Junior Kangaroo Mathematical Challenge

Tuesday 9th June 2015

Organised by the United Kingdom Mathematics Trust

The Junior Kangaroo allows students in the UK to test themselves on questions set for young mathematicians from across Europe and beyond.

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**. For each question mark *at most one* of the options A, B, C, D, E on the Answer Sheet. Do not mark more than one option.

6. Five marks will be awarded for each correct answer to Questions 1 - 15.
   Six marks will be awarded for each correct answer to Questions 16 - 25.

7. *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.

8. The questions on this paper challenge you **to think**, not to guess. Though you will not lose marks for getting answers wrong, you will undoubtedly get more marks, and more satisfaction, by doing a few questions carefully than by guessing lots of answers.

Enquiries about the Junior Kangaroo should be sent to: Maths Challenges Office,
School of Mathematics, University of Leeds, Leeds, LS2 9JT.
*(Tel. 0113 343 2339)*
http://www.ukmt.org.uk

1. Ben lives in a large house with his father, mother, sister and brother as well as 2 dogs, 3 cats, 4 parrots and 5 goldfish. How many legs are there in the house?

   A 18　　　　　B 36　　　　　C 38　　　　　D 46　　　　　E 66

2. The sum of five consecutive integers is 2015. What is the smallest of these integers?

   A 401　　　　　B 403　　　　　C 405　　　　　D 407　　　　　E 409

3. The diagram on the right shows a cube of side 18 cm. A giant ant walks across the cube's surface from X to Y along the route shown. How far does it walk?
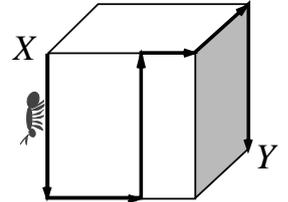
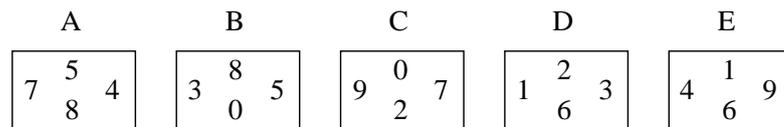   A 54 cm　　B 72 cm　　C 80 cm　　D 88 cm　　E 90 cm

4. How many seconds are there in $\frac{1}{4}$ of $\frac{1}{6}$ of $\frac{1}{8}$ of a day?

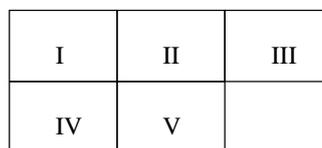   A 60　　　　　B 120　　　　　C 450　　　　　D 900　　　　　E 3600

5. What is 203 515 ÷ 2015?

   A 11　　　　　B 101　　　　　C 1001　　　　　D 111　　　　　E 103

6. In the diagram, five rectangles of the same size are shown with each side labelled with a number.

A	B	C	D	E
7　5　4　8	3　8　5　0	9　0　7　2	1　2　3　6	4　1　9　6

   These rectangles are placed in the positions I to V as shown so that the numbers on the sides that touch each other are equal.

I	II	III
IV	V	

   Which of the rectangles should be placed in position I?

   A　　　　　B　　　　　C　　　　　D　　　　　E

7. Selina takes a sheet of paper and cuts it into 10 pieces. She then takes one of these pieces and cuts it into 10 smaller pieces. She then takes another piece and cuts it into 10 smaller pieces and finally cuts one of the smaller pieces into 10 tiny pieces. How many pieces of paper has the original sheet been cut into?

   A 27　　　　　B 30　　　　　C 37　　　　　D 40　　　　　E 47

8. John takes 40 minutes to walk to school and then to run home. When he runs both ways, it takes him 24 minutes. He has one fixed speed whenever he walks, and another fixed speed whenever he runs. How long would it take him to walk both ways?

   A 56 minutes　　B 50 minutes　　C 44 minutes　　D 28 minutes　　E 24 minutes

9. In the diagram on the right, the number in each circle is the sum of the numbers in the two circles below it. What is the value of *x*?

   A 100   B 82   C 55   D 50   E 32
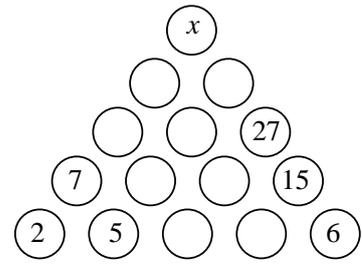
10. The diagram on the right shows a large triangle divided up into squares and triangles. *S* is the number of squares of any size in the diagram and *T* is the number of triangles of any size in the diagram. What is the value of $S \times T$?
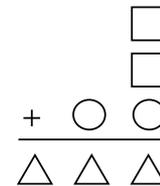
    A 30   B 35   C 48   D 70   E 100
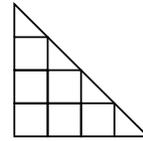
11. In the diagram, the small equilateral triangles have area 4 cm². What is the area of the shaded region?

    A 80 cm²   B 90 cm²   C 100 cm² D 110 cm² E 120 cm²
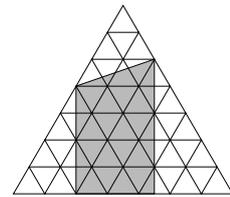
12. In the sum shown, different shapes represent different digits. What digit does the square represent?

    A 2   B 4   C 6   D 8   E 9

13. The sum of 10 distinct positive integers is 100. What is the largest possible value of any of the 10 integers?

    A 55   B 56   C 60   D 65   E 91

14. The diagram shows five circles of the same radius touching each other. A square is drawn so that its vertices are at the centres of the four outer circles.
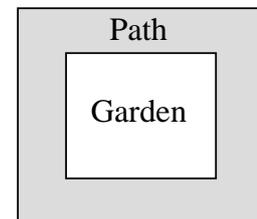
    What is the ratio of the area of the shaded parts of the circles to the area of the unshaded parts of the circles?

    A 1:3   B 1:4   C 2:5   D 2:3   E 5:4
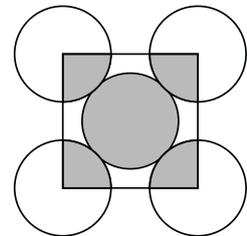
15. A rectangular garden is surrounded by a path of constant width. The perimeter of the garden is 24 m shorter than the distance along the outside edge of the path. What is the width of the path?

    A 1 m   B 2 m   C 3 m   D 4 m   E 5 m

16. A caterpillar starts from its hole and moves across the ground, turning 90° either left or right after each hour. It moves 2 m in the first hour, followed by 3 m in the second hour and 4 m in the third hour and so on. What is the greatest distance it can be from its hole after seven hours?

    A 35 m   B 30 m   C 25 m   D 20 m   E 15 m

17. In a pirate's trunk there are 5 chests. In each chest there are 4 boxes and in each box there are 10 gold coins. The trunk, the chests and the boxes are all locked. Blind Pew unlocks 9 locks and takes all the coins in all the boxes he unlocks. What is the smallest number of gold coins he could take?

    A 20   B 30   C 40   D 50   E 70

18. Brian chooses an integer, multiplies it by 4 then subtracts 30. He then multiplies his answer by 2 and finally subtracts 10. His answer is a two-digit number. What is the largest integer he could choose?

    A 10   B 15   C 18   D 20   E 21

19. From noon till midnight, Clever Cat sleeps under the oak tree and from midnight till noon he is awake telling stories. A poster on the tree above him says "Two hours ago, Clever Cat was doing the same thing as he will be doing in one hour's time". For how many hours a day does the poster tell the truth?

    A 3   B 6   C 12   D 18   E 21

20. The diagram below shows a sequence of shapes made up of black and white floor tiles where each shape after the first has two more rows and two more columns than the one before it.

    1st   2nd   3rd   15th
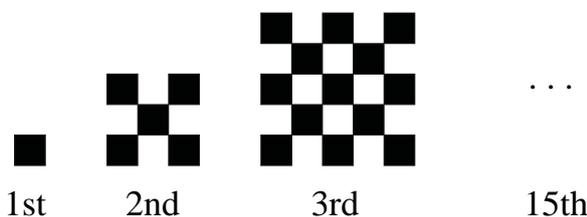
    How many black tiles would be required to create the 15th shape in the sequence?

    A 401   B 421   C 441   D 461   E 481

21. Peter has a lock with a three-digit code. He knows that all the digits of his code are different and that if he divides the second digit by the third and then squares his answer, he will get the first digit. What is the difference between the largest and smallest possible codes?

    A 42   B 468   C 499   D 510   E 541

22.

    The diagram above shows the front and right-hand views of a solid made up of cubes of side 3 cm. The maximum volume that the solid could have is V cm^3. What is the value of V?

    A 162   B 216   C 324   D 540   E 648

23. How many three-digit numbers have an odd number of factors?

    A 5   B 10   C 20   D 21   E 22

24. Molly, Dolly, Sally, Elly and Kelly are sitting on a park bench. Molly is not sitting on the far right and Dolly is not sitting on the far left. Sally is not sitting at either end. Kelly is not sitting next to Sally and Sally is not sitting next to Dolly. Elly is sitting to the right of Dolly but not necessarily next to her. Who is sitting at the far right end?

    A Molly   B Dolly   C Sally   D Kelly   E Elly

25. Anna, Bridgit and Carol run in a 100 m race. When Anna finishes, Bridgit is 16 m behind her and when Bridgit finishes, Carol is 25 m behind her. The girls run at constant speeds throughout the race. How far behind was Carol when Anna finished?

    A 37 m   B 41 m   C 50 m   D 55 m   E 60 m