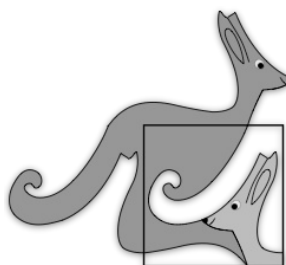


United Kingdom
Mathematics Trust



GREY KANGAROO

Thursday 19 March 2020

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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.
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.

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1. Which of these fractions has the largest value?

A $\frac{8+5}{3}$

B $\frac{8}{3+5}$

C $\frac{3+5}{8}$

D $\frac{8+3}{5}$

E $\frac{3}{8+5}$

2. A large square is divided into smaller squares. In one of the smaller squares a diagonal is also drawn, as shown. What fraction of the large square is shaded?

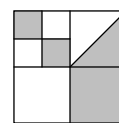
A $\frac{4}{5}$

B $\frac{3}{8}$

C $\frac{4}{9}$

D $\frac{1}{3}$

E $\frac{1}{2}$



3. There are 4 teams in a football tournament. Each team plays every other team exactly once. In each match, the winner gets 3 points and the loser gets 0 points. In the case of a draw, both teams get 1 point. After all matches have been played, which of the following total number of points is it impossible for any team to have obtained?

A 4

B 5

C 6

D 7

E 8

4. The diagram shows a shape made up of 36 identical small equilateral triangles. What is the smallest number of small triangles identical to these that could be added to the shape to turn it into a hexagon?

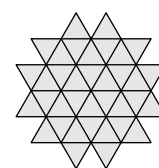
A 10

B 12

C 15

D 18

E 24



5. Kanga wants to multiply three different numbers from the following list: $-5, -3, -1, 2, 4, 6$. What is the smallest result she could obtain?

A -200

B -120

C -90

D -48

E -15

6. John always walks to and from school at the same speed. When he walks to school along the road and walks back using a short cut across the fields, he walks for 50 minutes. When he uses the short cut both ways, he walks for 30 minutes. How long does it take him when he walks along the road both ways?

A 60 minutes

B 65 minutes

C 70 minutes

D 75 minutes

E 80 minutes

7. Each cell of a 3×3 square has a number written in it. Unfortunately the numbers are not visible because they are covered in ink. However, the sum of the numbers in each row and the sum of the numbers in two of the columns are all known, as shown by the arrows on the diagram. What is the sum of the numbers in the third column?

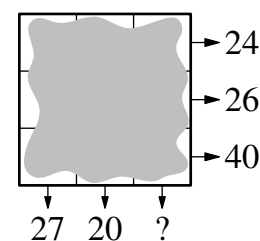
A 41

B 43

C 44

D 45

E 47



8. The shortest path from Atown to Cetown runs through Betown. The two signposts shown are set up at different places along this path. What distance is written on the broken sign?

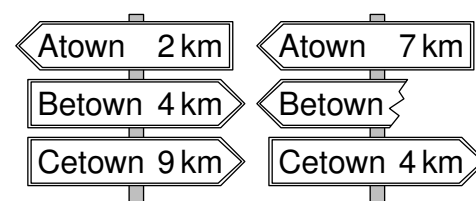
A 1 km

B 3 km

C 4 km

D 5 km

E 9 km



9. Anna wants to walk 5 km on average each day in March. At bedtime on 16th March, she realises that she has walked 95 km so far. What distance does she need to walk on average for the remaining days of the month to achieve her target?

A 5.4 km

B 5 km

C 4 km

D 3.6 km

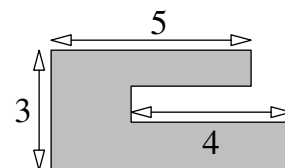
E 3.1 km

10. Every pupil in a class either swims or dances. Three fifths of the class swim and three fifths dance. Five pupils both swim and dance. How many pupils are in the class?

A 15 B 20 C 25 D 30 E 35

11. Sacha's garden has the shape shown. All the sides are either parallel or perpendicular to each other. Some of the dimensions are shown in the diagram. What is the length of the perimeter of Sacha's garden?

A 22 B 23 C 24 D 25 E 26

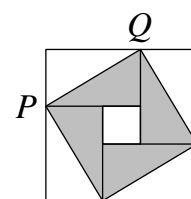


12. Werner's salary is 20% of his boss's salary. By what percentage is his boss's salary larger than Werner's salary?

A 80% B 120% C 180% D 400% E 520%

13. The pattern on a large square tile consists of eight congruent right-angled triangles and a small square. The area of the tile is 49 cm^2 and the length of the hypotenuse PQ of one of the triangles is 5 cm. What is the area of the small square?

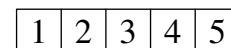
A 1 cm^2 B 4 cm^2 C 9 cm^2 D 16 cm^2 E 25 cm^2



14. Andrew buys 27 identical small cubes, each with two adjacent faces painted red. He then uses all of these cubes to build a large cube. What is the largest number of completely red faces that the large cube can have?

A 2 B 3 C 4 D 5 E 6

15. Aisha has a strip of paper with the numbers 1, 2, 3, 4 and 5 written in five cells as shown. She folds the strip so that the cells overlap, forming 5 layers. Which of the following configurations, from top layer to bottom layer, is it not possible to obtain?



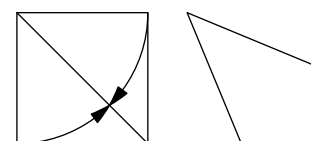
A 3, 5, 4, 2, 1 B 3, 4, 5, 1, 2 C 3, 2, 1, 4, 5 D 3, 1, 2, 4, 5 E 3, 4, 2, 1, 5

16. Twelve coloured cubes are arranged in a row. There are 3 blue cubes, 2 yellow cubes, 3 red cubes and 4 green cubes but not in that order. There is a yellow cube at one end and a red cube at the other end. The red cubes are all together within the row. The green cubes are also all together within the row. The tenth cube from the left is blue. What colour is the cube sixth from the left?

A green B yellow C blue D red E red or blue

17. Bella took a square piece of paper and folded two of its sides to lie along the diagonal, as shown, to obtain a quadrilateral. What is the largest size of an angle in that quadrilateral?

A 112.5° B 120° C 125° D 135° E 150°



18. How many four-digit numbers N are there, such that half of the number N is divisible by 2, a third of N is divisible by 3 and a fifth of N is divisible by 5?

A 1 B 7 C 9 D 10 E 11

19. In the final of a dancing competition, each of the three members of the jury gives each of the five competitors 0 points, 1 point, 2 points, 3 points or 4 points. No two competitors get the same mark from any individual judge. Adam knows all the sums of the marks and a few single marks, as shown. How many points does Adam get from judge III?

	Adam	Berta	Clara	David	Emil
I	2	0			
II		2	0		
III					
Sum	7	5	3	4	11

A 0 B 1 C 2 D 3 E 4

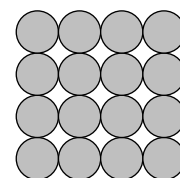
20. Harriet writes a positive integer on each edge of a square. She also writes at each vertex the product of the integers on the two edges that meet at that vertex. The sum of the integers at the vertices is 15. What is the sum of the integers on the edges of the square?

A 6 B 7 C 8 D 10 E 15

21. Sophia has 52 identical isosceles right-angled triangles. She wants to make a square using some of them. How many different-sized squares could she make?

A 6 B 7 C 8 D 9 E 10

22. Cleo builds a pyramid with identical metal spheres. Its square base is a 4×4 array of spheres, as shown in the diagram. The upper layers are a 3×3 array of spheres, a 2×2 array of spheres and a single sphere at the top. At each point of contact between two spheres, a blob of glue is placed. How many blobs of glue will Cleo place?



A 72 B 85 C 88 D 92 E 96

23. Four children are in the four corners of a $10 \text{ m} \times 25 \text{ m}$ pool. Their coach is standing somewhere on one side of the pool. When he calls them, three children get out and walk as short a distance as possible round the pool to meet him. They walk 50 m in total. What is the shortest distance the coach needs to walk to get to the fourth child's corner?

A 10 m B 12 m C 15 m D 20 m E 25 m

24. Anne, Bronwyn and Carl ran a race. They started at the same time, and their speeds were constant. When Anne finished, Bronwyn had 15 m to run and Carl had 35 m to run. When Bronwyn finished, Carl had 22 m to run. What was the length of the race?

A 135 m B 140 m C 150 m D 165 m E 175 m

25. The statements on the right give clues to the identity of a four-digit number.

What is the last digit of the four-digit number?

A 0 B 1 C 3
D 5 E 9

4	1	3	2
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Two digits are correct but in the wrong places.

9	8	2	6
---	---	---	---

One digit is correct and in the right place.

5	0	7	9
---	---	---	---

Two digits are correct with one of them being in the right place and the other one in the wrong place.

2	7	4	1
---	---	---	---

One digit is correct but in the wrong place.

7	6	4	2
---	---	---	---

None of the digits is correct.