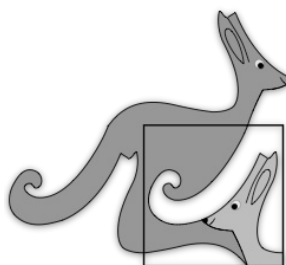# Pink Kangaroo

Thursday 17 March 2022

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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.

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.

1. Carolina has a box of 30 matches. She begins to make the number 2022 using matchsticks. The diagram shows the first two digits.
How many matchsticks will be left in the box when she has finished?
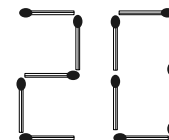
    A 20   B 19   C 10   D 9   E 5

2. A square has the same perimeter as an equilateral triangle whose sides all have length 12 cm.
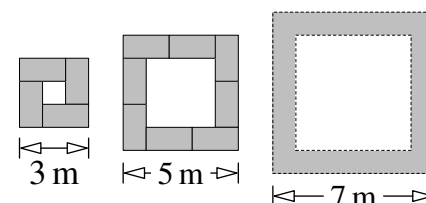What is the length, in cm, of the sides of the square?

    A 9   B 12   C 16   D 24   E 36

3. Some shapes are drawn on a piece of paper. The teacher folds the left-hand side of the paper over the central bold line. How many of the shapes on the left-hand side will fit exactly on top of a shape on the right-hand side?
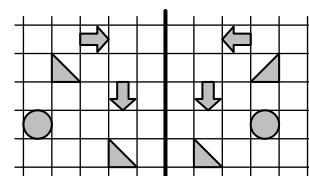
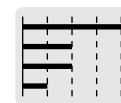   A 1   B 2   C 3   D 4   E 5

4. Katrin arranges tables measuring 2 m by 1 m according to the number of participants in a meeting. The diagrams show the plan view for a small, a medium and a large meeting.
How many tables are needed for a large meeting?

    A 10   B 11   C 12   D 14   E 16

5. On Nadya's smartphone, the diagram shows how much time she spent last week on four of her apps. This week she halved the time spent on two of these apps, but spent the same amount of time as the previous week on the other two apps.
Which of the following could be the diagram for this week?

    A   B   C   D   E

6. There were five candidates in the school election. After 90% of the votes had been counted, the preliminary results were as shown on the right. How many students still had a chance of winning the election?

Henry	India	Jenny	Ken	Lena
14	11	10	8	2

    A 1   B 2   C 3   D 4   E 5

7. Five squares and two right-angled triangles are positioned as shown. The areas of three squares are 3 m^2, 7 m^2 and 22 m^2 as shown.
What is the area, in m^2, of the square with the question mark?
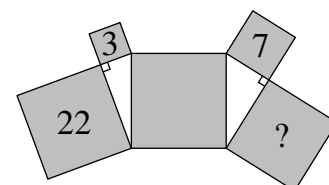
    A 18   B 19   C 20   D 21   E 22

8. A ladybird aims to travel from hexagon X to hexagon Y, passing through each of the seven unshaded hexagons once and only once. She can move from one hexagon to another only through a common edge. How many different routes could she take?
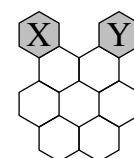
    A 2   B 3   C 4   D 5   E 6

9. Adam laid 2022 tiles in a long line. Beata removed every sixth tile. Carla then removed every fifth tile. Doris then removed every fourth tile. Lastly, Eric removed all of the remaining tiles. How many tiles did Eric remove?

    A 0   B 337   C 674   D 1011   E 1348

10. The centres of the seven circles shown all lie on the same line. The four smaller circles have radius 1 cm. The circles touch, as shown. What is the total area of the shaded regions?

    A $\pi\,\text{cm}^2$ B $2\pi\,\text{cm}^2$ C $3\pi\,\text{cm}^2$ D $4\pi\,\text{cm}^2$ E $5\pi\,\text{cm}^2$
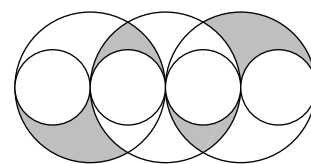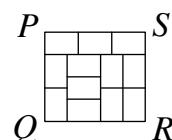
11. Gran's first grandchild guessed that Gran was 75, the second 78 and the third 81. It turned out that one of them was mistaken by 1 year, another one by 2 years and the other by 4 years. What is Gran's age?

    A 76   B 77   C 78   D 79
    E impossible to determine

12. Twelve congruent rectangles are placed together to make a rectangle $PQRS$ as shown. What is the ratio $PQ : QR$?

   A $2 : 3$ B $3 : 4$ C $5 : 6$ D $7 : 8$ E $8 : 9$

13. A rabbit and a hedgehog participated in a running race on a 550 m long circular track, both starting and finishing at the same point. The rabbit ran clockwise at a speed of 10 m/s and the hedgehog ran anticlockwise at a speed of 1 m/s. When they met, the rabbit continued as before, but the hedgehog turned round and ran clockwise. How many seconds after the rabbit did the hedgehog reach the finish?

    A 25   B 45   C 50   D 55   E 100

14. The diagram shows a square $PQRS$ of side-length 1. W is the centre of the square and U is the midpoint of RS. Line segments TW, UW and VW split the square into three regions of equal area. What is the length of SV?

    A $\dfrac{1}{2}$ B $\dfrac{2}{3}$ C $\dfrac{3}{4}$ D $\dfrac{4}{5}$ E $\dfrac{5}{6}$
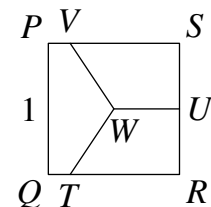
15. Eight teams participated in a football tournament, and each team played exactly once against each other team. If a match was drawn then both teams received 1 point; if not then the winner of the match was awarded 3 points and the loser received no points. At the end of the tournament the total number of points gained by all the teams was 61.
What is the maximum number of points that the tournament's winning team could have obtained?

    A 16   B 17   C 18   D 19   E 21

16. Two congruent isosceles right-angled triangles each have squares inscribed in them as shown. The square P has an area of 45 cm^2. What is the area, in cm^2, of the square R?

    A 40   B 42   C 45   D 48   E 50
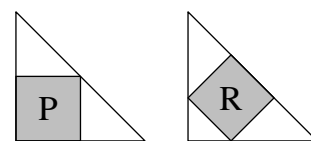
17. Veronica put on five rings: one on her little finger, one on her middle finger and three on her ring finger. In how many different orders can she take them all off one by one?

   A 16   B 20   C 24   D 30   E 45

18. A certain city has two types of people: the 'positives', who only ask questions for which the correct answer is "yes" and the 'negatives' who only ask questions for which the correct answer is "no". When Mo and Bo met Jo, Mo asked, "Are Bo and I both negative?" What can be deduced about Mo and Bo?

    A Both positive   B Both negative   C Mo negative, Bo positive
    D Mo positive, Bo negative   E impossible to determine

19. A group of pirates (raiders, sailors and cabin boys) divided 200 gold and 600 silver coins between them. Each raider received 5 gold and 10 silver coins. Each sailor received 3 gold and 8 silver coins. Each cabin boy received 1 gold and 6 silver coins. How many pirates were there altogether?

    A 50   B 60   C 72   D 80   E 90

20. Cuthbert is going to make a cube with each face divided into four squares. Each square must have one shape drawn on it; either a cross, a triangle or a circle. Squares that share an edge must have different shapes on them. One possible cube is shown in the diagram. Which of the following combinations of crosses and triangles is possible on such a cube (with the other shapes being circles)?
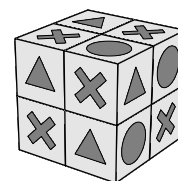
    A 6 crosses, 8 triangles   B 7 crosses, 8 triangles   C 5 crosses, 8 triangles
    D 7 crosses, 7 triangles   E none of these are possible

21. A grocer has twelve weights, weighing 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 kilograms respectively. He splits them into three groups of four weights each. The total weights of the first and second groups are 41 kg and 26 kg respectively. Which of the following weights is in the same group as the 9 kg weight?

    A 3 kg   B 5 kg   C 7 kg   D 8 kg   E 10 kg

22. The bases of the two touching squares shown lie on the same straight line. The lengths of the diagonals of the larger square and the smaller square are 10 cm and 8 cm respectively. P is the centre of the smaller square. What is the area, in cm^2, of the shaded triangle PQR?
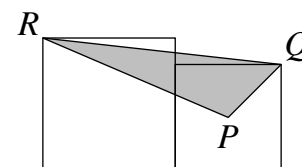
    A 18   B 20   C 22   D 24   E 26

23. The product of the digits of the positive integer N is 20.
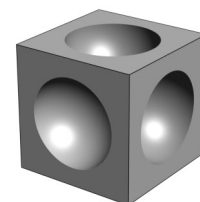One of the following could *not* be the product of the digits of $N + 1$. Which is it?

    A 24   B 25   C 30   D 35   E 40

24. The lengths of the sides of pentagon $ABCDE$ are as follows: $AB = 16$ cm, $BC = 14$ cm, $CD = 17$ cm, $DE = 13$ cm, $AE = 14$ cm. Five circles with centres at the points A, B, C, D, E are drawn so that each circle touches both of its immediate neighbours. Which point is the centre of the largest circle?

    A   B   C   D   E

25. The cube shown has sides of length 2 units. Holes in the shape of a hemisphere are carved into each face of the cube. The six hemispheres are identical and their centres are at the centres of the faces of the cube. The holes are just large enough to touch the hole on each neighbouring face. What is the diameter of each hole?

    A 1   B $\sqrt{2}$ C $2 - \sqrt{2}$ D $3 - \sqrt{2}$ E $3 - \sqrt{3}$