Canguro Matemático Costarricense

Junior Test
Tenth and eleventh grade

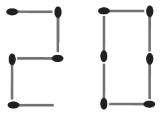
Name of the student:_____

Name of the institution:_____

Kangourou Sans Frontières
Costa Rica 2022

3 points

1. Carola is forming the four-digit number 2022 using some matches from a box. The box originally contained 30 matches. She has already started and formed the first two digits, as shown in the diagram.



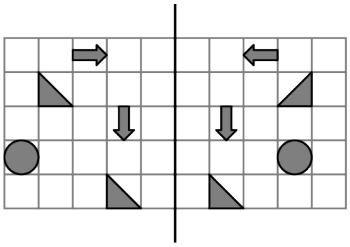
How many matches will remain in the box when she has finished forming 2022?

(**A**) 20 (**B**) 19 (**C**) 10 (**D**) 9 (**E**) 5

2. An equilateral triangle of side 12 has the same perimeter as a square of side x. What is the value of x?

(**A**) 9 (**B**) 12 (**C**) 16 (**D**) 24 (**E**) 36

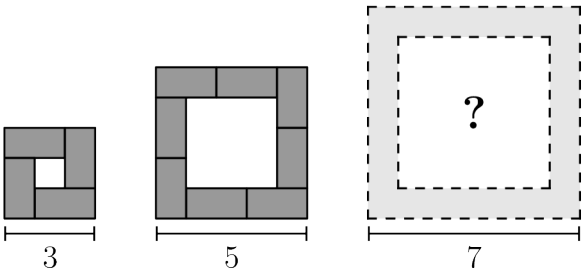
3. Some shapes are drawn on a piece of paper. The teacher folded the left-hand side of the paper over the thick line.



How many of the shapes on the left-hand side will fit exactly on top of a shape on the right-hand side?

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

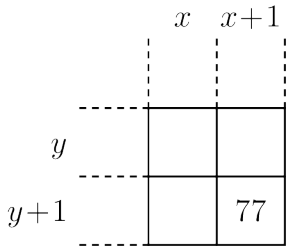
4. Katrin arranges tables of size 2×1  according to the number of participants in a meeting.



The diagrams show a top view of the tables for a small, a medium and a large meeting. How many tables are used for the large meeting?

(**A**) 10 (**B**) 11 (**C**) 12 (**D**) 14 (**E**) 16

5. A square of numbers is taken out from a multiplication table. Only one number is visible. The integers x and y are both positive and x is greater than y.



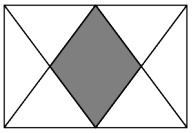
What is the value of x?

(**A**) 6 (**B**) 7 (**C**) 8
(**D**) 10 (**E**) 11

6. I am less than my half and greater than my double. The sum of me and my square is zero. Who am I?

(**A**) -2 (**B**) -1 (**C**) 0 (**D**) 1
(**E**) 2

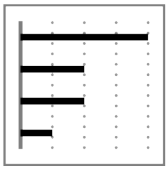
7. In the rectangle shown, the midpoints of the two longer sides are joined to all four vertices.



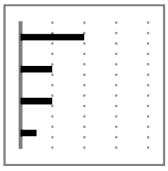
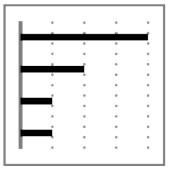
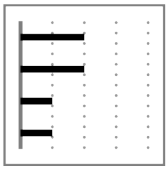
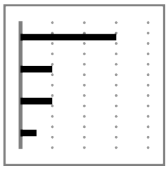
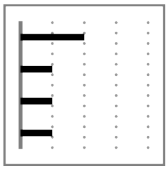
What fraction of the rectangle is shaded?

(**A**) $\frac{1}{5}$ (**B**) $\frac{1}{4}$ (**C**) $\frac{2}{7}$ (**D**) $\frac{1}{3}$ (**E**) $\frac{2}{5}$

8. On Nadya's smartphone, this diagram shows how much time she spent last week on each of her apps.



This week she halved the time spent on two of these apps, but spent the same amount of time on the other two apps. Which of the following could be the diagram for this week?

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

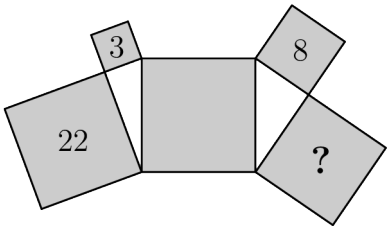
9. There are five candidates in the school election. After 90% of the votes had been counted, the preliminary results were as follows:

Alex	Bella	Calvin	Diane	Eddy
14	11	10	8	2

How many students still have a chance of winning the election?

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

10. Five squares and two right-angled triangles are arranged as shown.

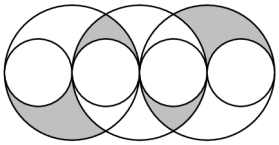


The numbers 3, 8 and 22 inside three of the squares indicate their areas in square metres. What is the area of the square containing the question mark?

(**A**) 14m^2 (**B**) 15m^2 (**C**) 16m^2 (**D**) 17m^2 (**E**) 18m^2

4 points

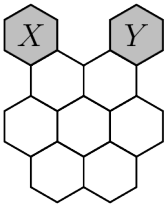
11. The diagram shows three large circles of equal radius and four small circles of equal radius where the centers of all circles and all points of contact lie on one straight line. The radius of each small circle is 1.



What is the shaded area?

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

12. Apini moves from hexagon X to hexagon Y. She can only move from one hexagon to another if they have an edge in common.



How many different routes are there from X to Y that pass through each of the seven white hexagons exactly once?

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

13. I once met six siblings whose ages were six consecutive whole numbers. I asked each of them the question: "How old is your oldest sibling?" Which of the following could **not** be the sum of their six answers?

(**A**) 95 (**B**) 125 (**C**) 167 (**D**) 205 (**E**) 233

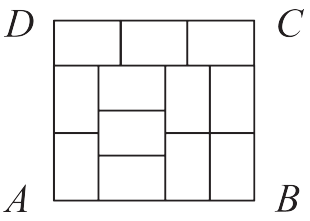
14. Eva puts 2022 tiles in a long line. Then Adam removes every sixth tile. Next Beata removes every fifth tile from those that remain. Then Calle removes every forth tile. Finally, Doris removes all the remaining tiles. How many tiles does Doris remove?

(**A**) 0 (**B**) 337 (**C**) 674 (**D**) 1011 (**E**) 1348

15. A painter wanted to mix 2 litres of blue paint with 3 litres of yellow paint to make 5 litres of green paint. However, by mistake he used 3 litres of blue and 2 litres of yellow so that he made the wrong shade of green. What is the smallest amount of this green paint that he must throw away so that, using the rest of his green paint and some extra blue and/or yellow paint, he could make 5 litres of paint of the correct shade of green?

(**A**) $\frac{5}{3}$ litres (**B**) $\frac{3}{2}$ litres (**C**) $\frac{2}{3}$ litres (**D**) $\frac{3}{5}$ litres (**E**) $\frac{5}{9}$ litres

16. The diagram shows a large rectangle $ABCD$ divided into 12 identical small rectangles.



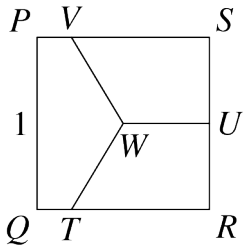
What is the ratio AD/DC?

(**A**) 8/9 (**B**) 5/6 (**C**) 7/8
(**D**) 2/3 (**E**) 9/8

17. A rabbit and a hedgehog had a race around a 550 m long circular track. Both ran at constant speeds. The rabbit's speed was 10 m/s, and the hedgehog's speed was 1 m/s. They started at the same time. However, the hedgehog ran in the opposite direction to the rabbit. When they met, the hedgehog immediately turned round and ran after the rabbit. How long after the rabbit did the hedgehog reach the finish?

(**A**) 45 sec (**B**) 50 sec (**C**) 55 sec (**D**) 100 sec (**E**) 505 sec

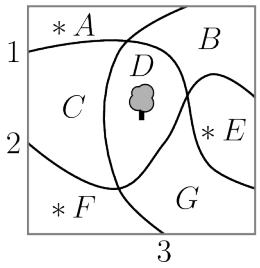
18. The diagram shows square $PQRS$ of side-length 1. The midpoint of RS is marked U and the centre of the square is marked W.
Line segments TW, UW and VW split the square into three regions of equal area.



What is the length of SV?

(**A**) $\frac{1}{2}$ (**B**) $\frac{2}{3}$ (**C**) $\frac{3}{4}$ (**D**) $\frac{4}{5}$ (**E**) $\frac{5}{6}$

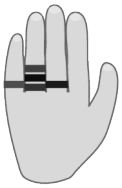
19. There are three paths through our city park. A tree is planted in the middle of the park, as shown.



What is the smallest number of trees that need to be planted so that there are the same number of trees on both sides of each of the paths?

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

20. Veronica has five rings on her fingers, as shown in the diagram.

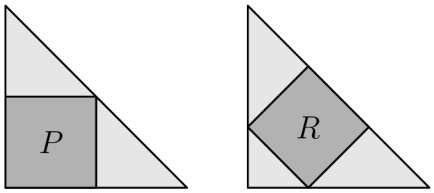


She takes them off one at a time. In how many different ways can she do this?

(**A**) 16 (**B**) 20 (**C**) 24 (**D**) 30 (**E**) 45

5 points

21. Two congruent isosceles right-angled triangles each have a square inscribed, as shown in the diagram. The square marked P has an area of 45.



What is the area of the square marked R?

(**A**) 35 (**B**) 40 (**C**) 45 (**D**) 50 (**E**) 60

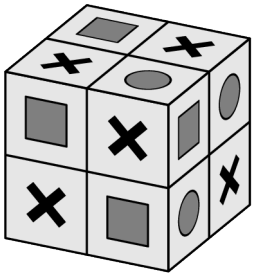
22. Eight teams participate in a football tournament. Each team plays against each other team exactly once. In each match, the winner gets 3 points and the loser does not get any points. If a match is drawn, each team gets 1 point. At the end of the tournament the total number of points obtained by all the teams is 61. What is the largest number of points that the champion team could have obtained?

(**A**) 21 (**B**) 19 (**C**) 18 (**D**) 17 (**E**) 16

23. A group of pirates divided 200 gold coins and 600 silver coins between them. Each officer received 5 gold and 10 silver coins. Each sailor received 3 gold and 8 silver coins. Each cabin boy received 1 gold and 6 silver coins. How many pirates are there in the group?

(**A**) 50 (**B**) 60 (**C**) 72 (**D**) 80 (**E**) 90

24. The squares on the surface of a $2 \times 2 \times 2$ cube have one of three shapes on them. The shapes are either a circle or a square or an X sign. Any two squares that share a common side have different shapes on them. The picture shows one such possibility.



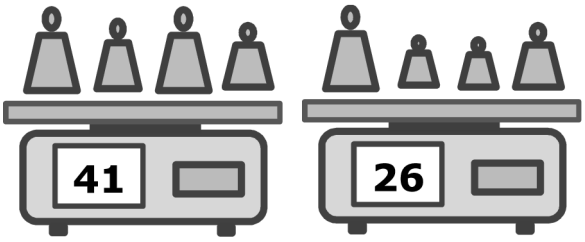
Which of the following combinations of shapes is also possible on such a cube?

(**A**) 6 circles, 8 squares and the rest are X's
(**B**) 7 circles, 8 squares and the rest are X's
(**C**) 5 circles, 8 squares and the rest are X's
(**D**) 7 circles, 7 squares and the rest are X's
(**E**) none of the previous

25. The inhabitants of a city always speak by means of questions. There are two types of inhabitants: the "positives", who always ask questions for which the answer is "yes" and the "negatives" who always ask questions for which the answer is "no". I met Albert and Berta and Berta asked me "Are Albert and I both negative?". What type of inhabitants are Albert and Berta?

(**A**) Both are positives
(**B**) Both are negatives
(**C**) Albert positive, Berta negative
(**D**) Albert negative, Berta positive
(**E**) There are not enough information to decide.

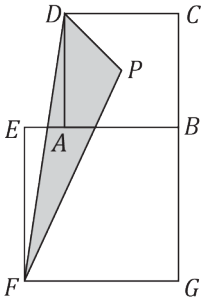
26. A grocer has twelve different integer weights from 1 kg to 12 kg. She splits them into three groups of four weights each. The total weight of the first group is 41 kg and of the second is 26 kg.



Which of the following weights is in the same group as the weight of 9 kg?

(**A**) 3 kg (**B**) 5 kg (**C**) 7 kg (**D**) 8 kg (**E**) 10 kg

27. The lengths of the diagonals of the squares $ABCD$ and $EFGB$ are 7 cm and 10 cm respectively. The point P is the intersection of the diagonals of the square $ABCD$.



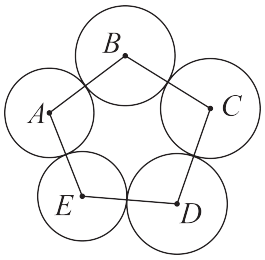
What is the area of the triangle FPD?

(**A**) 14.5 cm^2
(**B**) 15 cm^2
(**C**) 15.75 cm^2
(**D**) 16.5 cm^2
(**E**) 17.5 cm^2

28. The positive integer N is such that the product of its digits is 20. Which of the following could not be the product of the digits of $N + 1$?

(**A**) 40 (**B**) 30 (**C**) 25 (**D**) 35 (**E**) 24

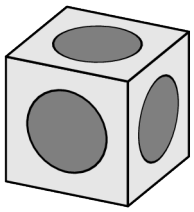
29. Five circles with centres A, B, C, D and E are arranged as shown in the diagram. Line segments are drawn to join the centres of adjacent circles. It is known that $AB = 16$ cm, $BC = 14$ cm, $CD = 17$ cm, $DE = 13$ cm, $AE = 14$ cm.



Which point is the centre of the circle with the largest radius?

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

30. A hole in the shape of a hemisphere is carved into each face of a cube. The holes are identical and centered at the centre of each face. The holes touch their neighbours at only one point. The cube has side 2.



What is the diameter of each hole?

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

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