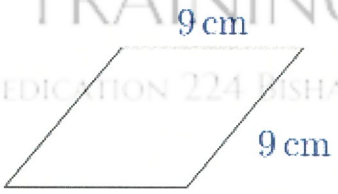
Mathlete Training Centre
2022 Australia Mathematics Competition - Junior

1. What is the perimeter of this rhombus?



(A) 20cm **(B)** 24cm **(C)** 28cm **(D)** 32cm **(E)** 36cm

2. The temperature in the mountains was $4°C$ but dropped overnight by $7°C$. What was the temperature in the morning?

(A) $3°C$ **(B)** $11°C$ **(C)** $-3°C$ **(D)** $-4°C$ **(E)** $-11°C$

3. What is the value of 20×22?

(A) 42 **(B)** 440 **(C)** 2022 **(D)** 2220 **(E)** 4400

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4. Which spinner is twice as likely to land on red as white?

(A) 

(B) 

(C) 

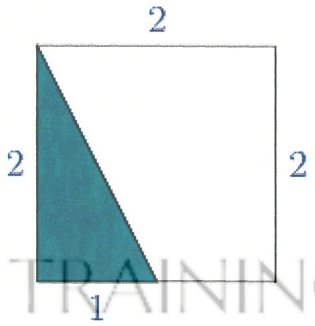
(D) 

(E) 

5. Russell's tuba lesson started at 4:28pm and finished at 5:05pm. How long was the lesson?

(A) 23 minutes **(B)** 27 minutes **(C)** 33 minutes **(D)** 37 minutes **(E)** 43 minutes

6. What fraction of the square is shaded?



(A) $\frac{1}{3}$ **(B)** $\frac{1}{4}$ **(C)** $\frac{2}{5}$ **(D)** $\frac{1}{2}$ **(E)** $\frac{3}{8}$

7. What is the value of $10^3 - 11^2$?
   (A) 8 **(B)** 22 **(C)** 279 **(D)** 779 **(E)** 879

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8. Which one of these fractions lies between 4 and 5 on the number line?
   (A) $\frac{7}{2}$ **(B)** $\frac{15}{4}$ **(C)** $\frac{16}{5}$ **(D)** $\frac{17}{4}$ **(E)** $\frac{18}{5}$

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9. In the triangle PQR shown, $PQ = PR$ and $\angle QPR = 48°$. What is $\angle PQR$?

(A) 60° **(B)** 66° **(C)** 72° **(D)** 78° **(E)** 84°

10. What is the time and day one-quarter of a week after midday on Sunday?

(A) 6am Tuesday **(B)** 9pm Tuesday **(C)** midday Monday **(D)** 3am Wednesday **(E)** 6pm Monday

11. These three coins have a number on each side. The two numbers on each coin multiply to 60. Whatis the sum of the three hidden numbers?

(A) 17 (B) 21 (C) 29 (D) 31 (E) 39

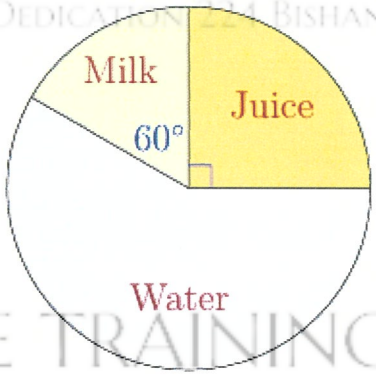
12. Three different squares are arranged as shown. The perimeter of the largest square is 36 cm. The area of the smallest square is 9 cm^2. What is the perimeter of the medium-sized square?

(A) 12cm (B) 18cm (C) 24cm (D) 30cm (E) 32cm

13. Australia uses 160 million litres of petrol each day. There is enough petrol stored to last 60 days. How much more petrol does Australia need to buy to have enough stored for 90 days?

(A) 4 million litres **(B)** 4.8 million litres **(C)** 480 million litres
(D) 160 million litres **(E)** 4800 million litres

14. Anumber of students were asked about their favourite drink: juice, milk or water. This pie chart shows their answers. Eighty students chose milk. How many students chose juice?



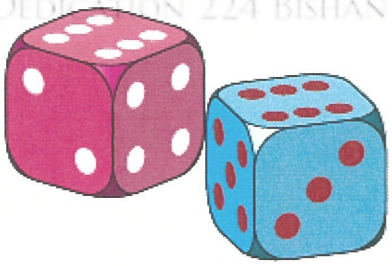
(A) 80 **(B)** 100 **(C)** 120 **(D)** 160 **(E)** 480

15. How many of these numbers are divisible by 3?

$$1, 12, 123, 1234, 12345, 123456, 1234567, 12345678, 123456789$$

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

16. Standard dice have 1 and 6 opposite, 2 and 5 opposite and 3 and 4 opposite. I can position any dice to be able to see 1, 2 or 3 sides. What is the smallest number of dice I can arrange to see exactly 100 dots at once?



(A) 5 (B) 6 (C) 7 (D) 10 (E) 17

17. This logo is reflected in the vertical axis ℓ shown, rotated clockwise by 90°, then reflected in the vertical axis ℓ again. What does it look like after these three steps?

(A) 

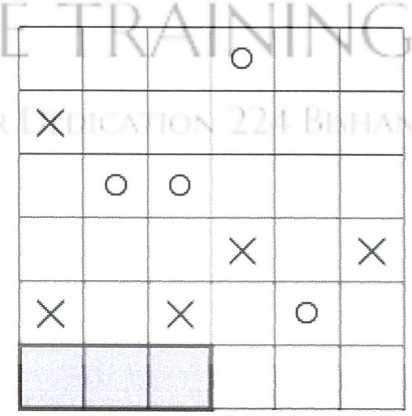
(B) 

(C) 

(D) 

(E) 

18. In this grid, the puzzle is to fill each square with either × or ○ following two rules. Firstly, in each row and column there must be three of each symbol. Secondly, there can't be three consecutive squares with the same symbol in any row or column. When this puzzle is solved, what is the arrangement of symbols in the three shaded squares in the lower left?

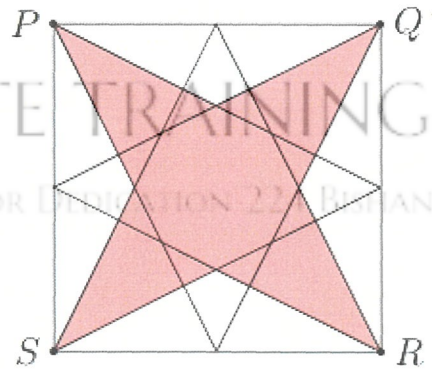


(A) × ○ × **(B)** ○ × ○ **(C)** × × ○ **(D)** ○ × × **(E)** ○ ○ ×

19. Ash, Sash, and Tash like to collect and swap monster trading cards. They meet to trade some cards with each other. Ash trades 11 cards, Sash trades 8, and Tash trades 15. Each card is swapped exactly once with another card belonging to another person. Everyone ends up with the same number of cards that they started with. How many cards does Sash swap with Tash?

(A) 1 **(B)** 3 **(C)** 4 **(D)** 6 **(E)** 7

20. Within the square $PQRS$, lines are drawn from each corner to the middle of the opposite sides as shown. What fraction of $PQRS$ is shaded?

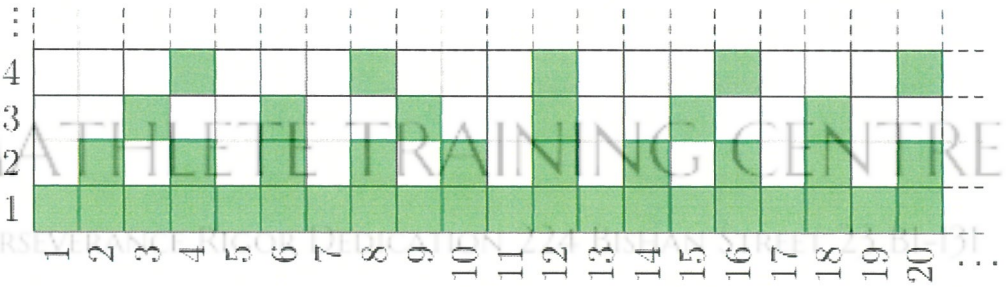


(A) $\frac{1}{4}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{3}{8}$ **(D)** $\frac{1}{2}$ **(E)** $\frac{2}{3}$

21. The first number in a list is 2. After that, each number is calculated by adding the digits of the previous number together and squaring the result. What is the 2022nd number in the list?

(A) 49 **(B)** 169 **(C)** 256 **(D)** 529 **(E)** 1024

22. On a large grid, rows and columns are numbered as shown. All squares in row 1 are shaded. Every second square in row 2 is shaded. Every third square in row 3 is shaded, and so on. As a result, each column has certain squares shaded. For instance, the shaded squares in column 6 are the three squares shown and one more in row 6. In column 105, how many squares are shaded?



(A) 3 **(B)** 4 **(C)** 8 **(D)** 12 **(E)** 35

23. Usually Andrew walks home from school in 24 minutes. Last Monday, he walked for the first 15 minutes but then it started to rain, so he ran the rest of the way home. His running speed is 1.5 times his usual walking speed. How many minutes did it take him to get from school to home?

(A) 18 (B) 20 (C) 21 (D) 22 (E) 23

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24. The single-digit unit fractions are

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \text{ and } \frac{1}{9}.$$

How many pairs of these fractions are there where the first fraction minus the second fraction is bigger than $\frac{1}{10}$?

(A) 5 (B) 10 (C) 15 (D) 20 (E) 25

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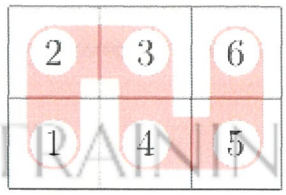
25. In the grid shown, the numbers 1 to 6 are placed so that when joined in ascending order they make a trail. The trail moves from one square to an adjacent square but does not move diagonally. In how many ways can the numbers 1 to 6 be placed in the grid to give such a trail?



(A) 16 **(B)** 20 **(C)** 24 **(D)** 28 **(E)** 36

26. In the sum shown, the symbols $\diamond$, $\heartsuit$, and $\square$ represent three different digits. What is the three-digit number represented by $\diamond\heartsuit\square$?

$$\begin{array}{r} \diamond\heartsuit\square \\ +\ \diamond\heartsuit\square \\ \hline \heartsuit\heartsuit\diamond \end{array}$$

27. The digits $1, 2, 3, 4, 5, 6, 7, 8$ are separated into two groups of 4 each. Each group is formed into a four-digit number and the two numbers are added. Finally, the digits in this sum are added together. An example of this is $3541 + 7628 = 11169$, with digit sum $1 + 1 + 1 + 6 + 9 = 18$. What is the difference between the largest possible and smallest possible digit sums?

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28. A surf club consists of three types of members: trainees, paddlers, and legends. There are 20 trainees, which is less than half the membership. There are twice as many legends as paddlers.

    After a surf rescue, they received a \$1000 donation to be divided among the members. All the donation was shared and every member received a whole number of dollars, at least \$2. Each paddler received 6 times as much as each trainee. Each legend received \$5 more than each paddler.

    How many members are there in the surf club?

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29. Horton has a regular hexagon of area 60. For each choice of three vertices of the hexagon, he writes down the area of the triangle with these three vertices. What is the sum of the 20 areas that Horton writes down?

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30. In how many ways can 100 be written as the sum of three different positive integers? Note that we do not consider sums formed by reordering the terms to be different, so that 34 +5+61 and 61+34+5 are treated as the same sum.

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