UK Maths Trust

Grey Kangaroo

Thursday 20 March 2025

a member of the Association Kangourou sans Frontières

proudly sponsored by [XTX] MARKETS

England & Wales: Year 9 or below | *Scotland: S2 or below* | *Northern Ireland: Year 10 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 Grey Kangaroo should be sent to:

challenges@ukmt.org.uk *www.ukmt.org.uk*

supported by Overleaf

1. Sandra rolls three dice and gets a total of 8. The three dice show different numbers of dots. Which number of dots could Sandra *not* have rolled on any of her dice?

A  B  C  D  E 

2. Daniel is 5 years old. His brother Dominic is 6 years older. What will the sum of their ages be in 7 years' time?

A 26 B 27 C 28 D 29 E 30

3. Ohad writes the four digits 2, 0, 2 and 5, in some order, in the boxes shown. He then does the sum he has created.

$$\square - \square + \square - \square$$

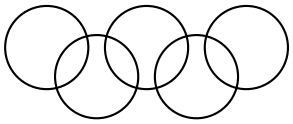
What is the smallest value that Ohad could obtain?

A -7 B -6 C -5 D -4 E -3

4. There were ten more truth-tellers than liars in a room. Everyone in the room was asked, "Are you a truth-teller?" and everyone gave an answer. A total of 20 people answered, "Yes." How many liars were in the room?

A 0 B 5 C 15 D 20 E 25

5. Five circles, each with an area of $8\,\text{cm}^2$, overlap each other to form the figure shown. The area of each section where two circles overlap is $1\,\text{cm}^2$. What is the total area covered by the figure?



A $32\,\text{cm}^2$ B $36\,\text{cm}^2$ C $39\,\text{cm}^2$ D $41\,\text{cm}^2$ E $42\,\text{cm}^2$

6. Ria has some £1 coins and some £2 coins in her pocket. She has 50% more £1 coins than £2 coins. She has £35 in total. How many £2 coins does Ria have?

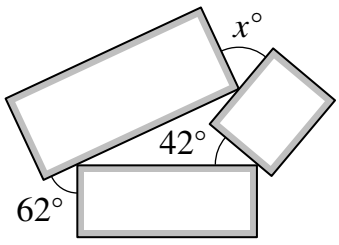
A 12 B 10 C 8 D 6 E 4

7. There are five hurdles in a 60 m hurdles race. The first hurdle is 12 m from the start. The gap between any two consecutive hurdles is 8 m. How far is the last hurdle from the finish?

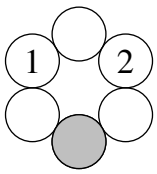
A 16 m B 14 m C 12 m D 10 m E 8 m

8. Louisa places three rectangular pictures in the way shown. What is the value of x?

A 64 B 70 C 72 D 76 E 80

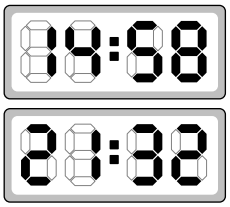


9. Eddie wants to write a number in each circle in the diagram. He wants each number to be equal to the sum of the numbers in the two adjacent circles. He has already written two numbers, as shown. What number should he write in the grey circle?



A 2 B -1 C -2 D -3 E -4

10. Werner is on a treadmill in the gym. He keeps looking at two stopwatches. The first shows the time elapsed since he started and the second the time remaining until the end of his session. The diagram shows the times displayed by these two stopwatches at some point during the session.
What time do the stopwatches show when they display the same times?



A 17:50 B 18:00 C 18:12 D 18:15 E 18:20

11. Julia wants to fill in each $\square$ with a different prime number less than 20 so that the value of X is an integer.
What is the maximum possible value of X?

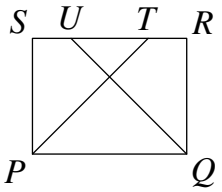
$$X = \frac{\square+\square+\square+\square+\square+\square+\square}{\square}$$

A 20 B 14 C 10 D 8 E 6

12. The integers a, b, c and d satisfy $a < 2b$, $b < 3c$, $c < 4d$, and $d < 100$.
What is the largest possible value of a?

A 1200 B 2000 C 2367 D 2399 E 2400

13. In the rectangle $PQRS$, the points T and U are marked on side SR as shown, so that $\angle RUQ = \angle STP = 45°$ and $PQ + UT = 20$ cm.
What is the length of QR?



A 4 cm B 6 cm C 8 cm D 10 cm E 12 cm

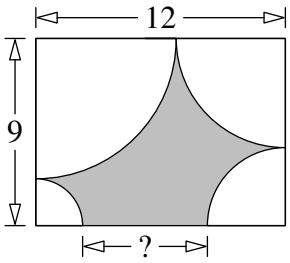
14. Sanja has two bowls of numbered balls. Bowl X contains seven balls numbered 1, 2, 6, 7, 10, 11 and 12. Bowl Y contains five balls numbered 3, 4, 5, 8, and 9. Which ball should Sanja transfer from Bowl X to Bowl Y to increase the mean of the numbers on the balls in each bowl?

A 12 B 11 C 10 D 7 E 6

15. In the six-digit integer $PAPAYA$, different letters stand for different digits and the same letter always represents the same digit. Also $Y = P + P = A + A + A$.
What is the value of $P \times A \times P \times A \times Y \times A$?

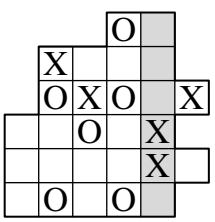
A 432 B 342 C 324 D 243 E 234

16. Peter has drawn a rectangular flag with dimensions 12 cm by 9 cm. He has drawn a quarter-circle with centre at each corner and coloured the region formed, as shown.
What is the length indicated by the question mark?



A 5 cm B 6 cm C 7 cm D 8 cm E 9 cm

17. Morten fills in the cells on the diagram shown so that each cell contains either an X or an O. He also ensures there is no line of four consecutive identical symbols in any column, row or diagonal.
When he has completed the diagram, what will the column coloured grey contain?



A 3 Os and 3 Xs B 2 Os and 4 Xs C 4 Os and 2 Xs
D 5 Os and 1 X E 1 O and 5 Xs

18. During two sessions of football training, Paul shoots a total of 17 times at a target. He hits with 60% of his shots in the first session. He hits with 75% of his shots in the second session.
How many times did he hit the target in the second session?

A 6 B 7 C 8 D 9 E 10

19. Anurag leaves for school at 8:00 a.m. His school is 1 km away. When he walks, his speed is 4 km/h. When he cycles, his speed is 15 km/h. He is 5 minutes early when he walks.
How many minutes early is he when he cycles?

A 12 B 13 C 14 D 15 E 16

20. Jaina is a train driver. She drives the train from Sao Paolo to Rio. The journey usually takes 4 hours, non-stop and at constant speed. One day, the train stopped half way for 40 minutes. By what percentage did Jaina then need to increase the train's speed to still arrive on time?

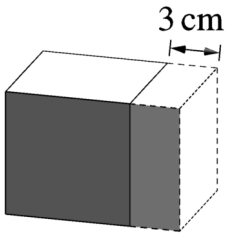
A 30 B 40 C 50 D 60 E 70

21. The letters p, q, r, s and t represent five consecutive positive integers, though not necessarily in that order. The sum of p and q is 69 and the sum of s and t is 72.
What is the value of r?

A 29 B 31 C 34 D 37 E 39

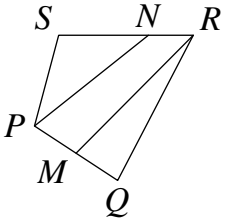
22. When the length of a cuboid is reduced by 3 cm, its surface area is reduced by 60 cm^2. The resulting shape is a cube.
What is the volume of the original cuboid, in cm^3?

A 75 B 125 C 150 D 200 E 225

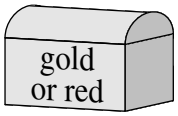


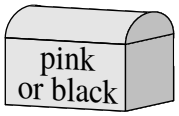
23. In the quadrilateral $PQRS$, the points M and N are marked on sides PQ and RS respectively so that $PM = MQ$ and $SN = 2NR$. The area of triangle MQR is 2 m^2, and the area of triangle PSN is 6 m^2.
What is the area of quadrilateral $PQRS$?

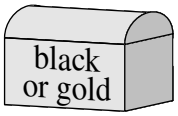
A 13 m^2 B 14 m^2 C 15 m^2 D 16 m^2 E 17 m^2

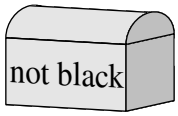


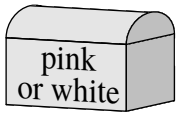
24. Adira keeps gold, red, black, pink and white pearls in five small boxes. Each box contains pearls of only one colour. The boxes are labelled as shown, and all the statements are true. Adira's friend Lilly wants to know which box contains the gold pearls. She may open exactly one of the five boxes to look inside.
Which box must Lilly open to be certain which of the boxes contains the gold pearls?

A 

B 

C 

D 

E 

25. Some birds, including Ha, Long, Nha and Trang, are perching on four parallel wires which are one above the other. There are 10 birds perched above Ha. There are 25 birds perched above Long. There are five birds perched below Nha. There are two birds perched below Trang. The number of birds perched above Trang is a multiple of the number of birds perched below her.
How many birds in total are perched on the four wires?

A 27 B 30 C 32 D 37 E 40

