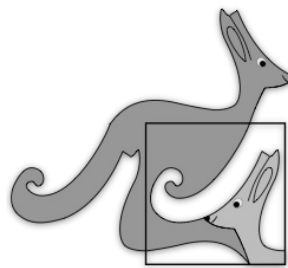


United Kingdom
Mathematics Trust



JUNIOR KANGAROO

Tuesday 15 and Wednesday 16 June 2021

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MARKETS

*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 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, with a thick, clear line inside the box, one of the options A, B, C, D, E on the Answer Sheet for each question. Do not mark more than one option or go outside the lines of the box.
5. 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, the machine will interpret the mark in own way.
6. **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.
7. **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.
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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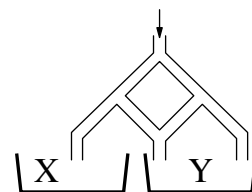
www.ukmt.org.uk

1. Which of these expressions has the largest value?

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

2. Lily pours 296 litres of water into the top of the pipework shown in the diagram. Each time a pipe forks, half the water flows to one side and half to the other. How many litres of water will reach container Y?

A 210 B 213 C 222 D 225 E 231



3. Andrew wants to write the letters of the word KANGAROO in the cells of a 2×4 grid such that each cell contains exactly one letter. He can write the first letter in any cell he chooses but each subsequent letter can only be written in a cell with at least one common vertex with the cell in which the previous letter was written. Which of the following arrangements of letters could he not produce in this way?

A

| | |
|---|---|
| K | A |
| N | O |
| O | G |
| R | A |

B

| | |
|---|---|
| N | G |
| A | A |
| K | R |
| O | O |

C

| | |
|---|---|
| O | O |
| K | R |
| A | A |
| G | N |

D

| | |
|---|---|
| K | A |
| N | G |
| O | O |
| R | A |

E

| | |
|---|---|
| K | O |
| A | O |
| R | N |
| A | G |

4. At 8:00 my watch was four minutes slow. However, it gains time at a constant rate and at 16:00 on the same day it was six minutes fast. At what time did it show the correct time?

A 9:10 B 10:11 C 11:12 D 12:13 E 13:14

5. In how many two-digit numbers is one digit twice the other?

A 6 B 8 C 10 D 12 E 14

6. What day will it be 2021 hours after 20:21 on Monday?

A Friday B Thursday C Wednesday D Tuesday E Monday

7. A square of paper is cut into two pieces by a single straight cut.

Which of the following shapes *cannot* be the shape of either piece?

A An isosceles triangle B A right-angled triangle C A pentagon
D A rectangle E A square

8. When Cathy the cat just lazes around, she drinks 60 ml of milk per day. However, each day she chases mice she drinks a third more milk. Also, each day she gets chased by a dog she drinks half as much again as when she chases mice. In the last two weeks Cathy has been chasing mice on alternate days and has also been chased by a dog on two other days. How much milk did she drink in the last two weeks?

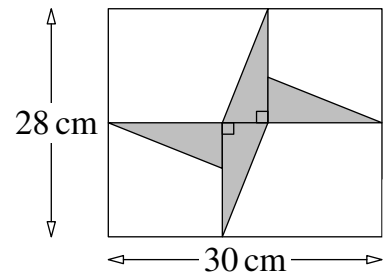
A 900 ml B 980 ml C 1040 ml D 1080 ml E 1100 ml

9. The houses on the south side of Crazy Street are numbered in increasing order starting at 1 and using consecutive odd numbers, except that odd numbers that contain the digit 3 are missed out. What is the number of the 20th house on the south side of Crazy Street?

A 41 B 49 C 51 D 59 E 61

10. The diagram shows four congruent right-angled triangles inside a rectangle. What is the total area, in cm^2 , of the four triangles?

A 46 B 52 C 54 D 56 E 64



11. Dad says he is exactly 35 years old, not counting weekends. How old is he really?

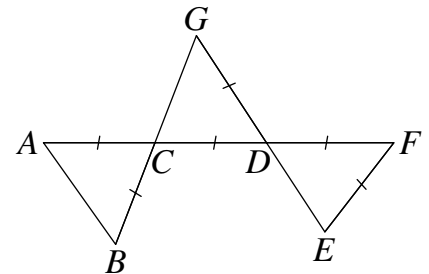
A 40 B 42 C 45 D 49 E 56

12. The mean of a set of 8 numbers is 12. Two numbers with a mean of 18 are removed from the set. What is the mean of the remaining 6 numbers?

A 6 B 7 C 8 D 9 E 10

13. The diagram shows three triangles which are formed by the five line segments $ACDF$, BCG , GDE , AB and EF so that $AC = BC = CD = GD = DF = EF$. Also $\angle CAB = \angle EFD$. What is the size, in degrees, of $\angle CAB$?

A 40 B 45 C 50 D 55 E 60

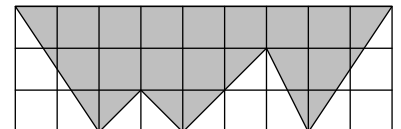


14. The ratio $a : b : c = 2 : 3 : 4$. The ratio $c : d : e = 3 : 4 : 5$. What is the ratio $a : e$?

A 1 : 10 B 1 : 5 C 3 : 10 D 2 : 5 E 1 : 2

15. Each square in the grid shown is 1 cm by 1 cm. What is the area of the shaded figure, in cm^2 ?

A 14 B 15 C 16 D 17 E 18



16. Aimee says Bella is lying. Bella says Marc is lying. Marc says Bella is lying. Terry says Aimee is lying. How many of the four children are lying?

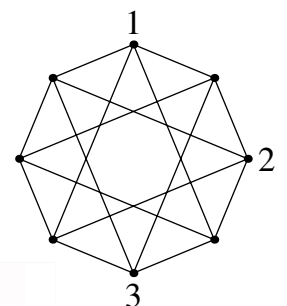
A 0 B 1 C 2 D 3 E 4

17. In three games a football team scored three goals and conceded one. In those three games, the club won one game, drew one game and lost one game. What was the score in the game they won?

A 3 - 0 B 2 - 0 C 1 - 0 D 3 - 1 E 2 - 1

18. The diagram shows the eight vertices of an octagon connected by line segments. Jodhvir wants to write one of the integers 1, 2, 3 or 4 at each of the vertices so that the two integers at the ends of every line segment are different. He has already written three integers as shown. How many times will the integer 4 appear in his completed diagram?

A 5 B 4 C 3 D 2 E 1



19. Sacha places 25 counters into 14 boxes so that each box contains 1, 2 or 3 counters. No box is inside any other box. Seven boxes contain 1 counter. How many contain 3 counters?

A 2 B 3 C 4 D 5 E 6

20. In the addition sum shown, J, K and L stand for different digits.

What is the value of $J + K + L$?

A 6 B 8 C 9 D 10 E 11

$$\begin{array}{r} J K L \\ J L L \\ + J K L \\ \hline 4 7 9 \end{array}$$

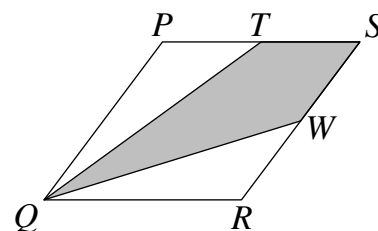
21. In a particular month there were 5 Saturdays and 5 Sundays but only 4 Mondays and 4 Fridays. What must occur in the next month?

A 5 Wednesdays B 5 Thursdays C 5 Fridays D 5 Saturdays
E 5 Sundays

22. In the diagram $PQRS$ is a rhombus. Point T is the mid-point of PS and point W is the mid-point of SR .

What is the ratio of the unshaded area to the shaded area?

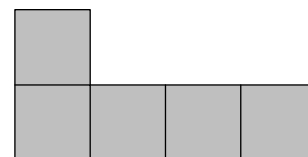
A 1 : 1 B 2 : 3 C 3 : 5 D 4 : 7 E 5 : 9



23. Using only pieces like the one shown in the diagram, Zara wants to make a complete square without gaps or overlaps.

What is the smallest number of pieces she can use?

A 5 B 8 C 16 D 20 E 75



24. Four positive numbers p, q, r and s are in increasing order of size. One of the numbers is to be increased by 1 so that the product of the four new numbers is now as small as possible.

Which number should be increased?

A p B q C r D s E either q or r

25. Sonia wants to write a positive five-digit integer whose digits are 1, 2, 3, 4 and 5 in some order. The first digit of the integer is to be divisible by 1, the first two digits are to form a two-digit integer divisible by 2, the first three digits are to form a three-digit integer divisible by 3, the first four digits are to form a four-digit integer divisible by 4 and the five-digit integer itself is to be divisible by 5. How many such five-digit integers could Sonia write?

A 10 B 5 C 2 D 1 E 0