

UK JUNIOR MATHEMATICAL CHALLENGE

TUESDAY 26th APRIL 2005

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.

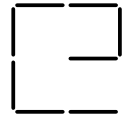
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1. The value of $1000 - 100 + 10 - 1$ is:

- A 111 B 900 C 909 D 990 E 999

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?

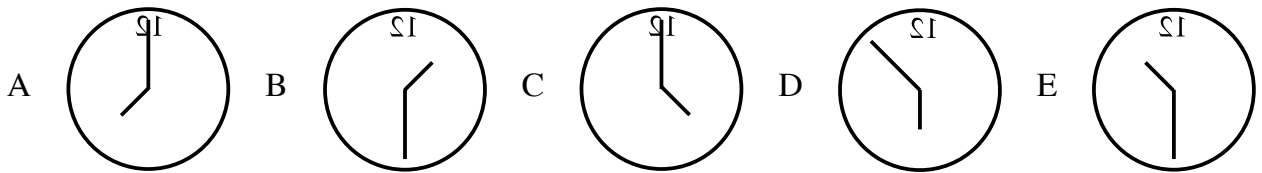


- A 0 B 1 C 2 D 3 E 4

3. Gollum eats fish on alternate days. How often does he eat fish on a Monday?

- A Twice a day B Once a week C Once a fortnight D Once a month E Once a year

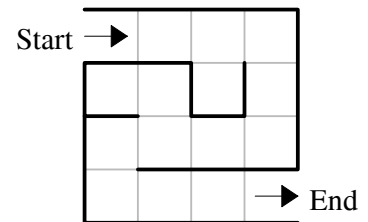
4. If you looked in a mirror at an accurate clock at 1:30 pm, which of the following would you see?



5. Which of the following numbers is *not* the difference between two of the others?

- A 1 B 7 C 6 D 5 E 2

6. Jonny's rat is a slow learner! Every time it goes through this maze, it visits every square at least once. What is the smallest possible number of squares it visits more than once when it goes through the maze?



- A 0 B 1 C 2 D 3 E 4

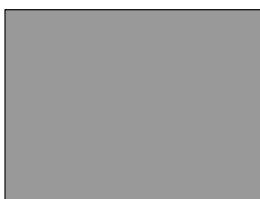
7. The lightest seeds in the world are probably those of the Creeping Lady's-tresses Orchid, 500 000 of which would weigh 1 gram. How many millions of these seeds weigh 1 kilogram?

- A 2 B 200 C 500 D 5 000 E 1 000 000

8. Peg has six times as much chocolate as Reg. Meg has twice as much chocolate as Reg. Peg has how many times as much chocolate as Meg?

- A Three times as much B Four times as much C Eight times as much
D Ten times as much E Twelve times as much

9.



Beatrix takes a sheet of paper (shown on the far left), folds the sheet in half 4 times and punches a hole all the way through the folded sheet, as shown on the near left. She then unfolds the sheet. How many holes are there now in the unfolded sheet?

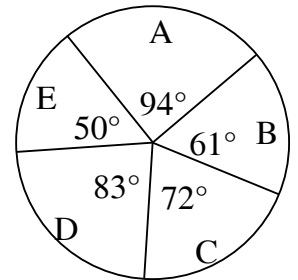
- A 4 B 6 C 8 D 12 E 16

10. On Monday last week Dilly started to learn the Tlingit language. Every day she learnt five new words, but when she woke every morning she had forgotten two of the words learnt the day before. When did Dilly first achieve her target of learning fourteen words?

- A Friday B Monday C Saturday D Thursday E Wednesday

11. Which one of the sectors in the pie chart represents the **mode**?

- A B C D E

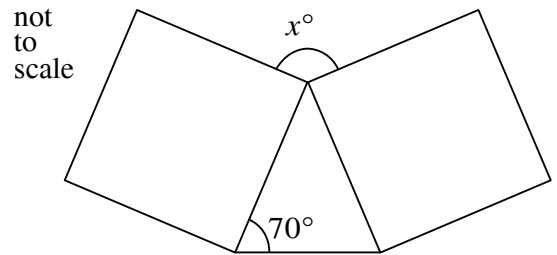


12. Which one of these calculations is **incorrect**?

- A $4 \times 5 + 67 = 45 + 6 \times 7$ B $3 \times 7 + 48 = 37 + 4 \times 8$ C $6 \times 3 + 85 = 63 + 8 \times 5$
 D $2 \times 5 + 69 = 25 + 6 \times 9$ E $9 \times 6 + 73 = 96 + 7 \times 3$

13. The diagram shows two equal squares. What is the value of x ?

- A 140 B 145 C 150 D 155 E 160



14. If the following fractions are arranged in increasing order of size, which one is in the middle?

- A $\frac{1}{2}$ B $\frac{2}{3}$ C $\frac{3}{5}$ D $\frac{4}{7}$ E $\frac{5}{9}$

15. There are six different three-digit numbers, each of which contains all the digits 1, 3 and 5. How many of these three-digit numbers are prime?

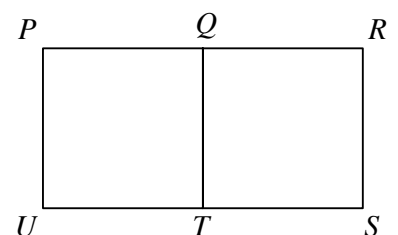
- A 0 B 1 C 2 D 3 E 4

16. 'Saturn' chocolate bars are packed either in boxes of 5 or boxes of 12. What is the smallest number of full boxes required to pack exactly 2005 'Saturn' bars?

- A 118 B 167 C 168 D 170 E 401

17. The figure shows rectangle $PRSU$ and line QT , which divides the rectangle into two squares. How many right-angled triangles can be drawn using any three of the points P, Q, R, S, T, U as corners?

- A 8 B 9 C 10 D 12 E 14

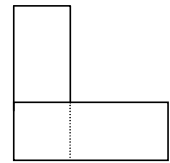


18. In the subtraction sum on the right a , b and c are digits, and a is less than b . What is the value of c ?

$$\begin{array}{r} b a \\ - a b \\ \hline c 6 \end{array}$$

- A 3 B 4 C 5 D 6 E a number greater than 6

19. Two identical rectangular cards are glued together as shown to form an 'L' shape. The perimeter of this 'L' shape is 40 cm. What is the ratio of the lengths of the sides of one of the original cards?



- A 1:2 B 1:4 C 1:5 D 2:5 E more information required

20. How many of the statements in the box are true?

- A 0 B 1 C 2 D 3 E 4

None of these statements is true.
 Exactly one of these statements is true.
 Exactly two of these statements are true.
 All of these statements are true.

21. If the square is completed with the letters A, B, C, D and E so that no row, column or either of the two main diagonal lines contains the same letter more than once, which letter should replace the asterisk?

	*			A
		B		
D		C		
			E	

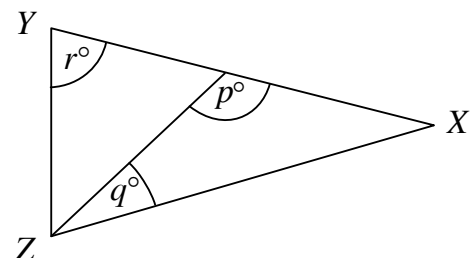
- A B C D E

22. In a certain code, A = 1, B = 2, C = 3 etc. Words are encoded by multiplying together the values of their letters, so the code for SQUARE is $19 \times 17 \times 21 \times 1 \times 18 \times 5 = 610\,470$. Similarly, the code for RECTANGLE is 31 752 000. What is the code for TRIANGLE?

- A 2 116 800 B 2 721 600 C 19 051 200 D 25 401 600 E 52 920 000

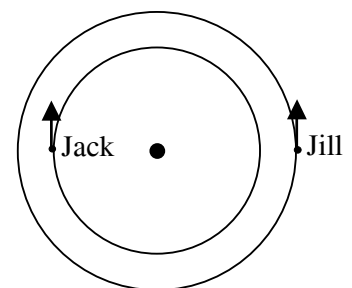
23. In the diagram, triangle XYZ is isosceles, with $XY = XZ$. What is the value of r in terms of p and q ?

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



24. Jack dances clockwise around the Maypole, making one revolution every five seconds. Starting from a point diametrically opposite Jack's starting point, Jill dances anticlockwise, making one revolution every six seconds. How many times do they pass each other in the first minute?

- A 11 B 15 C 22 D 30 E 60



25. The diagram shows a unit cube coloured blue. Additional blue unit cubes are glued face-to-face to each of its six faces to form a three-dimensional "cross". If unit cubes coloured yellow are now glued face-to-face to all the spare faces of this cross, how many yellow unit cubes are required?

- A 6 B 18 C 24 D 30 E 36

