Junior Division

1. The value of $2 + 0 + 1 + 7$ is

(A) 10　　　　　　(B) 19　　　　　　(C) 37　　　　　　(D) 208　　　　　　(E) 2017

2. What is the value of x in the diagram?

(A) 20　　　　　　(B) 70　　　　　　(C) 80

　　　(D) 110　　　　　(E) 160

3. This rectangle is $3.2\,\text{m}$ wide and $3\,\text{m}$ tall. Its area is

(A) $9.6\,\text{m}^2$　　　　(B) $15\,\text{m}^2$　　　　(C) $90.6\,\text{m}^2$

　　　(D) $9.2\,\text{m}^2$　　　　　(E) $6.5\,\text{m}^2$

4. Starting with 13, and counting by fives, you count $13, 18, 23$, and so on. Which one of the following numbers will be one of the numbers you count?

(A) 47　　　　　　(B) 48　　　　　　(C) 49　　　　　　(D) 50　　　　　　(E) 51

5. What fraction of these circles are shaded?

(A) $\frac{1}{2}$　　(B) $\frac{1}{3}$　　(C) $\frac{2}{3}$　　(D) $\frac{3}{4}$　　(E) $\frac{9}{16}$

6. Of the following, which digit could be put in the box to make this three-digit number divisible by 3?

$$1 \,\square\, 7$$

(A) 1　　　　　　(B) 3　　　　　　(C) 6　　　　　　(D) 8　　　　　　(E) 9

7. A pump runs for 150 minutes, using 8 litres of biodiesel. For how many hours can it run with 32 litres of biodiesel?

(A) 6   (B) 7   (C) 8   (D) 10   (E) 12

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8. Jonah returned from the shop with a bag carrying 780 g of fish, 1.35 kg of vegetables, and 680 g of fruit for his mother. The bag itself weighed 150 g. The total weight, in kilograms, that Jonah carried was

(A) 1.745   (B) 2   (C) 2.81   (D) 2.96   (E) 3

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9. 1000% of 1 is

(A) 0.1   (B) 1   (C) 10   (D) 100   (E) 1000

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10. Which one of the following numbers could be put in the box to make the fraction between 7 and 8?

$$\frac{\boxed{} + 3}{6}$$

(A) 47   (B) 25   (C) 32   (D) 37   (E) 41

Questions 11 to 20, 4 marks each

11. Alice is playing with words. At each tick of her grandfather's clock she swaps two letters. What is the smallest number of clock ticks during which she can change WORDS to SWORD?

(A) 3   (B) 4   (C) 6   (D) 7   (E) 8

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12. This pinwheel star is formed by rotating a right-angled triangle around one of its corners. What is the angle at each of the nine tips that are marked with dots?

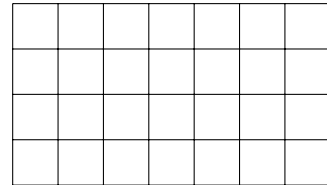(A) 30°   (B) 40°   (C) 45°

     (D) 50°   (E) 60°
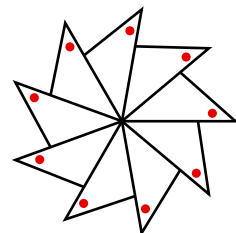
13. I have twelve paint tins each capable of holding twelve litres. Half of them are half full. A third of them are a third full. The rest are one-sixth full. How many litres of paint do I have in total?

(A) 48   (B) 50   (C) 52   (D) 54   (E) 56

14. How many ways are there of placing a single 3×1 rectangle on this grid so that it completely covers three grid squares?
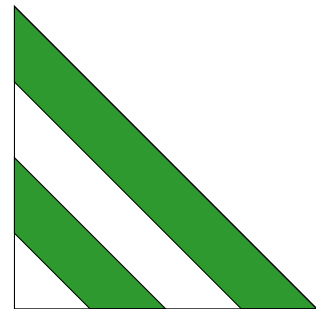
(A) 34   (B) 28   (C) 56

     (D) 40   (E) 10

15. The time 2017 minutes after 10 am on Tuesday is closest to

(A) 7.30 pm Tuesday   (B) 7.30 am Wednesday   (C) 7.30 pm Wednesday

     (D) 7.30 am Thursday   (E) 7.30 pm Thursday

16. The bottom and left side of this triangle are divided into 4 equal parts by the diagonal lines. What fraction of the large triangle is shaded?
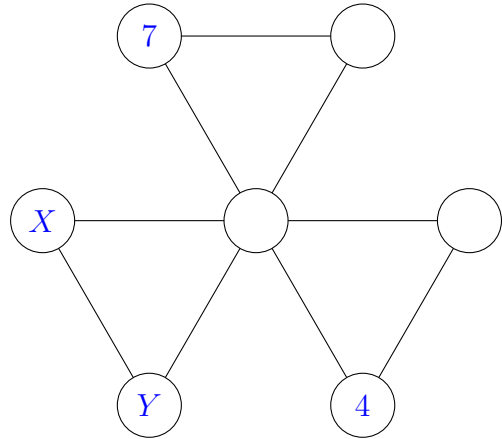
(A) $\frac{5}{8}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$

     (D) $\frac{2}{3}$ (E) $\frac{3}{5}$

17. Each of the fractions $\frac{4}{n}, \frac{5}{n}, \frac{7}{n}$ is in its simplest form. Which of the following could be the value of n?

(A) 24   (B) 25   (C) 26   (D) 27   (E) 28

18. The whole numbers from 1 to 7 are to be placed in the seven circles in the diagram. In each of the three triangles drawn, the sum of the three numbers is the same.

Two of the numbers are given.

What is $X + Y$?

(A) 5   (B) 6   (C) 7

      (D) 8   (E) 9

19. Farhad, Greg and Huong were dismantling their marble madness machine and had 2017 marbles to share. They split them so that Farhad had exactly twice as many as Greg, and Greg had twice as many as Huong, with as few left over as possible. How many marbles were in Farhad's share?

(A) 1008   (B) 504   (C) 288   (D) 1344   (E) 1152

20. Whole numbers greater than 1 are arranged in a table in the pattern shown. In which column will the number 501 be found?

(A) A   (B) B   (C) C   (D) D   (E) E

A	B	C	D	E
		2	3	4
5	6	7		
		8	9	10
11	12	13		
		14	15	16
17	18	19		

$$\vdots \qquad \vdots$$

Questions 21 to 25, 5 marks each

21. Two rectangles overlap to create three regions, each of equal area. The original rectangles are 6 cm by 15 cm and 10 cm by 9 cm as shown. The sides of the smaller shaded rectangle are each a whole number of centimetres.

What is the perimeter of the smaller shaded rectangle, in centimetres?
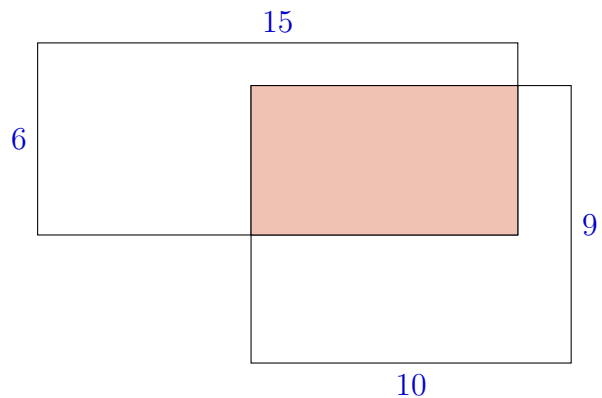
(A) 24   (B) 28   (C) 30   (D) 32   (E) 36

22. A number is a palindrome if it reads the same forwards as backwards. The number 131131 is a palindrome; also the first pair of digits (13), the middle pair of digits (11) and the last pair of digits (31) are prime numbers. How many such 6-digit palindromes are there?

(A) 8   (B) 9   (C) 10   (D) 11   (E) 12

23. A triangular prism is to be cut into two pieces with a single straight cut. What is the smallest possible total for the combined number of faces of the two pieces?

(A) 6   (B) 8   (C) 9

       (D) 10   (E) 11
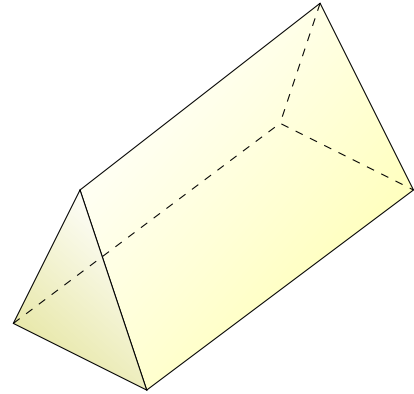
24. Ike and Seb were arguing over how 120 mL of soft drink had been shared between them.

To settle the argument, their dad poured one-third of Ike's drink into Seb's glass, and then he poured one-third of Seb's drink back into Ike's glass. Now they have an equal amount.

How much soft drink did Ike originally have compared to Seb?

(A) 60 mL less   (B) 30 mL less   (C) the same

   (D) 30 mL more   (E) 60 mL more

25. A 3 × 3 grid has a pattern of black and white squares.

A pattern is called *balanced* if each 2 × 2 subgrid contains exactly two squares of each colour, as seen in the first example.
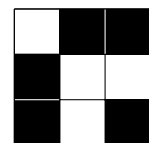
The pattern in the second example is *unbalanced* because the bottom-right 2 × 2 subgrid contains three white squares.

Counting rotations and reflections as different, how many balanced 3 × 3 patterns are there?

(A) 2   (B) 7   (C) 10   (D) 14   (E) 18
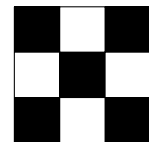
balanced

unbalanced

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.
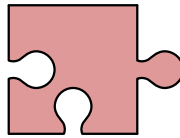
26. All of the digits from 0 to 9 are used to form two 5-digit numbers. What is the smallest possible difference between these two numbers?

27. A jigsaw piece is formed from a square with a combination of 'tabs' and 'slots' on at least two of its sides.
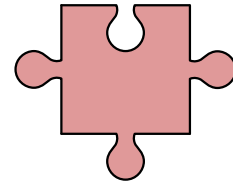
Pieces are either corner, edge or interior, as shown.
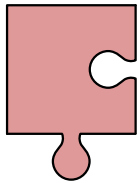
corner piece
(two straight sides at right angles)

edge piece
(one straight side)

interior piece
(no straight sides)

We treat two shapes as the same if one is a rotation of the other, without turning it over. How many different shapes are possible?

28. The reverse of the number 129 is 921, and these add to 1050, which is divisible by 30. How many three-digit numbers have the property that, when added to their reverse, the sum is divisible by 30?

29. I have a large number of toy soldiers, which I can arrange into a rectangular array consisting of a number of rows and a number of columns. I notice that if I remove 100 toy soldiers, then I can arrange the remaining ones into a rectangular array with 5 fewer rows and 5 more columns.

How many toy soldiers would I have to remove from the original configuration to be able to arrange the remaining ones into a rectangular array with 11 fewer rows and 11 more columns?

30. Mike multiplied at least two consecutive integers together. He obtained a six-digit number N. The first two digits of N are 47 and the last two digits of N are 74. What is the sum of the integers that Mike multiplied together?