United Kingdom Mathematics Trust

Junior Kangaroo

Tuesday 11 June 2019

Organised by the United Kingdom Mathematics Trust

a member of the Association Kangourou sans Frontières

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England & Wales:	*Year 8 or below*
Scotland:	*S2 or below*
Northern Ireland:	*Year 9 or below*

Instructions

1. Do not open the paper until the invigilator tells you to do so.
2. Time allowed: **60 minutes**.
   No answers, or personal details, may be entered after the allowed time is over.
3. The use of blank or lined paper for rough working is allowed; **squared paper**, **calculators and measuring instruments are forbidden**.
4. **Use a B or an HB non-propelling pencil.** 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.
5. **Do not expect to finish the whole paper in the time allowed.** The questions in this paper have been arranged in approximate order of difficulty with the harder questions towards the end. You are not expected to complete all the questions during the time. You should bear this in mind when deciding which questions to tackle.
6. **Scoring rules:**
   5 marks are awarded for each correct answer to Questions 1-15;
   6 marks are awarded for each correct answer to Questions 16-25;
   In this paper you will not lose marks for getting answers wrong.
7. Your Answer Sheet will be read by a machine. **Do not write or doodle on the sheet except to mark your chosen options.** The machine will read 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 eraser stuck to the page, the machine will interpret the mark in its own way.
8. **The questions on this paper are designed to challenge you to think, not to guess.** You will gain more marks, and more satisfaction, by doing one question carefully than by guessing lots of answers. This paper is about solving interesting problems, not about lucky guessing.

Enquiries about the Junior Kangaroo should be sent to:

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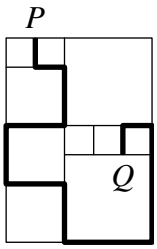
1. Riana has been asked to erase digits from the number 12 323 314 to obtain a number which reads the same from left to right as it does from right to left. What is the smallest number of digits Riana needs to erase?

A 1 B 2 C 3 D 4 E 5

2. The diagram shows squares of three different sizes arranged into a rectangle. The length of each side of the smallest squares is 20 cm. Adam Ant walks along the path marked from P to Q. How far does Adam walk?



A 380 cm B 400 cm C 420 cm D 440 cm E 460 cm

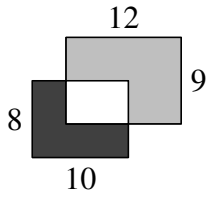
3. A bridge is built across a river. One quarter of the bridge is over the left bank of the river and one third of the bridge is over the right bank. The river is 120 m wide. How long is the bridge?

A 150 m B 190 m C 240 m D 288 m E 324 m

4. In four years' time Evie will be three times older than she was two years ago. How old will Evie be in one year's time?

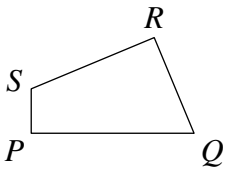
A 2 B 3 C 4 D 6 E 7

5. Two rectangles of dimensions 8 cm by 10 cm and 9 cm by 12 cm overlap as shown in the diagram. The area of the black region is 37 cm^2. What is the area of the grey region?



A 60 cm^2 B 62 cm^2 C 62.5 cm^2 D 64 cm^2 E 65 cm^2

6. In the quadrilateral $PQRS$, the length of PQ is 11 cm, the length of QR is 7 cm, the length of RS is 9 cm and the length of SP is 3 cm. Both $\angle QRS$ and $\angle SPQ$ are 90°. What is the area of the quadrilateral $PQRS$?



A 30 cm^2 B 48 cm^2 C 50 cm^2 D 52 cm^2 E 60 cm^2

7. There are 30 pupils in my class. 20 pupils like Maths and 18 pupils like English. Twice as many pupils like both subjects as like neither of them. How many pupils like only Maths?

A 20 B 16 C 12 D 8 E 4

8. The mean of five numbers is 25. Abbie adds 5 to the first number, 10 to the second number, 15 to the third number, 20 to the fourth number and 25 to the fifth number to obtain a new set of five numbers. What is the mean of the numbers in the new set?

A 100 B 50 C 40 D 30 E 25

9. What is the smallest possible sum of two positive integers whose product is 240?

A 30 B 31 C 32 D 34 E 38

10. There are 39 boys and 23 girls in a dance group. Every week, 6 boys and 8 girls join the group and no one leaves the group. What is the total number of people in the dance group in the week when the number of boys is equal to the number of girls?

A 144 B 154 C 164 D 174 E 184

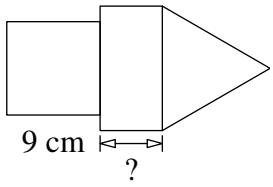
11. Two of the following four facts about a positive integer N are true and two are false.

N is divisible by 5
N is divisible by 11
N is divisible by 55
N is less than 10

What is the value of N?

A 5 B 10 C 11 D 55 E 110

12. The shape in the diagram is made up of a rectangle, a square and an equilateral triangle, all of which have the same perimeter. The length of the side of the square is 9 cm. What is the length of the shorter sides of the rectangle?



A 4 cm B 5 cm C 6 cm D 7 cm E 8 cm

13. What is the minimum number of cubes of the same size required to fill a box with dimensions 30 cm by 40 cm by 50 cm?

A 20 B 40 C 60 D 80 E 120

14. Henry starts to read a 290-page book on a Sunday. He reads four pages every day except on Sundays when he reads 25 pages. How many days does it take him to finish the book?

A 41 B 40 C 35 D 12 E 6

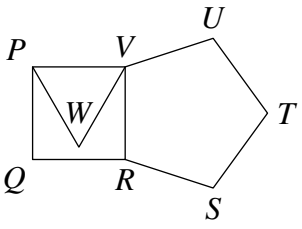
15. Amy, Bob, Cat and Dee occupy the top four positions in a chess tournament. The sum of Amy's position, Bob's position and Dee's position is 6. The sum of Bob's position and Cat's position is 6. Bob finished ahead of Amy. Who came first in the tournament?

A Amy B Bob C Cat D Dee
E You can't be certain

16. Eight cards are numbered from 1 to 8. The cards are placed in two boxes P and Q so that the sum of the numbers on the three cards in box P is equal to the sum of the numbers on the five cards in box Q. Which of the following statements must be true?

A The card numbered 1 is not in box Q
B Four cards in box Q have even numbers on
C The card numbered 5 is in box Q
D The card numbered 2 is in box Q
E Exactly three cards in box Q have odd numbers on.

17. The diagram shows a square, an equilateral triangle and a regular pentagon. What is the size of $\angle WUV$?



A 21° B 23° C 25° D 27° E 29°

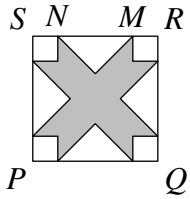
18. In the diagram,♠, ♦ and ♣ each represent a positive integer. The sums of the numbers in each row and in each column are as shown.

♠	♦	♠	53
♦	♠	♣	47
♦	♣	♠	47
52	47	48	

What is the value of ♠ + ♦ − ♣?

A 12 B 17 C 18 D 22 E 23

19. In the diagram, $PQRS$ is a square of side 10 cm. The distance MN is 6 cm. The square is divided into four congruent isosceles triangles, four congruent squares and the shaded region.



What is the area of the shaded region?

A $42\,\text{cm}^2$ B $46\,\text{cm}^2$ C $48\,\text{cm}^2$ D $52\,\text{cm}^2$ E $58\,\text{cm}^2$

20. The diagram shows a 2×4 table in which the numbers in each column except the first column are the sum and the difference of the numbers in the previous column.

10	13	20	26
3	7	6	14

Carl completes a 2×7 table in the same way and obtains the numbers 96 and 64 in the final column. What is the sum of the numbers in the first column of Carl's table?

A 24 B 20 C 12 D 10 E 8

21. Ellis's Eel Emporium contains a large tank holding three different types of eel: electric eels, moray eels and freshwater eels. A notice on the tank reads as follows:

> All the eels are electric eels except 12
> All the eels are moray eels except 14
> All the eels are freshwater eels except 16

How many eels are in the tank?

A 42 B 33 C 24 D 21 E 20

22. Geraint always cycles to work, leaving at 8am every morning. When he averages 15 km/h, he arrives 10 minutes late. However, when he averages 30 km/h, he arrives 10 minutes early. What speed should he average to arrive on time?

A 20 km/h B 21 km/h C 22.5 km/h D 24 km/h E 25 km/h

23. Sid is colouring the cells in the grid using the four colours red, blue, yellow and green in such a way that any two cells that share a vertex are coloured differently. He has already coloured some of the cells as shown.

R	B		Y	G
				X

What colour will he use for the cell marked X?

A Red B Blue C Yellow D Green
E You can't be certain

24. There are two ponds at the bottom of Gabrielle's garden, each containing frogs and toads. In one pond the ratio of frogs to toads is 3 : 4. In the other pond the ratio of frogs to toads is 5 : 6. Suppose there are 36 frogs in total. What then would be the largest possible total number of toads in the ponds?

A 48 B 46 C 44 D 42 E 40

25. The room numbers of a hotel are all three-digit numbers. The first digit represents the floor and the last two digits represent the room number. The hotel has rooms on five floors, numbered 1 to 5. It has 35 rooms on each floor, numbered n01 to n35 where n is the number of the floor. In numbering all the rooms, how many times will the digit 2 be used?

A 60 B 65 C 95 D 100 E 105

