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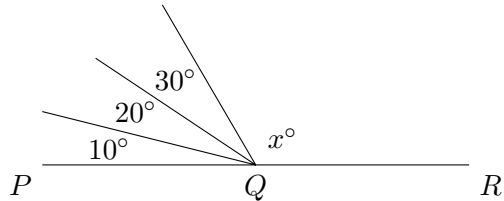
Junior Division

Questions 1 to 10, 3 marks each

1. $1999 + 24$ is equal to

- (A) 1923 (B) 2003 (C) 2013 (D) 2023 (E) 2113
-

2. PQR is a straight line. Find the value of x .



- (A) 40 (B) 90 (C) 100 (D) 110 (E) 120
-

3. The value of the fraction $\frac{1}{2}$ is closest to

- (A) 0.45 (B) 0.6 (C) $\frac{1}{3}$ (D) $\frac{5}{8}$ (E) $\frac{2}{5}$
-

4. Which of the following is equal to 20?

- (A) $3 + 2 \times 4$ (B) $(9 + 5) \times 2 - 4 \times 2$ (C) 10^2 (D) $20 + 20 \div 2$ (E) $10 \div 2$
-

5. How many minutes are there between 8:37 am and 10:16 am?

- (A) 39 (B) 79 (C) 99 (D) 141 (E) 179
-

6. Three squares each with an area of 25 cm^2 are placed side by side to form a rectangle. The perimeter, in centimetres, of the rectangle is

- (A) 20 (B) 36 (C) 40 (D) 75 (E) 100
-

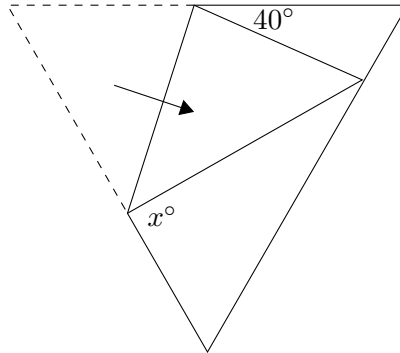
7. If every digit of a whole number is either a 3 or a 5, the number will always be

- (A) divisible by 3 (B) divisible by 5 (C) prime (D) even (E) odd
-

8. P is the point at 0.56 and Q is the point at 1.2 on a number line. The point which is halfway between P and Q is at

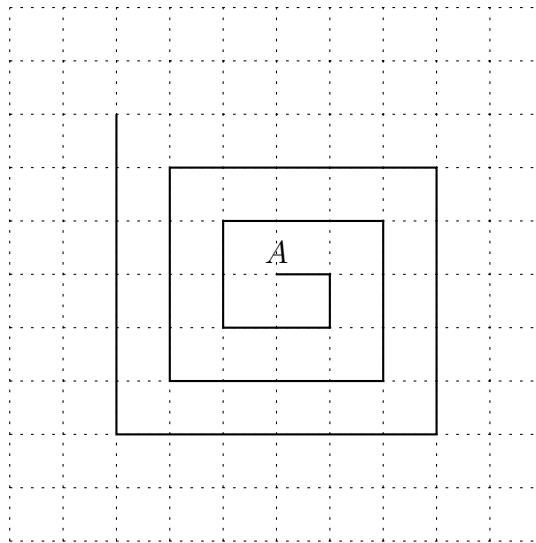
- (A) 0.34 (B) 0.64 (C) 0.83 (D) 0.88 (E) 0.93
-

13. A piece of paper in the shape of an equilateral triangle has one corner folded over, as shown.



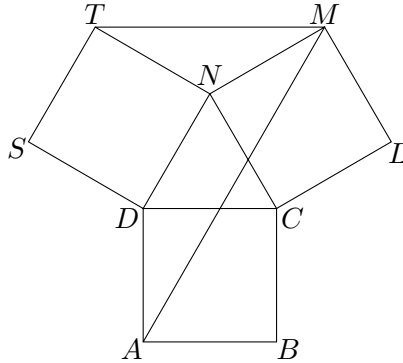
What is the value of x ?

- (A) 60 (B) 70 (C) 80 (D) 90 (E) 100
14. Beginning at the point A , Joel draws the spiral pattern of line segments below on a 1 cm grid. If he continues this pattern, how long, in centimetres, is the 97th segment?



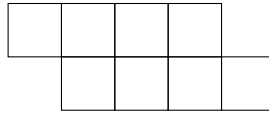
- (A) 46 (B) 47 (C) 48 (D) 49 (E) 50

18. The three squares in the figure below are the same size. Find the value, in degrees, of $\angle AMT$.



- (A) 45° (B) 50° (C) 55° (D) 60° (E) 75°
-

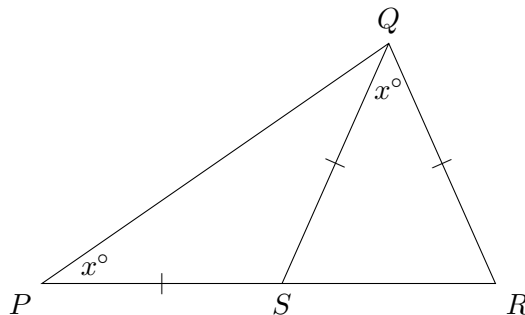
19. Eight 1×1 square tiles are laid as shown.



Two more 1×1 tiles are added, so that at least one side of each new tile is shared with a side of the original shape. Several different perimeter lengths are now possible. What is the sum of the shortest and longest possible perimeter of the modified shape?

- (A) 28 (B) 30 (C) 32 (D) 34 (E) 36
-

20. In the triangle PQR , S is a point on PR such that PQS and SQR are both isosceles triangles (as shown). Angle QPS is equal to angle SQR .

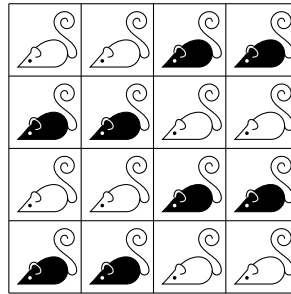


What is the value of x ?

- (A) 30 (B) 36 (C) 40 (D) 45 (E) 48
-

Questions 21 to 25, 5 marks each

- 21.** A biologist has a set of cages in a 4×4 array. He wants to put one mouse (black or white) into each cage in such a way that each mouse has at least one neighbour of each colour (neighbouring cages share a common wall).



The black mice are more expensive, so he wants to use as few of them as possible. What is the smallest number of black mice that he needs?

- (A) 4 (B) 5 (C) 6 (D) 7 (E) 8
-

- 22.** Two discs have different numbers on each side as shown.



The two sides of disc 1 The two sides of disc 2

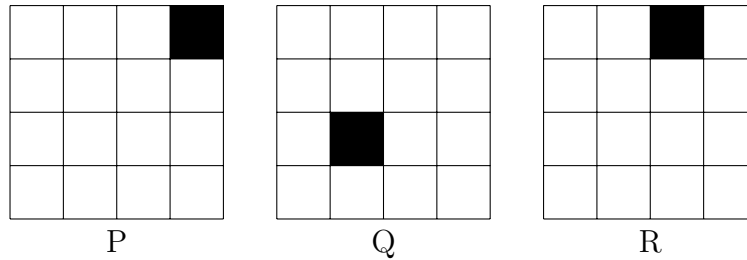
The discs are flipped and they land on a table. The two numbers on the sides that are showing are added. If the possible sums that can be obtained in this way are 8, 9, 10 and 11, the sum $b + c + d$ is

- (A) 8 (B) 18 (C) 20 (D) 27 (E) 30
-

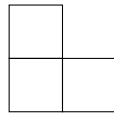
- 23.** An *oddie* number is a 3-digit number with all three digits odd. The number of *oddie* numbers divisible by 3 is

- (A) 20 (B) 26 (C) 29 (D) 41 (E) 42
-

24. Consider the following 4×4 squares with a 1×1 square deleted (shown in black).



Consider tiling the squares P, Q and R using tiles like the one below.



Which of the following statements is true?

- (A) Only P can be tiled this way.
- (B) Only Q can be tiled this way.
- (C) Only R can be tiled this way.
- (D) Only P and Q can be tiled this way.
- (E) All the shapes can be tiled this way.

25. A number is formed by writing the numbers 1 to 30 in order as shown.

12345678910111213.....2930

Simeon removed 45 of these 51 digits leaving 6 in their original order to make the largest 6-digit number possible. What is the sum of the digits of this number?

- (A) 33 (B) 38 (C) 41 (D) 43 (E) 51

For questions 26 to 30, shade the answer as an integer from 0 to 999 in the space provided on the answer sheet.

Question 26 is 6 marks, question 27 is 7 marks, question 28 is 8 marks, question 29 is 9 marks and question 30 is 10 marks.

26. Consider a sequence of letters where each letter is A or B . We call the sequence *stable* if, when we tally the number of A s and the number of B s in the sequence, working from left to right, the difference is never greater than one. For example, the sequence $ABBABA$ is stable but the sequence $AABBAB$ is not, because after counting the first two letters, the difference is two. How many stable sequences with eighteen letters are there?

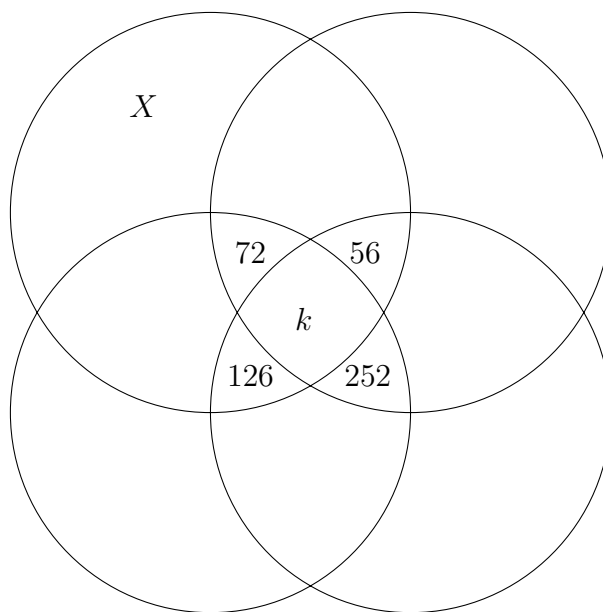
- 27.** Whenever Callum reads a date like 1/8/2013, he incorrectly interprets it as two divisions, with the second one evaluated before the first one:

$$1 \div (8 \div 2013) = 251\frac{5}{8}$$

For some dates, like this one, he does not get an integer, while for others, like 28/7/2013, he gets $28 \div (7 \div 2013) = 8052$, an integer. How many dates this year (day/month/year) give him an integer?

- 28.** What is the smallest positive integer that can be expressed as the sum of nine consecutive integers, the sum of ten consecutive integers and the sum of eleven consecutive integers?
-

- 29.** Each of the four circles below has a whole number value. X is the value of the top-left circle. A number written on the figure indicates the product of the values of the circles it lies within. What is the value of $X + k$?



- 30.** Three different non-zero digits are used to form six different 3-digit numbers. The sum of five of them is 3231. What is the sixth number?
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