UK JUNIOR MATHEMATICAL CHALLENGE

TUESDAY 28TH MARCH 2000

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.

1. What is half of 999?

   A 444½ B 449½ C 454½ D 494½ E 499½

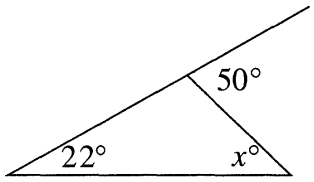
2. Sir Isaac Newton, the English mathematician, physicist and discoverer of the laws of gravity, was born in Woolsthorpe, Lincolnshire in 1642, the same year that Galileo, the Italian scientist, died.

   How many years ago was that?

   A 351 B 358 C 368 D 424 E 442

3. What is the value of x?

   A 22 B 28 C 108 D 130 E 208



4. Which of the following has the greatest value?

   A $(1 \times 2) \times (3 \times 4)$ B $(1 \times 2) + (3 \times 4)$ C $(1 \times 2) \times (3 + 4)$
   D $(1 + 2) \times (3 \times 4)$ E $(1 + 2) \times (3 + 4)$

5. Which of the following could be the image of U K M T when seen reflected in a mirror?

   A ∩ K W ⊥ B T M K U C U ꓘ M T D ∩ ꓘ W ⊥ E ⊥ W ꓘ ∩

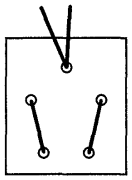
6. A transport company's vans each carry a maximum load of 12 tonnes. A firm needs to deliver 24 crates each weighing 5 tonnes. How many van loads will be needed to do this?

   A 9 B 10 C 11 D 12 E 13

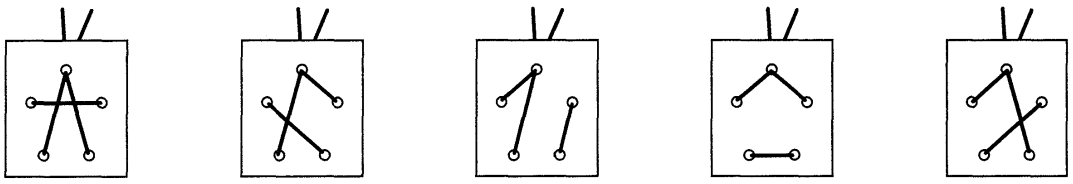
7. Today, the sun rose at Greenwich at 6:45 am and will set 12 hours and 44 minutes later. At what time will the sun set at Greenwich today?

   A 6:29 pm B 7:09 pm C 7:29 pm D 7:39 pm E 9:29 pm

8. A single piece of string is threaded through five holes in a piece of card. One side of the card is shown in the diagram on the right. Which of the diagrams below could *not* represent the pattern of the string on the reverse side?



   A B C D E



9. Three-quarters of the junior members of a tennis club are boys and the rest are girls. What is the ratio of boys to girls among these members?

   A 3 : 4 B 4 : 3 C 3 : 7 D 4 : 7 E 3 : 1

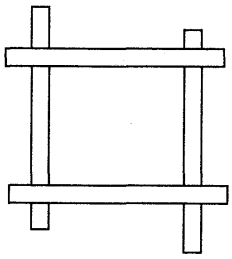
10. Each Junior Mathematical Challenge answer sheet weighs 6 grams. If 140 000 pupils enter the Challenge this year, what will be the total weight of all their answer sheets?

A 84 kg B 840 kg C 8 400 kg D 84 000 kg E 840 000 kg

11. The digits of this year, 2000 A.D., add up to 2. In how many *other* years since 1 A.D. has this happened?

A 3 B 6 C 8 D 9 E 10

12. Four rectangular paper strips, each measuring 10 cm by 1 cm, are laid flat on a table. Each strip is at right angles to two of the other strips as shown.



What is the area of the table covered by the strips?

A 30 cm^2 B 32 cm^2 C 34 cm^2 D 36 cm^2 E 38 cm^2

13. 48% of the pupils at a certain school are girls. 25% of the girls and 50% of the boys at this school travel to school by bus. What percentage of the whole school travel by bus?

A 37% B 38% C 62% D 73% E 75%

14. The DISPUTOR is similar to a calculator, but it behaves a little oddly. When you type in a number, the DISPUTOR doubles the number, then reverses the digits of this result, then adds 2 and displays the final result. I type in a whole number between 10 and 99 inclusive. Which of the following could be the final result displayed?

A 39 B 41 C 42 D 43 E 45

15. Dilly is 7 years younger than Dally. In 4 years time she will be half Dally's age. What is the sum of their ages now?

A 13 B 15 C 17 D 19 E 21

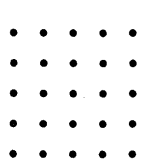
16. A book has 256 pages with, on average, 33 lines on each page and 9 words on each line. Which of the following is the best approximation to the number of words in the book?

A 64 000 B 68 000 C 72 000 D 76 000 E 80 000

17. The first and third digits of the five-digit number $d6d41$ are the same. If the number is exactly divisible by 9, what is the sum of its five digits?

A 18 B 23 C 25 D 27 E 30

18. A circle is added to the grid alongside. What is the largest number of dots that the circle can pass through?



A 4 B 6 C 8 D 10 E 12

19. The numbers $\frac{1}{2}$, x, y, $\frac{3}{4}$ are in increasing order of size. The differences between successive numbers in this list are all the same. What is the value of y?

A $\frac{3}{8}$ B $\frac{2}{3}$ C $\frac{7}{12}$ D $\frac{5}{6}$ E $\frac{5}{8}$

20. Despite his name, Mr. Bean likes to eat lots of fruit. He finds that four apples and two oranges cost £1.54 and that two oranges and four bananas cost £ 1.70. How much would he have to pay if he bought one apple, one orange and one banana?

A 77p B 78p C 79p D 80p E 81p

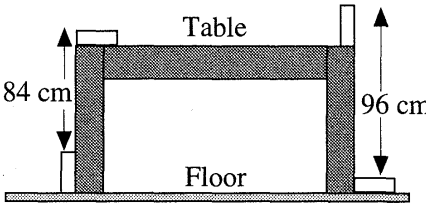
21. Tick's watch runs 2 minutes per hour too slow. Tock's watch runs 1 minute per hour too fast. They set them to the same time at noon on Sunday. The next time they met, one of the watches was one hour ahead of the other. What was the earliest time this could have been?

A 8am on Monday B 7:20 pm on Monday C 4am on Tuesday

D midnight on Wednesday E 10 pm on Saturday

22. Four identical blocks of wood are placed touching a table in the positions shown in this side-on view.
How high is the table?

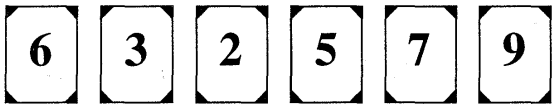
A 84cm B 87cm C 90cm D 93cm E 96cm



23. A certain number has exactly eight factors including 1 and itself. Two of its factors are 21 and 35. What is the number?

A 105 B 210 C 420 D 525 E 735

24. The six cards shown display the number 632579. One "turn" consists of exchanging the positions of two adjacent cards so, for instance, after one "turn" the cards could show 632759. Starting from the original 632579, what is the least number of "turns" required so that the cards display a number which is divisible by 4?



A 2 B 3 C 4 D 5 E 6

25. In a magic square each row, each column and both main diagonals have the same total. What number should replace x in this partially completed magic square?

A 4 B 9 C 10 D 12

E more information needed

13		
5		15
x		