

Between L6 and U6 (Senior 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. Three different positive integers add up to 12.

How large could the largest of the three numbers be?

A 6 B 7 C 8 D 9 E 10

2. A dictionary defines one billion to be either one million million or one thousand million.

What is the difference between these two numbers?

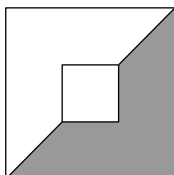
A 1000 B 1 000 000 C 999 000
D 999 000 000 E 999 000 000 000

3. What is the value of 2005 plus 2005 thousandths?

A 2005.002005 B 2005.2005 C 2007.005 D 2025.05 E 2205.5

4. The diagram shows two squares, with sides of length 1 and 3, which have the same centre and corresponding sides parallel.

What fraction of the larger square is shaded?



A $\frac{4}{9}$ B $\frac{4}{11}$ C $\frac{2}{5}$ D $\frac{2}{7}$ E $\frac{6}{11}$

5. If n is some integer, $1 \leq n \leq 9$, what is the value of $(0.\dot{n}) / (0.\dot{\dot{n}})$?

A $1/10$ B $9/10$ C 1 D $10/9$ E it depends on n

6. The factorial of n , written $n!$, is defined by $n! = 1 \times 2 \times 3 \times \dots \times (n-2) \times (n-1) \times n$
e.g. $6! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 = 720$.

What is the smallest positive integer which is *not* a factor of $50!$?

A 51 B 52 C 53 D 54 E 55

7. Mary received a 10% pay rise, and Margaret received a 5% pay rise. This gave them both salaries of £23 100 per year.
- How much more, per year, did Margaret earn than Mary before they received these pay rises?

A £1155 B £1000 C £850 D £760 E £550

8. The 80 spokes of the giant wheel *The London Eye* are made from 4 miles of cable.
- Roughly what is the circumference of the wheel in metres?

A 50 B 100 C 500 D 750 E 900

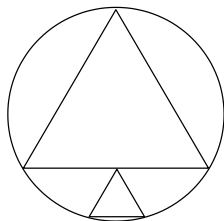
9. The year 1789 (when the French Revolution started) has three and no more than three adjacent digits (7, 8 and 9) which are consecutive integers in increasing order.

How many years between 1000 and 9999 have this property?

A 130 B 142 C 151 D 169 E 180

10. An equilateral triangle is inscribed in a circle, as shown. Another equilateral triangle is drawn in one of the segments so that the final diagram has a line of symmetry.

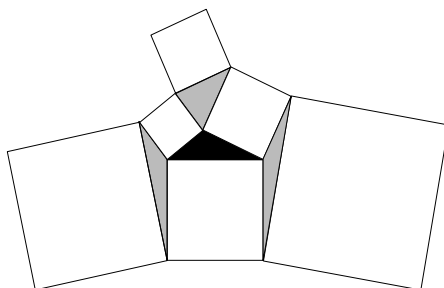
What is the ratio of the length of the side of the bigger triangle to the length of the side of the smaller triangle?



A $(\sqrt{5} + 1):1$ B $(2\sqrt{5} + 1):1$ C $(\sqrt{3} + \sqrt{5}):1$ D $2\sqrt{5}:1$ E 3 : 1

11. The black triangle is drawn, and a square is drawn on each of its edges. The three shaded triangles are then formed by drawing three lines which join vertices of the squares and a square is now drawn on each of these three lines. The total area of the original three squares is A_1 , and the total area of the three new squares is A_2 .

Given that $A_2 = kA_1$ then



A $k = 1$ B $k = \frac{3}{2}$ C $k = 2$ D $k = 3$ E more information needed

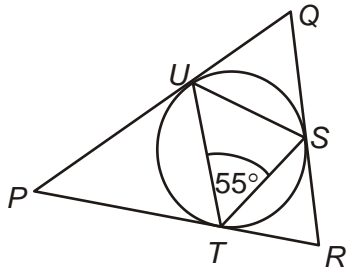
12. The factorial of n , written $n!$, is defined by $n! = 1 \times 2 \times 3 \times \dots \times (n-2) \times (n-1) \times n$.

For how many positive integer values of k less than 50 is it impossible to find a value of n such that $n!$ ends in exactly k zeros?

- A 0 B 5 C 8 D 9 E 10

13. The largest circle which it is possible to draw inside triangle PQR touches the triangle at S , T and U , as shown in the diagram. The size of $\angle STU = 55^\circ$.

What is the size of $\angle PQR$?



- A 55° B 60° C 65° D 70° E 75°

14. A bracelet is to be made by threading four identical red beads and four identical yellow beads onto a hoop.

How many different bracelets can be made?

- A 4 B 8 C 12 D 18 E 24

15. The sum of the lengths of the 12 edges of a cuboid is x cm. The distance from one corner of the cuboid to the furthest corner is y cm.

What, in cm^2 , is the total surface area of the cuboid?

- A $\frac{x^2 - 2y^2}{2}$ B $x^2 + y^2$ C $\frac{x^2 - 4y^2}{4}$ D $\frac{xy}{6}$ E $\frac{x^2 - 16y^2}{16}$