

UK JUNIOR MATHEMATICAL CHALLENGE

THURSDAY 26th APRIL 2007

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.

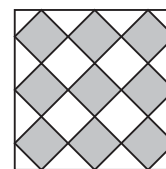
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- What is the value of $0.1 + 0.2 + 0.3 \times 0.4$?
 A 0.24 B 0.312 C 0.42 D 1.0 E 1.5
- My train was scheduled to leave at 17:40 and to arrive at 18:20. However, it started five minutes late and the journey then took 42 minutes. At what time did I arrive?
 A 18:21 B 18:23 C 18:25 D 18:27 E 18:29
- What is the remainder when 354972 is divided by 7 ?
 A 1 B 2 C 3 D 4 E 5
- Which of the following numbers is three less than a multiple of 5 and three more than a multiple of 6?
 A 12 B 17 C 21 D 22 E 27

- In the diagram, the small squares are all the same size. What fraction of the large square is shaded?

- A $\frac{9}{20}$ B $\frac{9}{16}$ C $\frac{3}{7}$ D $\frac{3}{5}$ E $\frac{1}{2}$

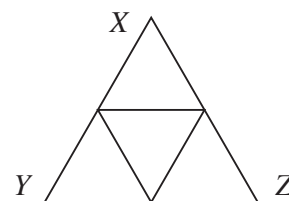


- When the following fractions are put in their correct places on the number line, which fraction is in the middle?

- A $-\frac{1}{7}$ B $\frac{1}{6}$ C $-\frac{1}{5}$ D $\frac{1}{4}$ E $-\frac{1}{3}$

- The equilateral triangle XYZ is fixed in position. Two of the four small triangles are to be painted black and the other two are to be painted white. In how many different ways can this be done?

- A 3 B 4 C 5 D 6 E more than 6

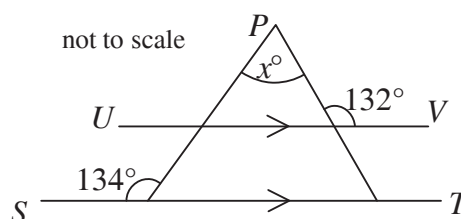


- Amy, Ben and Chris are standing in a row. If Amy is to the left of Ben and Chris is to the right of Amy, which of these statements must be true?

- A Ben is furthest to the left B Chris is furthest to the right C Amy is in the middle
 D Amy is furthest to the left E None of statements A, B, C, D is true

- In the diagram on the right, ST is parallel to UV . What is the value of x ?

- A 46 B 48 C 86 D 92 E 94



10. Which of the following has the largest value?

A $\frac{1}{2} + \frac{1}{4}$

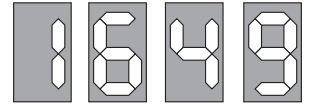
B $\frac{1}{2} - \frac{1}{4}$

C $\frac{1}{2} \times \frac{1}{4}$

D $\frac{1}{2} \div \frac{1}{4}$

E $\frac{1}{4} \div \frac{1}{2}$

11. A station clock shows each digit by illuminating up to seven bars in a display. For example, the displays for 1, 6, 4 and 9 are shown.



When all the digits from 0 to 9 are shown in turn, which bar is used least?



12. The six-member squad for the Ladybirds five-a-side team consists of a 2-spot ladybird, a 10-spot, a 14-spot, an 18-spot, a 24-spot and a pine ladybird (on the bench). The average number of spots for members of the squad is 12. How many spots has the pine ladybird?

- A 4 B 5 C 6 D 7 E 8

13. Points P and Q have coordinates $(1, 4)$ and $(1, -2)$ respectively. For which of the following possible coordinates of point R would triangle PQR **not** be isosceles?

- A $(-5, 4)$ B $(7, 1)$ C $(-6, 1)$ D $(-6, -2)$ E $(7, -2)$

14. If the line on the right were 0.2 mm thick, how many metres long would the line need to be to cover an area of one square metre?



- A 0.5 B 5 C 50 D 500 E 5000

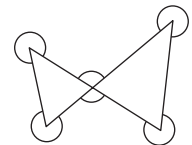
15. I choose three numbers from this number square, including one number from each row and one number from each column. I then multiply the three numbers together. What is the largest possible product?

| | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |

- A 72 B 96 C 105 D 162 E 504

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

- A 1080° B 1440° C 1620°
 D 1800° E more information needed



17. Just William's cousin, Sweet William, has a rectangular block of fudge measuring 2 inches by 3 inches by 6 inches. He wants to cut the block up into cubes whose side lengths are whole numbers of inches. What is the smallest number of cubes he can obtain?

- A 3 B 8 C 15 D 29 E 36

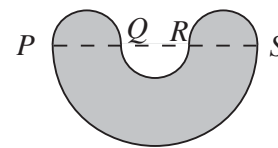
18. The letters J, M, C represent three different non-zero digits.

What is the value of $J + M + C$?

- A 19 B 18 C 17 D 16 E 15

$$\begin{array}{r} J J \\ M M \\ \hline C C \\ \hline J M C \end{array}$$

19. The points P, Q, R, S lie in order along a straight line, with $PQ = QR = RS = 2$ cm. Semicircles with diameters PQ, QR, RS and SP join to make the shape shown on the right. What, in cm^2 , is the area of the shape?



- A 5π B $9\pi/2$ C 4π D $7\pi/2$ E 3π

20. At halftime, Boarwarts Academy had scored all of the points so far in their annual match against Range Hill School. In the second half, each side scored three points. At the end of the match, Boarwarts Academy had scored 90% of the points. What fraction of the points in the match was scored in the second half?

- A $\frac{3}{100}$ B $\frac{3}{50}$ C $\frac{1}{10}$ D $\frac{9}{50}$ E $\frac{1}{5}$

21. A list of ten numbers contains two of each of the numbers 0, 1, 2, 3, 4. The two 0s are next to each other, the two 1s are separated by one number, the two 2s by two numbers, the two 3s by three numbers and the two 4s by four numbers. The list starts 3, 4, What is the last number?

- A 0 B 1 C 2 D 3 E 4

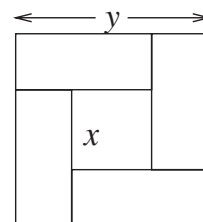
22. Only one choice of the digit d gives a prime number for each of the three-digit numbers read across and downwards in the diagram on the right. Which digit is d ?

- A 4 B 5 C 6 D 7 E 8

$$\begin{array}{r} 5 \\ 1 \ d \ 3 \\ 7 \end{array}$$

23. The diagram shows a square with sides of length y divided into a square with sides of length x and four congruent rectangles. What is the length of the longer side of each rectangle?

- A $\frac{y-x}{2}$ B $\frac{y+2x}{3}$ C $y-x$ D $\frac{2y}{3}$ E $\frac{y+x}{2}$



24. The pages of a book are numbered 1, 2, 3, In total, it takes 852 digits to number all the pages of the book. What is the number of the last page?

- A 215 B 314 C 320 D 329 E 422

25. A piece of paper in the shape of a polygon is folded in half along a line of symmetry. The resulting shape is also folded in half, again along a line of symmetry. The final shape is a triangle. How many possibilities are there for the number of sides of the original polygon?

- A 3 B 4 C 5 D 6 E 7