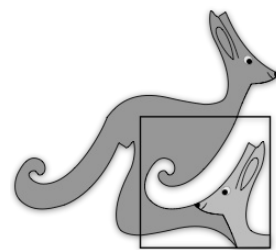


# UK Maths Trust



## Pink Kangaroo

**Thursday 20 March 2025**

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*a member of the Association Kangourou sans Frontières*

*proudly sponsored by* **[XTX]**  
MARKETS

*England & Wales: Year 11 or below | Scotland: S4 or below | Northern Ireland: Year 12 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, or reject the answer sheet.
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.

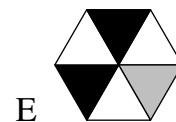
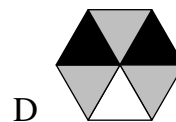
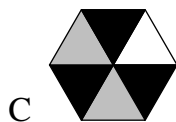
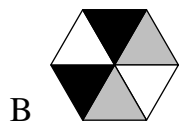
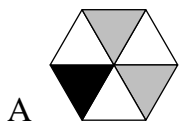
Enquiries about the Pink Kangaroo should be sent to:

[challenges@ukmt.org.uk](mailto:challenges@ukmt.org.uk)

[www.ukmt.org.uk](http://www.ukmt.org.uk)

*supported by* **Overleaf**

1. Which of the following hexagons has exactly one-third of its area black and exactly half of its area white?



2. The base of a triangle increases by 50 % and its height decreases by one-third. What is the ratio of the area of the new triangle to that of the original triangle?

A 2 : 1

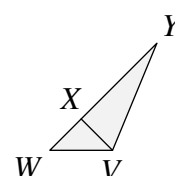
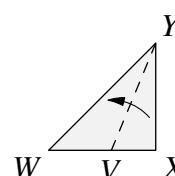
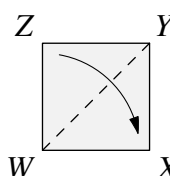
B 1 : 1

C 1 : 2

D 1 : 3

E 1 : 4

3. Freddy folds a square  $WXYZ$  in half along the diagonal  $WY$  to make a triangle  $WXY$ . Then he folds the paper again so that the edge  $XY$  of this triangle lies on part of the edge  $WY$ , making the smaller triangle  $WVY$  as shown.



What is the size of angle  $\angle WVY$ ?

A  $108^\circ$

B  $112.5^\circ$

C  $120^\circ$

D  $145^\circ$

E  $157.5^\circ$

4. The four-digit number  $80\square\square$  is missing its last two digits. It is divisible by 8 and also by 9. What is the product of its last two digits?

A 6

B 16

C 20

D 24

E 48

5. A circle with centre  $O$  and radius 10 cm is given. A square  $OPQR$  is drawn inside the circle, where  $Q$  is a point on the circle.

What is the area of the shaded triangle  $PQR$ ?

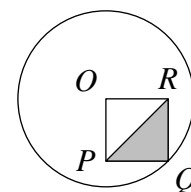
A  $25\text{ cm}^2$

B  $30\text{ cm}^2$

C  $35\text{ cm}^2$

D  $40\text{ cm}^2$

E  $50\text{ cm}^2$



6. Sam has some dogs, some rabbits and some cats. Eight of his pets are not dogs, five of them are not rabbits, and seven of them are not cats.

How many pets does Sam have?

A 10

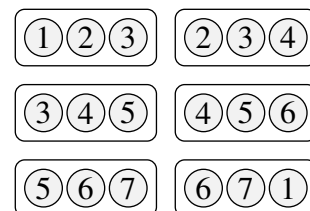
B 11

C 15

D 16

E 20

7. Aimee has a collection of two gold and five silver medals. They are numbered from 1 to 7, in some order. The diagram shows six black and white photos of the medals. It is known that in each photo, exactly one of the medals is gold. What is the sum of the numbers on the two gold medals?



A 7

B 8

C 9

D 10

E 11

8. Sami and Parnika are celebrating their birthday today. Sami notices that  $\frac{1}{19}$  of Parnika's age is equal to  $\frac{1}{17}$  of his age. The sum of their ages is greater than 40 and less than 100. How old is Parnika?

A 19

B 34

C 38

D 57

E 76

9. Debanshi has a bag of 18 balls, numbered from 1 to 18. What is the smallest number of balls she would have to remove to be sure that at least three of them displayed primes?

A 11

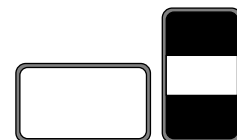
B 12

C 13

D 14

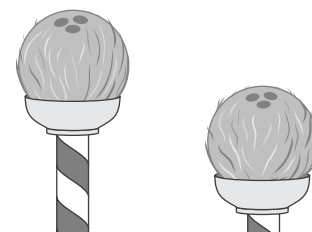
E 15

10. Etienne looks at a photo on his smartphone. The width and height of the photo are in the ratio of 16 : 9 and fills the whole display. When he holds the smartphone vertically, the photo is reduced in size. What proportion of the display area is taken up by the smaller photo?



- A  $\frac{3}{4}$       B  $\frac{9}{16}$       C  $\frac{27}{64}$       D  $\frac{32}{81}$       E  $\frac{81}{256}$

11. Shruti throws 27 balls, each time at one or other of the two coconuts. She hits with 50 % of her throws aimed at the top left coconut and 80 % of her throws at the bottom right coconut. Nine of her throws miss their target.



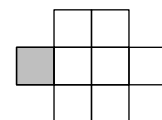
How many times does she hit the top left coconut?

- A 4      B 5      C 6      D 7      E 8

12. The integer  $N$  is the largest six-digit integer with the product of all its digits equal to 180. What is the sum of the digits of  $N$ ?

- A 16      B 17      C 18      D 20      E 21

13. Prem wants to place the digits 1 to 8, inclusive, in the eight cells of the diagram. He wants to place one digit in each cell so that any two cells that contain consecutive digits are not adjacent (including diagonally). What digits could be placed in the shaded cell?



- A 1 or 8      B 2 or 7      C 3 or 6      D 4 or 5      E 7 or 8

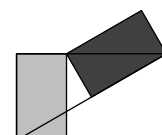
14. The product of three primes is 11 times as big as their sum. What is the largest possible value that this sum could take?

- A 14      B 17      C 21      D 25      E 26

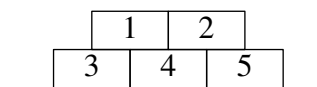
15. The two shaded rectangles are identical. They both have an area of  $4 \text{ cm}^2$ .

What is the area of the large rectangle?

- A  $10 \text{ cm}^2$       B  $8\sqrt{3} \text{ cm}^2$       C  $8 \text{ cm}^2$       D  $12 \text{ cm}^2$       E  $4\sqrt{3} \text{ cm}^2$



16. Five bricks are placed on the ground, as shown on the right. Navithan can only remove a brick if there are no bricks on top of it. He repeatedly removes a brick, chosen at random from those available, until all the bricks are removed.

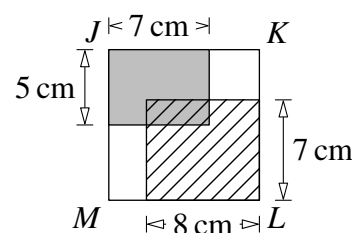


What is the probability that the brick numbered 4 is the third one to be removed?

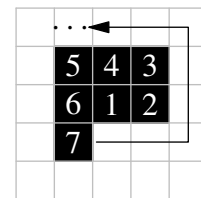
- A  $\frac{1}{3}$       B  $\frac{1}{4}$       C  $\frac{1}{5}$       D  $\frac{1}{6}$       E  $\frac{1}{8}$

17. Square  $JKLM$  contains two rectangles. One is grey and the other striped, with dimensions as shown, but not to scale. The area where the rectangles overlap is  $18 \text{ cm}^2$ . What is the perimeter of  $JKLM$ ?

- A 28 cm      B 34 cm      C 36 cm      D 38 cm      E 40 cm

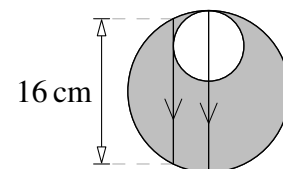


18. Patrick numbers certain squares on a sheet of grid paper. Each square has a side-length of 0.5 cm. He starts by putting 1 in one of the squares and then numbers 2, 3, 4, 5, ... in squares in an anti-clockwise direction, as shown. He stops when he has numbered 2025 squares, and looks at the figure made up of all numbered squares. What is the perimeter of this figure?



A 80 cm      B 90 cm      C 120 cm      D 180 cm      E 360 cm

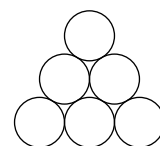
19. The figure shows a diameter of a smaller circle which lies along the diameter of a larger touching circle. It also shows a chord of the larger circle which is parallel to these diameters and is tangent to the smaller circle. The length of the chord is 16 cm. What is the area of the shaded region?



- A  $16\pi \text{ cm}^2$       B  $36\pi \text{ cm}^2$       C  $49\pi \text{ cm}^2$       D  $64\pi \text{ cm}^2$       E  $81\pi \text{ cm}^2$
20. Eghosa has written down a six-digit number ' $abcdef$ ' where the six digits are 1, 2, 3, 4, 5, and 6 in some order. The first two digits form a number ' $ab$ ' which is a multiple of 2. The first three digits form a number ' $abc$ ' which is a multiple of 3. Similarly, ' $abcd$ ' is a multiple of 4, ' $abcde$ ' is a multiple of 5, and ' $abcdef$ ' is a multiple of 6.

What are the possible values for the sixth digit  $f$ ?

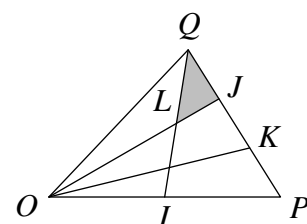
- A 2      B 4      C 6      D 2 or 4      E 4 or 6
21. Six circles are arranged in the shape of a triangle. Louis is asked to write the positive integers from one to six, inclusive, in the circles so that the sums of the numbers on each side of this triangle are the same. He is then asked to calculate the sum of the three integers at the vertices of the triangle. How many different sums could Louis calculate?



- A 1      B 2      C 3      D 4      E 5
22. Ella is constructing a sequence of numbers such that, starting from the third term, each term is equal to the average of all the previous terms. That is, the third term is the average of the first and second terms; the fourth term is the average of the first, second and third terms; and so on. She starts her sequence with 8 and the tenth term she writes down is 26. What is the second term?

- A 28      B 32      C 38      D 44      E 50
23. At a party, there are twelve children, among whom there are three pairs of twins. Shreya has six blue hats and six red hats. In how many different ways can she choose which colour of hat to give to each child while ensuring that, for each pair of twins, the two are given the same colour?

- A 72      B 86      C 92      D 102      E 132
24. Triangle  $OQP$  has an area of  $60 \text{ cm}^2$ .  $I$  is the midpoint of side  $OP$ , and the points  $J$  and  $K$  divide side  $QP$  into three equal segments. Let  $L$  be the intersection of  $QI$  and  $OJ$ . What is the area of triangle  $QLJ$ ?



- A  $4 \text{ cm}^2$       B  $5 \text{ cm}^2$       C  $6 \text{ cm}^2$       D  $7 \text{ cm}^2$       E  $8 \text{ cm}^2$
25. Chiakala wants to write the positive integers from one to eight, inclusive, into the squares of a  $2 \times 4$  grid. For each square, if there is a neighbouring square to its right or below, that neighbour must contain a number larger than that in the given square. In how many different ways can Chiakala fill the grid?



- A 6      B 8      C 10      D 12      E 14