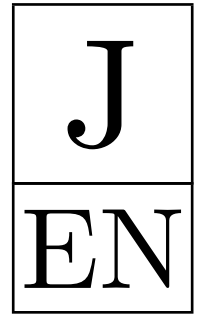


# KANGAROO 2021



Time allowed: 75 minutes  
Calculators are not permitted  
The participants solve problems independently

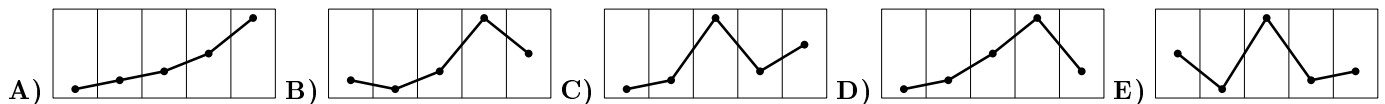
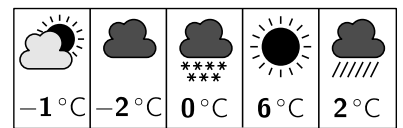
Junior  
9–10 grades

## Questions for 3 points

1. Each year, the third Thursday in March is named Kangaroo Day. The dates of Kangaroo Day for the next few years are shown below, with one error. Which date is wrong?

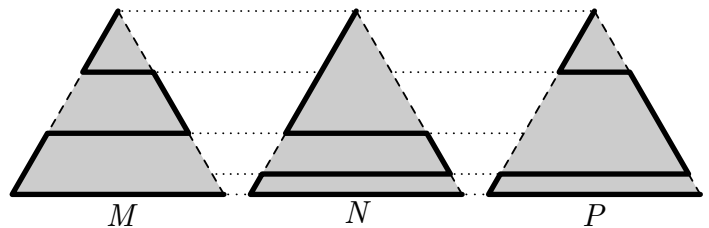
A) 2022 17 March   B) 2023 16 March   C) 2024 14 March   D) 2025 20 March   E) 2026 19 March

2. Jenny looks at her weather app that shows the predicted weather and maximum temperatures for the next five days. Which of the following represents the corresponding graph of maximum temperatures?



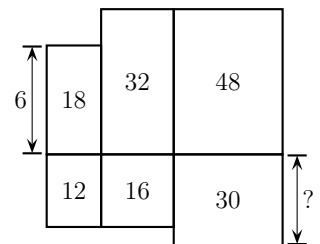
3. A park is shaped like an equilateral triangle. A cat wants to walk along one of the three indicated paths (thicker lines) from the upper corner to the lower right corner. The lengths of the paths are  $M$ ,  $N$  and  $P$ , as shown. Which of the following statements about the lengths of the paths is true?

A)  $M < N < P$    B)  $M < P < N$    C)  $M < N = P$   
D)  $M = P < N$    E)  $M = N = P$



4. Six rectangles are arranged as shown. The top left-hand rectangle has height 6. The numbers within the rectangles indicate their areas. What is the height of the bottom right-hand rectangle?

A) 10   B) 7.5   C) 6   D) 5   E) 4

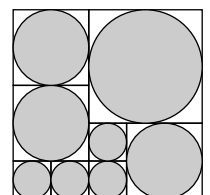


5. The halftime score of a handball match was  $9 : 14$ , thus the visiting team was leading by five goals. As a consequence of coach instructions received at halftime, the home team dominated in the second half and scored twice as many goals as their opponents. The home team won the match by one goal. What was the final score of the match?

A)  $20 : 19$    B)  $21 : 20$    C)  $22 : 21$    D)  $23 : 22$    E)  $24 : 23$

6. A large square is divided into smaller squares, as shown. A shaded circle is inscribed inside each of the smaller squares. What proportion of the area of the large square is shaded?

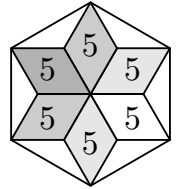
A)  $\frac{6\pi}{25}$    B)  $\frac{\pi}{5}$    C)  $\frac{3\pi}{10}$    D)  $\frac{\pi}{4}$    E)  $\frac{5\pi}{16}$



7. In a jazz band, Giuseppe plays the saxophone, Sergio plays the trumpet, and Eliana sings. They are all the same age. There are three more members of the jazz band, who are 19, 20 and 21 years old respectively. The average age of the jazz band is 21. How old is Eliana?

A) 20   B) 21   C) 22   D) 23   E) 24

8. Six congruent rhombuses, each of area 5, form a star. The tips of the star are joined to draw a regular hexagon, as shown. What is the area of the hexagon?

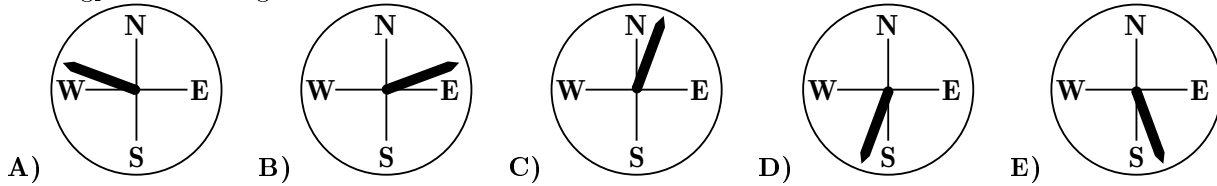


- A) 36 B) 40 C) 45 D) 48 E) 60

9. The little kangaroo has chosen a special number. She gets the same result when she subtracts  $\frac{1}{10}$  from her number as she does when she multiplies it by  $\frac{1}{10}$ . What is her number?

- A)  $\frac{1}{100}$  B)  $\frac{1}{11}$  C)  $\frac{1}{10}$  D)  $\frac{11}{100}$  E)  $\frac{1}{9}$

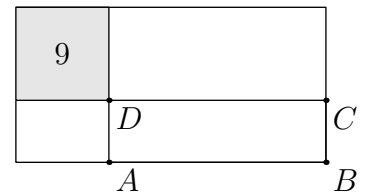
10. After the storm last night, the flagpole on our school building is leaning over. Looking from northwest, its tip is to the right of its bottom point. Looking from the east, its tip is also to the right of its bottom point. In which direction could the flagpole be leaning over?



**Questions for 4 points**

11. A rectangle with perimeter 30 is divided into four parts by a vertical line and a horizontal line. One of the parts is a square of area 9, as shown in the figure. What is the perimeter of rectangle  $ABCD$ ?

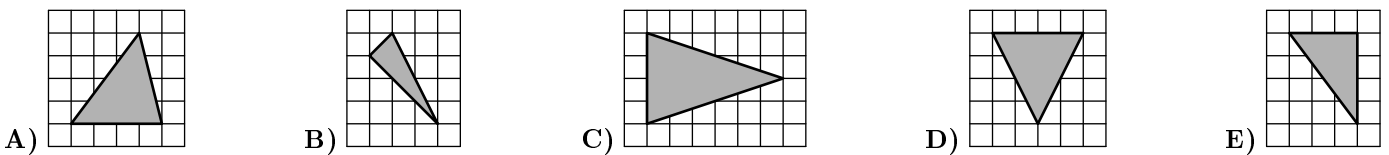
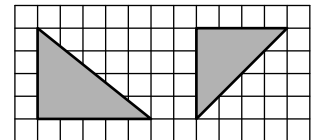
- A) 14 B) 21 C) 16 D) 18 E) 24



12. Tom had ten sparklers of the same size. He lit one first. When only a tenth of it remained, he lit the second one. When only a tenth of that remained, he lit the third one, and so on. Sparklers burn at the same speed along their entire length. One sparkler will burn in 2 minutes. How long did it take for all 10 sparklers to burn down?

- A) 18 min 20 sec B) 18 min 12 sec C) 18 min D) 17 min E) 16 min 40 sec

13. Ally drew three triangles on a grid. Exactly two of them have the same area, exactly two of them are isosceles, and exactly two are right-angled triangles. Two of the triangles are shown. Which could be the third one?

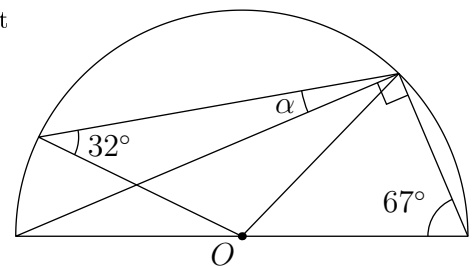


14. Number 2021 has a remainder of 5 when divided by 6, by 7, by 8, and by 9. How many positive integers, less than 2021, have this property?

- A) 4 B) 3 C) 2 D) 1 E) 0

15. The figure shows a semicircle with center  $O$ . Two of the angles are given. What is the size, in degrees, of the angle  $\alpha$ ?

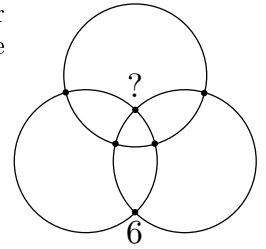
- A)  $9^\circ$  B)  $11^\circ$  C)  $16^\circ$  D)  $17.5^\circ$  E)  $18^\circ$



16. In a team competition, there are five teams waiting to start. Each team consists of either only boys or only girls. The number of team members are 9, 15, 17, 19 and 21. After all members of the first team have started, the number of girls not started yet is three times the number of boys not started yet. How many members are on the team that has already started?

- A) 9 B) 15 C) 17 D) 19 E) 21

17. The numbers from 1 to 6 are placed at the six intersections of three rings. The position of number 6 is shown. The sums of the numbers on each ring are the same. What number is placed at the intersection with the question mark?  
 A) 1 B) 2 C) 3 D) 4 E) 5

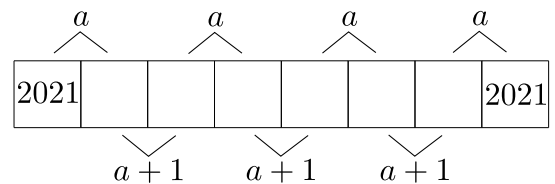


18. A  $3 \times 3$  square initially has the number 0 in each of its cells. In one step all four numbers in any  $2 \times 2$  subsquare (i.e. in any four cells sharing a vertex) are then increased by 1. This operation is repeated several times to obtain the arrangement on the right. Unfortunately some numbers in this arrangement are hidden. What number is in the square with the question mark?  
 A) 14 B) 15 C) 16 D) 17 E) 19

■	18	■
■	47	■
13	■	?

19. Ahmad walks up 8 steps going up either 1 or 2 steps at a time. There is a hole on the 6th step, so he cannot use this step. In how many different ways can Ahmad reach the top step?  
 A) 6 B) 7 C) 8 D) 9 E) 10

20. There are eight boxes in the strip shown. Numbers in adjacent boxes have sum  $a$  or  $a + 1$  as shown. The numbers in the first box and the eighth box are both 2021. What is the value of  $a$ ?  
 A) 4041 B) 4042 C) 4043 D) 4044 E) 4045

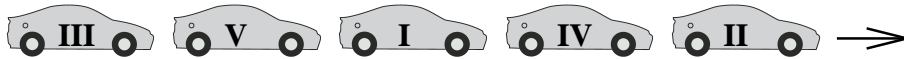


**Questions for 5 points**

21. Five cars participated in a race, starting in the order shown:



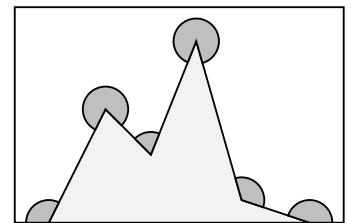
Whenever a car overtook another car, a point was awarded. The cars reached the finish line in the following order:



What is the smallest number of points in total that could have been awarded?

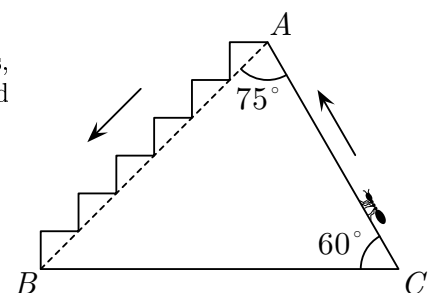
- A) 10 B) 9 C) 8 D) 7 E) 6
22. The numbers  $a$ ,  $b$  and  $c$  satisfy  $a + b + c = 0$  and  $abc = 78$ . What is the value of  $(a + b)(b + c)(c + a)$ ?  
 A)  $-156$  B)  $-39$  C) 78 D) 156 E) None of the previous

23. What is the sum of the six marked angles in the picture?  
 A)  $360^\circ$  B)  $900^\circ$  C)  $1080^\circ$  D)  $1120^\circ$  E)  $1440^\circ$



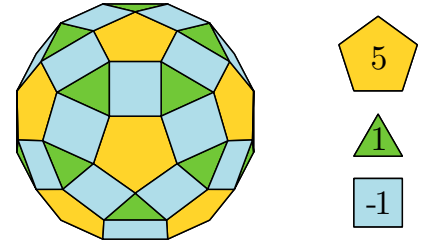
24. Let  $N$  be the smallest positive integer whose sum of its digits is 2021. What is the sum of the digits of  $N + 2021$ ?  
 A) 10 B) 12 C) 19 D) 28 E) 2026

25. An ant climbs from  $C$  to  $A$  on path  $CA$  and descends from  $A$  to  $B$  on the stairs, as shown in the diagram. What is the ratio of the lengths of the descending and ascending paths?  
 A) 1 B) 2 C) 3 D)  $\sqrt{2}$  E)  $\sqrt{3}$



26. Each of the numbers  $a$  and  $b$  is a square of an integer. The difference  $a - b$  is a prime number. Which of the following could be neither  $a$  nor  $b$ ?  
 A) 144 B) 400 C) 625 D) 729 E) 2500

27. The solid shown in the diagram has 12 regular pentagonal faces, the other faces being either equilateral triangles or squares. Each pentagonal face is surrounded by 5 square faces and each triangular face is surrounded by 3 square faces. John writes 1 on each triangular face, 5 on each pentagonal face and  $-1$  on each square. What is the total of the numbers written on the solid?  
 A) 20   B) 50   C) 60   D) 80   E) 120



28. How many five-digit positive integers have the product of their digits equal to 1000?  
 A) 10   B) 20   C) 30   D) 40   E) 60
29. Christina has eight coins whose weights in grams are different positive integers. When Christina puts any two coins on one side of a balance scales and any two on the other side of the balance scales, the side containing the heaviest of the four coins is always the heavier side. What is the smallest possible weight of the heaviest coin?  
 A) 8   B) 12   C) 34   D) 128   E) 256
30. 2021 balls are arranged in a row and are numbered from 1 to 2021. Each ball is coloured in one of four colours: green, red, yellow or blue. Among any five consecutive balls there is exactly one red, one yellow and one blue ball. The next ball after a red ball is always yellow. The balls numbered 2, 20 and 202 are green. What colour is the ball numbered 2021?  
 A) Green   B) Red   C) Yellow   D) Blue   E) It is impossible to determine