1}{2}(p - q)$       B  $\frac{1}{2}(p + q)$       C  $p - q$       D  $p + q$       E Impossible to determine

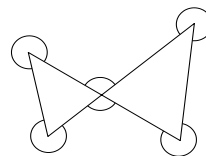
9. The figure shows a regular pentagon  $PQRST$  together with three sides  $XP, PR, RU$  of a regular hexagon with vertices  $PRUVWX$ .

What is the size of angle  $SRU$ ?



- A  $48^\circ$       B  $54^\circ$       C  $60^\circ$       D  $63^\circ$       E  $72^\circ$

10. What is the sum of the six marked angles?



- A  $1080^\circ$       B  $1440^\circ$       C  $1620^\circ$       D  $1800^\circ$       E more information needed