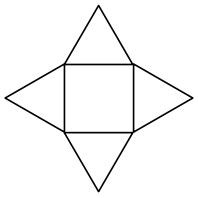
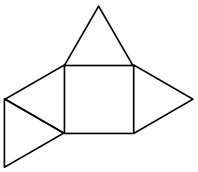
L6 Christmas present (Senior UKMT)

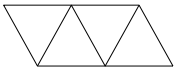
These questions must be attempted ***without a calculator***

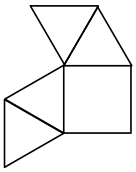
Topics covered in the questions below may not necessarily be from the topic of the title.

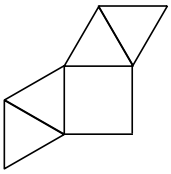
1. Which of the following is not the net of a pyramid?

A 

B 

C 

D 

E 

2. What is the remainder when the number 743589 × 301647 is divided by 5?

A 0 B 1 C 2 D 3 E 4

3. A candle will burn for 100 hours. If I light it at midday on Sunday, on which day will it burn out?

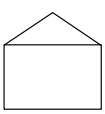
A Tuesday B Wednesday C Thursday D Friday E Saturday

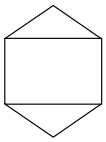
4. Exactly one of the following numbers is divisible by 11.

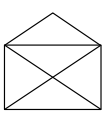
Which is it?

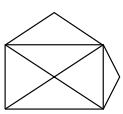
A $10^7 - 11$ B $10^7 - 1$ C 10^7 D $10^7 + 1$ E $10^7 + 11$

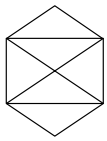
5. Which of the following networks is not traversable? (A traversable network is one which can be drawn without taking the pen off the paper and without going over any line more than once.)

A 

B 

C 

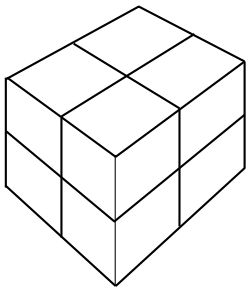
D 

E 

6. Susan is taller than Sophie, but shorter than Sandra. Stephanie is taller than Sarah, but shorter than Susan. Who is the tallest of these five girls?

A Susan B Sophie C Sandra D Stephanie E Sarah

7. Eight unit cubes are arranged to form an imaginary 2 by 2 by 2 cube. What is the largest number of unit cubes one can remove from this arrangement if the resulting shape has to have the same surface area as the original?



A 0 B 1 C 2 D 3 E 4

8. At Ulan Bator market yesterday, you could buy a white elephant or 99 wild geese for the same number of Tugriks (the Mongolian currency). Today, the price of a white elephant has fallen by10% and the price of a wild goose has risen by 10%.

How many wild geese are now worth the same as one white elephant?

A 81 B 90 C 98.01 D 99 E 121

9. On 2 July 2002, Steve Fossett completed the first solo balloon circumnavigation of the world after $13\frac{1}{2}$ days.

Assuming the balloon travelled along a circle of diameter 12 750 km, roughly what was the average speed of the balloon in km/h?

A 12 B 40 C 75 D 120 E 300

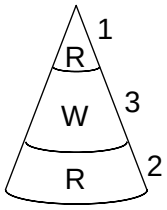
10. Which of the following gives the exact number of seconds in the last six complete weeks of 2007?

A 9! B 10! C 11! D 12! E 13!

{Note that $n!$ = $1 \times 2 \times 3 \times \ldots \times n$*.}*

11. A traffic cone is painted with red (R) and white (W) bands of paint as shown. The sloping heights of the bands are in the ratio 1 : 3 : 2.

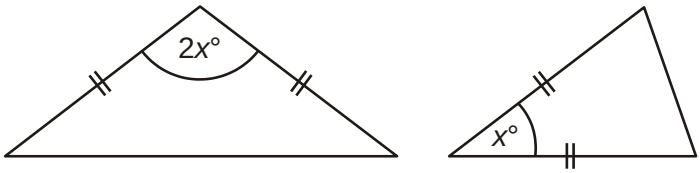
What is the ratio of the area painted white to the area painted red?



A 5:9 B 5:7 C 1:1 D 7:5 E 9:5

12. The two triangles have equal areas and the four marked lengths are equal.

What is the value of x?



A 30 B 45 C 60 D 75 E more information needed

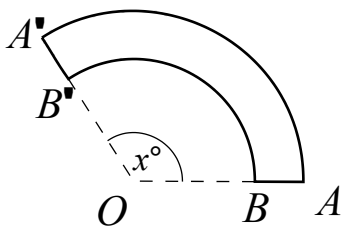
13. Triangle ABC is isosceles with $AB = AC$, and D is the midpoint of AB.

If $\angle BCD = \angle BAC = \theta$, then $\cos\theta$ equals

A 3/4 B $\sqrt{7}/(2\sqrt{2})$ C $1/\sqrt{2}$ D $\sqrt{7}/4$ E $1/(2\sqrt{2})$

14. AA' and BB' are arcs of concentric circles with centre O and with radii a and b respectively. Let $\angle A'OA = x°$. The length of the arc AA' is equal to the total distance from A to A' via the arc BB'.

Find the value of x to the nearest integer.



A 115 B 120 C 125 D 135 E it depends on a and b

15. A cube is inscribed in a sphere of diameter 1m.

What is the surface area of the cube?

A $2\ m^2$ B $3\ m^2$ C $4\ m^2$ D $5\ m^2$ E $6\ m^2$

16. Let N be a positive integer less than 10^{2002}. When the digit 1 is placed after the last digit of N, the number formed is three times the number formed when the digit 1 is placed in front of the first digit of N.

How many different values of N are there?

A 1 B 42 C 333 D 667 E 2002

17. Given an unlimited supply of 50p, £1 and £2 coins, in how many different ways is it possible to make a sum of £100?

A 1326 B 2500 C 2601 D 5050 E 10 000

18. The number N is exactly divisible by 7. It has 4008 digits. Reading from left to right, the first 2003 digits are all 2s, the next digit is n and the last 2004 digits are all 8s.

What is the value of n?

A 4 B 5 C 0 or 3 D 2 or 9 E 1 or 8

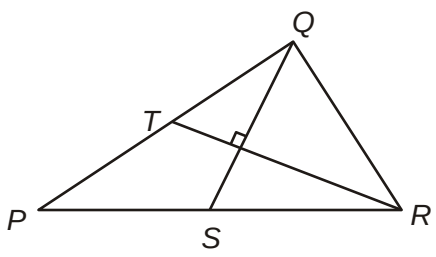
19. Which of the following is equal to $\dfrac{1}{\sqrt{2005+\sqrt{2005^2-1}}}$?

A $\sqrt{1003}-\sqrt{1002}$ B $\sqrt{1005}-\sqrt{1004}$ C $\sqrt{1007}-\sqrt{1005}$

D $\sqrt{2005}-\sqrt{2003}$ E $\sqrt{2007}-\sqrt{2005}$

20. In triangle PQR, S and T are the midpoints of PR and PQ respectively; QS is perpendicular to RT; $QS = 8$; $RT = 12$.

What is the area of triangle PQR?



A 24 B 32 C 48 D 64 E 96