Canguro Matemático Costarricense

Cadet Test
Eighth grade

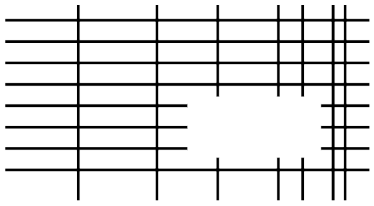
Name of the student:_____

Name of the institution:_____

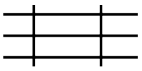
Kangourou Sans Frontières
Costa Rica 2023

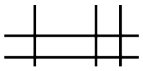
3 points

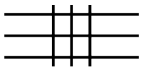
1. The diagram shows a set of horizontal and vertical lines with one part removed.

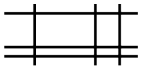


Which of the following could be the missing part?

(**A**) 

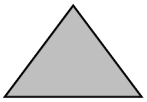
(**B**) 

(**C**) 

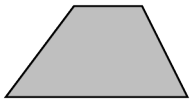
(**D**) 

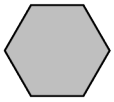
(**E**) 

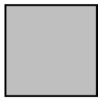
2. Which of the shapes below cannot be divided into two trapezia by a single straight line?

(**A**) triangle 

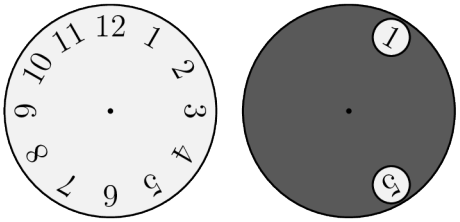
(**B**) rectangle 

(**C**) trapezium 

(**D**) regular hexagon 

(**E**) square 

3. A grey circle with two holes in it is placed on top of a clock-face, as shown.

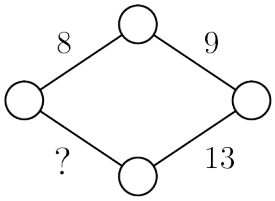


The grey circle is turned around its centre such that an 8 appears in one hole. Which two numbers could be seen in the other hole?

(**A**) 4 or 12 (**B**) 1 or 5 (**C**) 1 or 4

(**D**) 7 or 11 (**E**) 5 or 12

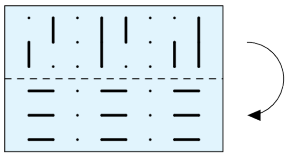
4. Werner wants to write a number at each vertex and on each edge of the rhombus shown.



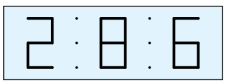
He wants the sum of the numbers at the two vertices at the ends of each edge to be equal to the number written on the edge. What number will he write instead of the question mark?

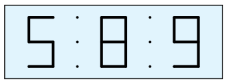
(**A**) 11 (**B**) 12 (**C**) 13 (**D**) 14 (**E**) 15

5. Kristina has a piece of transparent paper with some lines marked on it.



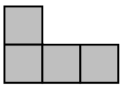
She folds it along the dashed line. What can she now see?

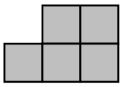
(**A**)  (**B**)  (**C**)  (**D**) 

(**E**) 

6. A tiler wants to tile a floor of dimensions 4 m × 6 m using identical tiles. No overlaps or gaps are allowed.

Which of the following tiles could not be used?

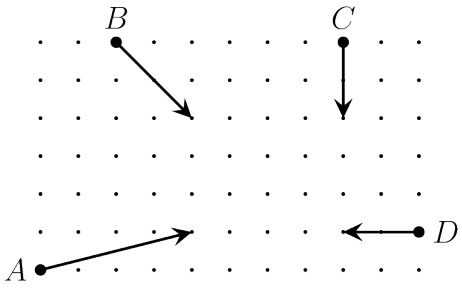
(**A**)  (**B**)  (**C**) 

(**D**)  (**E**) 

7. John has 150 coins. When he throws them on the table, 40% of them show heads and 60% of them show tails. How many coins showing tails does he need to turn over to have the same number show heads as show tails?

(**A**) 10 (**B**) 15 (**C**) 20 (**D**) 25 (**E**) 30

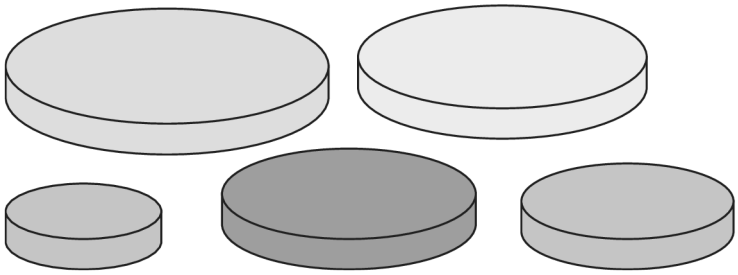
8. The diagram shows the initial position, the direction of travel and how far four bumper cars move in five seconds.



Which two cars will collide?

(**A**) A and B (**B**) A and C (**C**) A and D (**D**) B and C (**E**) C and D

9. Anna has five circular discs, each of a different size. She decides to build a tower using three of her discs so that each disc in her tower is smaller than the disc below it.



How many different towers could Anna construct?

(**A**) 5 (**B**) 6 (**C**) 8 (**D**) 10 (**E**) 15

10. Evita wants to write the numbers 1 to 8 in the boxes of the grid shown, so that the sums of the numbers in the boxes in each row are equal and the sums of the numbers in the boxes in each column are equal. She has already written numbers 3, 4 and 8, as shown.

	4		
3		8	

What number will she write in the shaded box?

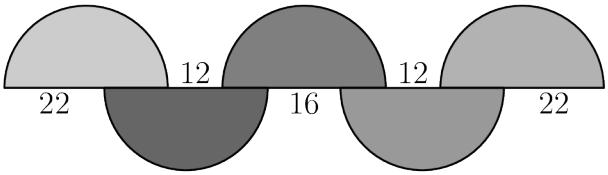
(**A**) 1 (**B**) 2 (**C**) 5 (**D**) 6 (**E**) 7

4 points

11. Theodorika wrote down three consecutive whole numbers in order, but instead of digits she used symbols so wrote □◊◊, ♡△△, ♡△□.
What would she write next?

(**A**) ♡♡◊ (**B**) □♡□ (**C**) ♡△◊ (**D**) ♡◊□ (**E**) ♡△♡.

12. The diagram shows five equal semicircles and the lengths of some line segments.



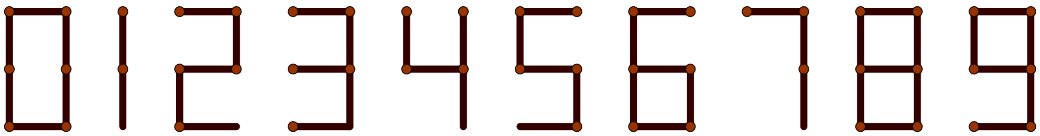
What is the radius of the semicircles?

(**A**) 12 (**B**) 16 (**C**) 18 (**D**) 22 (**E**) 36

13. Some edges of a cube are to be coloured red so that every face of the cube has at least one red edge. What is the smallest possible number of edges that could be coloured red?

(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

14. Matchsticks can be used to write digits, as shown in the diagram.



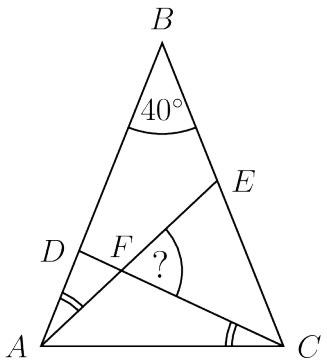
How many different positive integers can be written using exactly six matchsticks in this way?

(**A**) 2 (**B**) 4 (**C**) 6 (**D**) 8 (**E**) 9

15. The edges of a square are 1 cm long. How many points on the plane are exactly 1 cm away from two of the vertices of this square?

(**A**) 4 (**B**) 6 (**C**) 8 (**D**) 10 (**E**) 12

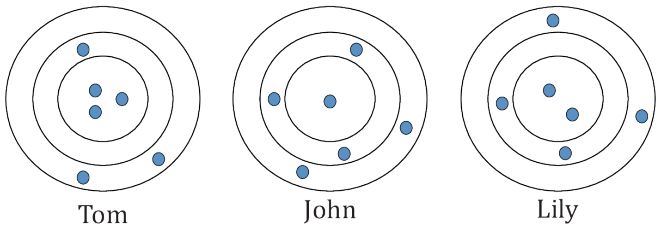
16. Triangle ABC is isosceles with $\angle ABC = 40°$. The two marked angles, $\angle EAB$ and $\angle DCA$, are equal.



What is the size of the angle $\angle CFE$?

(**A**) 55° (**B**) 60° (**C**) 65° (**D**) 70° (**E**) 75°

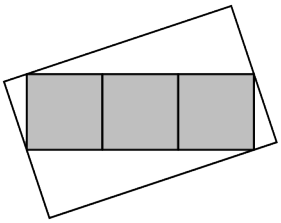
17. Tom, John and Lily each shot six arrows at a target. Arrows hitting anywhere within the same ring score the same number of points. Tom scored 46 points and John scored 34 points, as shown.



How many points did Lily score?

(**A**) 37 (**B**) 38 (**C**) 39 (**D**) 40 (**E**) 41

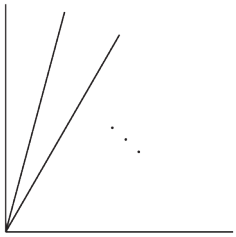
18. The diagram shows a rectangle made from three grey squares, each of area 25 cm^2, inside a larger white rectangle. Two of the vertices of the grey rectangle touch the mid-points of the shorter sides of the white rectangle and the other two vertices of the grey rectangle touch the other two sides of the white rectangle.



What is the area, in cm^2, of the white rectangle?

(**A**) 125 (**B**) 136 (**C**) 149 (**D**) 150 (**E**) 172

19. Angel has drawn a right angle. He wants to draw some straight lines coming off the vertex of the 90 grain angle, as shown, so that for any of the values 10°, 20°, 30°, 40°, 50°, 60°, 70° and 80° you can choose a pair of lines with the angle between them equal to that value.



What is the smallest number of lines that should be drawn?

(**A**) 2 (**B**) 3 (**C**) 4
(**D**) 5 (**E**) 6

20. The sum of 2023 consecutive integers is 2023. What is the sum of digits of the largest of these integers?

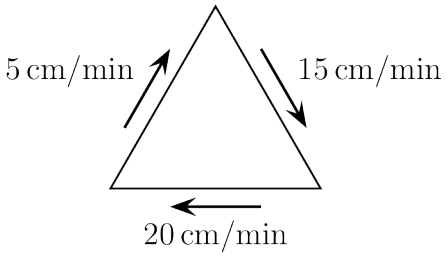
(**A**) 4 (**B**) 5 (**C**) 6 (**D**) 7 (**E**) 8

5 points

21. Some beavers and some kangaroos are standing in a circle. There are three beavers in total and there are no two beavers who are standing next to another beaver. There are exactly three kangaroos who are standing next to another kangaroo. What is the largest possible amount of kangaroos in the circle?

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

22. An ant is walking along the sides of an equilateral triangle. The speeds at which it travels along the three sides are 5 cm/min, 15 cm/min and 20 cm/min, as shown.



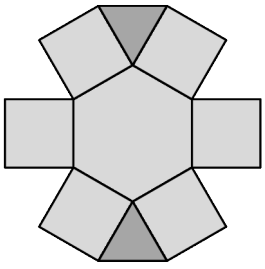
What is the average speed, in cm/min, at which the ant walks the whole perimeter of the triangle?

(**A**) 10 (**B**) $\frac{80}{11}$ (**C**) $\frac{180}{19}$ (**D**) 15 (**E**) $\frac{40}{3}$

23. Snow White organised a chess competition for the seven dwarves, in which each dwarf played one game with every other dwarf. On Monday, Grumpy played 1 game, Sneezy played 2, Sleepy 3, Bashful 4, Happy 5 and Doc played 6 games. How many games did Dopey play on Monday?

(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5

24. Elizabetta wants to write the numbers 1 to 9 in the regions of the shape shown so that the product of the numbers in any two adjacent regions is not more than 15. Two regions are said to be adjacent if they have a common edge.



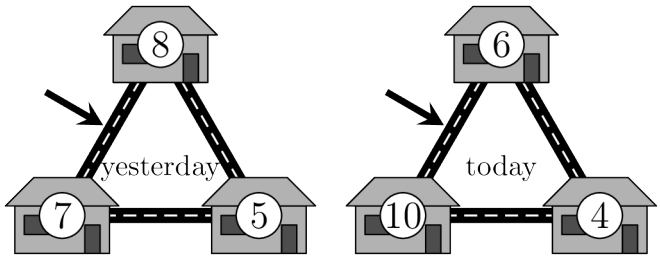
In how many ways can she do this?

(**A**) 12 (**B**) 8 (**C**) 32 (**D**) 24 (**E**) 16

25. Martin is standing in a queue. The number of people in the queue is a multiple of 3. He notices that he has as many people in front of him as behind him. He sees two friends, both standing behind him in the queue, one in 19th place and the other in 28th place. In which position in the queue is Martin?

(**A**) 14 (**B**) 15 (**C**) 16 (**D**) 17 (**E**) 18

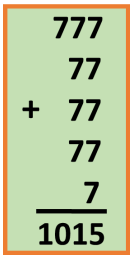
26. Some mice live in three neighbouring houses. Last night, every mouse left its house and moved to one or the other of the other two houses, always taking the shortest route. The numbers in the diagram show the number of mice per house, yesterday and today.



How many mice used the path shown by the arrow?

(**A**) 9 (**B**) 11 (**C**) 12 (**D**) 16 (**E**) 19

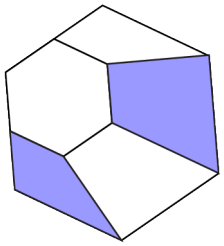
27. Bart wrote the number 1015 as a sum of numbers using only the digit 7. He used a 7 a total of 10 times, as shown. Now he wants to write the number 2023 as a sum of numbers using only the digit 7, using a 7 a total of 19 times.



How many times will he use the number 77?

(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

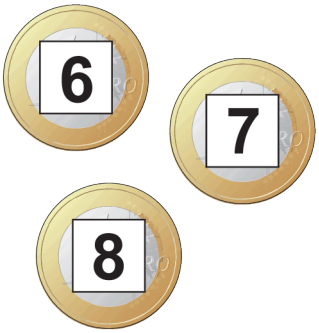
28. A regular hexagon is divided in four quadrilaterals and one smaller regular hexagon. The area of the shaded region and the area of the small hexagon are in the ratio $\frac{4}{3}$.



What is the ratio $\frac{\text{area small hexagon}}{\text{area big hexagon}}$?

(**A**) $\frac{3}{11}$ (**B**) $\frac{1}{3}$ (**C**) $\frac{2}{3}$ (**D**) $\frac{3}{4}$ (**E**) $\frac{3}{5}$

29. Jake wrote six consecutive numbers onto six white pieces of paper, one number on each piece. He stuck these bits of paper onto the top and bottom of three coins. Then he tossed these three coins three times. On the first toss, he saw the numbers 6, 7 and 8, as shown, and then coloured them red. On the second toss, the sum of the numbers he saw was 23 and on the third toss the sum was 17.



What was the sum of the numbers on the remaining three white pieces of paper?

(**A**) 18 (**B**) 19 (**C**) 23 (**D**) 24 (**E**) 30

30. A rugby team scored 24 points, 17 points and 25 points in the seventh, eighth and ninth games of the 2022 season. Their average points-per-game was higher after 9 games than it was after their first 6 games. Their average after 10 games was more than 22. What is the smallest number of points that they could have scored in their 10th game?

(**A**) 22 (**B**) 23 (**C**) 24 (**D**) 25 (**E**) 26

Name:_____

Institution:_____

01.	A	B	C	D	E
02.	A	B	C	D	E
03.	A	B	C	D	E
04.	A	B	C	D	E
05.	A	B	C	D	E
06.	A	B	C	D	E
07.	A	B	C	D	E
08.	A	B	C	D	E
09.	A	B	C	D	E
10.	A	B	C	D	E
11.	A	B	C	D	E
12.	A	B	C	D	E
13.	A	B	C	D	E
14.	A	B	C	D	E
15.	A	B	C	D	E

16.	A	B	C	D	E
17.	A	B	C	D	E
18.	A	B	C	D	E
19.	A	B	C	D	E
20.	A	B	C	D	E
21.	A	B	C	D	E
22.	A	B	C	D	E
23.	A	B	C	D	E
24.	A	B	C	D	E
25.	A	B	C	D	E
26.	A	B	C	D	E
27.	A	B	C	D	E
28.	A	B	C	D	E
29.	A	B	C	D	E
30.	A	B	C	D	E

Costa Rica