

UK JUNIOR MATHEMATICAL CHALLENGE

THURSDAY 27th APRIL 2006

Organised by the **United Kingdom Mathematics Trust**
from the **School of Mathematics, University of Leeds**



RULES AND GUIDELINES (to be read before starting)

1. Do not open the paper until the Invigilator tells you to do so.
2. Time allowed: **1 hour**.
No answers, or personal details, may be entered after the allowed hour is over.
3. The use of rough paper is allowed; **calculators** and measuring instruments are **forbidden**.
4. Candidates in England and Wales must be in School Year 8 or below.
Candidates in Scotland must be in S2 or below.
Candidates in Northern Ireland must be in School Year 9 or below.
5. **Use B or HB pencil only**. Mark *at most one* of the options A, B, C, D, E on the Answer Sheet for each question. Do not mark more than one option.
6. *Do not expect to finish the whole paper in 1 hour*. Concentrate first on Questions 1-15.
When you have checked your answers to these, have a go at some of the later questions.
7. Five marks are awarded for each correct answer to Questions 1-15.
Six marks are awarded for each correct answer to Questions 16-25.
Each incorrect answer to Questions 16-20 loses 1 mark.
Each incorrect answer to Questions 21-25 loses 2 marks.
8. Your Answer Sheet will be read only by a *dumb machine*. **Do not write or doodle on the sheet except to mark your chosen options**. The machine 'sees' all black pencil markings even if they are in the wrong places. If you mark the sheet in the wrong place, or leave bits of rubber stuck to the page, the machine will 'see' a mark and interpret this mark in its own way.
9. The questions on this paper challenge you to **think**, not to guess. You get more marks, and more satisfaction, by doing one question carefully than by guessing lots of answers. The UK JMC is about solving interesting problems, not about lucky guessing.

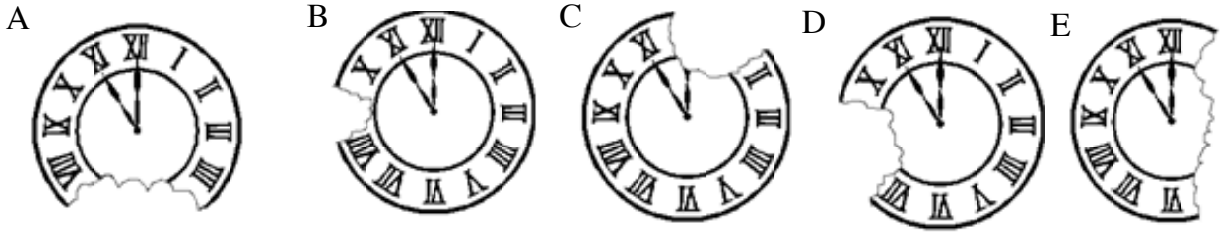
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1. What is the value of $6002 - 2006$?

- A 3994 B 3996 C 4000 D 4004 E 4006

2. Horatio the hamster likes to eat parts of clock faces. In which of these clock faces has the largest sum of numbers been eaten?

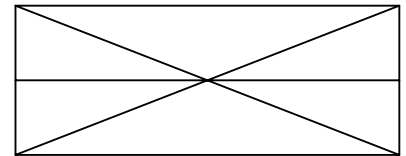


3. Among the children in a certain family, each child has at least one brother and at least one sister. What is the *smallest* possible number of children in the family?

- A 2 B 3 C 4 D 5 E 6

4. How many triangles of any size are there in this diagram?

- A 8 B 10 C 12 D 14 E 16



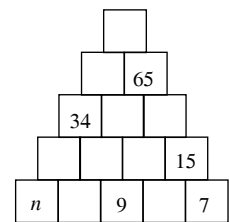
5. Euclid Gardens has 123 houses in it, numbered consecutively from 1 to 123. Houses 29 to 37 inclusive are knocked down to make space for a multi-storey car park. How many houses remain in Euclid Gardens?

- A 86 B 114 C 115 D 116 E 117

6. Each block shown in this tower is to have a number displayed on it. Some are already done. For each block above the bottom row, the number on it should be the sum of the numbers on the two blocks it stands upon.

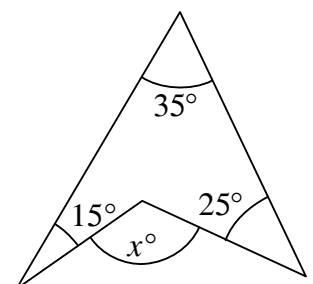
What number should replace n ?

- A 3 B 6 C 10 D 11 E 13



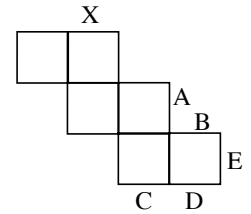
7. What is the value of x ?

- A 75 B 85 C 95 D 105 E 115



8. The diagram shows the net of a cube. Which edge meets the edge X when the net is folded to form the cube?

- A B C D E

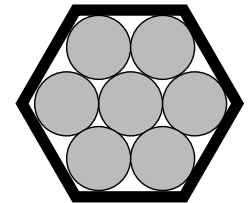


9. Four of these calculations give the same answer. Which is the odd one out?

- A $2 \times \sqrt{64}$ B $22 - 2 \times 3$ C 2^4 D $5^2 - 3^2$ E $4 + 4 \times 2$

10. 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



11. Travelling by train from Edinburgh to London, I passed a sign saying “London 150 miles”. After 7 more miles, I passed another sign saying “Edinburgh 250 miles”. How far is it by train from Edinburgh to London?

- A 407 miles B 393 miles C 257 miles D 243 miles E 157 miles

12.

This sentence contains the letter e _____ times.

- seven eight nine ten eleven

How many of the five words above can be placed in the gap to make the sentence in the box true?

- A 0 B 1 C 2 D 3 E 4

13. At the end of a hard day at the mine, the seven dwarves share out all their gold nuggets, making sure that they each get the same number of nuggets. If there are any left over, they are given to Snow White. Which number of nuggets would leave Snow White with the most?

- A 300 B 400 C 500 D 600 E 700

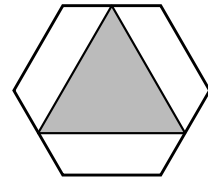
14. In the rules of Association Football, Law 1 states that the field of play must be rectangular and have length from 100 to 130 yards, and width from 50 to 100 yards. What is the difference in area between the smallest possible field of play and the largest possible field of play?

- A 1300 square yards B 5000 square yards C 8000 square yards
D 10 000 square yards E 13 000 square yards

15. Which of these fractions does **not** simplify to $\frac{1}{4}$?

- A $\frac{3942}{15768}$ B $\frac{4392}{17568}$ C $\frac{5796}{23184}$ D $\frac{6957}{31248}$ E $\frac{7956}{31824}$

16. The diagram shows an equilateral triangle with its corners at the mid-points of alternate sides of a regular hexagon. What fraction of the area of the hexagon is shaded?



- A $\frac{1}{2}$ B $\frac{1}{3}$ C $\frac{3}{8}$ D $\frac{4}{9}$ E $\frac{7}{12}$

17. In how many different ways can a row of five “on/off” switches be set so that no two adjacent switches are in the “off” position?

- A 5 B 10 C 11 D 13 E 15

18. In this magic square, which uses all whole numbers from 7 to 15 inclusive, each of the rows, columns and the two main diagonals has the same total. Which number replaces n in the completed square?

n		
		7
		14

- A 8 B 9 C 10 D 11 E 12

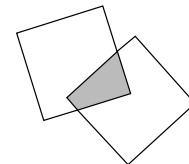
19. Pinocchio’s nose is 5cm long. Each time he tells a lie his nose doubles in length. After he has told nine lies, his nose will be roughly the same length as a:

- A domino B tennis racquet C snooker table D tennis court E football pitch

20. The sum of three different prime numbers is 40. What is the difference between the two biggest of these three numbers?

- A 8 B 12 C 16 D 20 E 24

21. 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

22. A positive whole number less than 100 has remainder 2 when it is divided by 3, remainder 3 when it is divided by 4 and remainder 4 when it is divided by 5. What is its remainder when it is divided by 7?

- A 2 B 3 C 4 D 5 E 6

23. At a holiday camp, the ratio of boys to girls is 3:4 and the ratio of girls to adults is 5:7. What is the ratio of children to adults at the camp?

- A 4:5 B 5:4 C 12:7 D 15:28 E 21:20

24. Amrita has written down four whole numbers. If she chooses three of her numbers at a time and adds up each triple, she obtains totals of 115, 153, 169 and 181. What is the largest of Amrita’s numbers?

- A 66 B 53 C 91 D 121 E 72

25. For how many positive values of n are both $\frac{1}{2}n$ and $2n$ three-digit whole numbers?

- A 0 B 150 C 200 D 300 E 500