

# Canguro Matemático



## Junior Problems Ninth grade

Name: \_\_\_\_\_

Institution: \_\_\_\_\_ Grade: \_\_\_\_\_

Kangourou Sans Frontières

Costa Rica 2019

3 points

1.  $20 \times 19 + 20 + 19 =$

- (A) 389                      (B) 399                      (C) 409                      (D) 419                      (E) 429

2. A model train takes exactly 1 minute and 11 seconds for each round on a course. How long does it take for six rounds?

- (A) 6 minutes 56 seconds                      (B) 7 minutes 6 seconds                      (C) 7 minutes 16 seconds  
(D) 7 minutes 26 seconds                      (E) 7 minutes 36 seconds

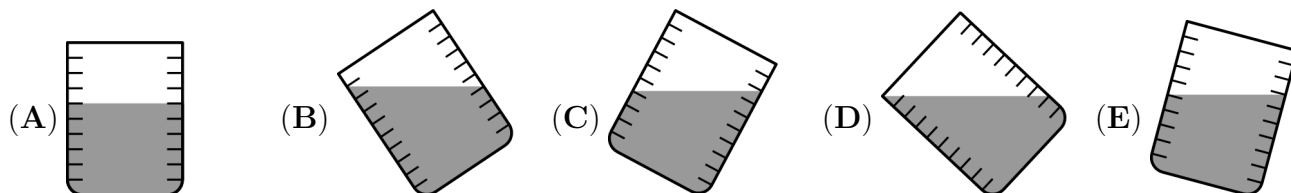
3. A barber wants to write the word SHAVE on a board in such a way that a client looking in to the mirror reads the word correctly. How should the barber write it on the board?

- (A) **SHAVE**                      (B) **SHAVE**                      (C) **EVAHS**  
(D) **EVAHS**                      (E) **SHAVE**

4. How many different sums of dots can you get by rolling three standard dice simultaneously?

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

5. Five identical glasses are filled with water. Four of them contain the same amount of water. Which one contains a different amount?



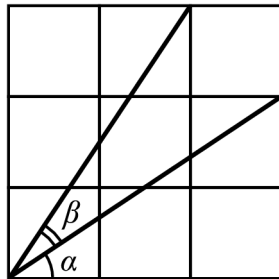
6. A park has five gates. Monica wants to enter through one gate and to exit through a different one. In how many ways can she enter and exit the park?

- (A) 25                      (B) 20                      (C) 16                      (D) 15                      (E) 10

7. The weight of each of three kangaroos is a different whole number. The total weight of them is 97 kg. How much can the lightest of them weigh at most?

- (A) 1 kg                      (B) 30 kg                      (C) 31 kg                      (D) 32 kg                      (E) 33 kg

8. Which of the following statements is true for the marked angles in the given figure of nine identical squares?

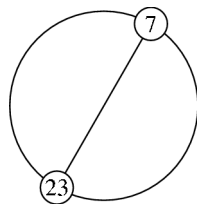


- (A)  $\alpha = \beta$       (B)  $2\alpha + \beta = 90^\circ$       (C)  $\alpha + \beta = 60^\circ$       (D)  $2\beta + \alpha = 90^\circ$       (E)  $\alpha + \beta = 45^\circ$

9. Jane is playing basketball. After a series of 20 shots, Jane had scored 55% of the time. Five shots later, her scoring rate had increased to 56%. On how many of the last five shots did she score?

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

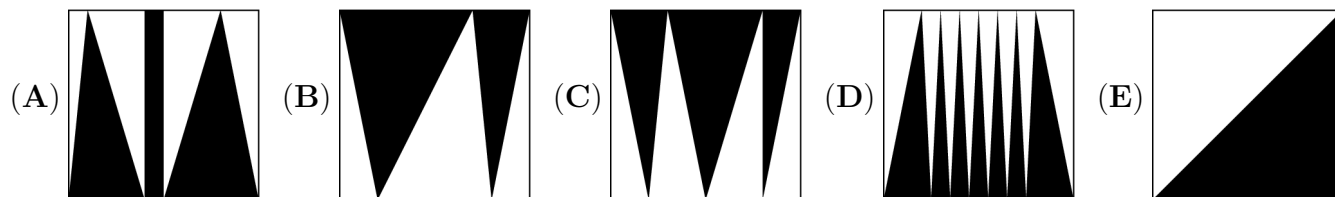
10. The integers from 1 to  $n$ , inclusive, are equally spaced in order round a circle. The diameter through the position of the integer 7 also goes through the position of 23, as shown. What is the value of  $n$ ?



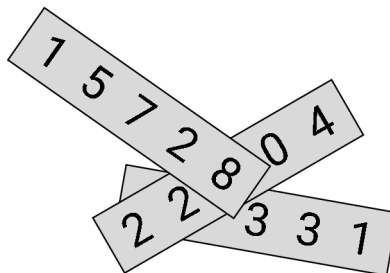
- (A) 30      (B) 32      (C) 34      (D) 36      (E) 38

4 points

11. Inside each unit square a certain part has been shaded. In which square is the total shaded area the largest?



12. On each of three pieces of paper a five digit number is written as shown. Three of the digits are covered. The sum of the three numbers is 57263. Which are the covered digits?



- (A) 0, 2 and 2      (B) 1, 2 and 9      (C) 2, 4 and 9      (D) 2, 7 and 8      (E) 5, 7 and 8

13. A square has vertices  $A, B, C, D$  labelled clockwise. An equilateral triangle is constructed with labels  $A, E, C$  labelled clockwise. What is the size of angle  $CBE$  in degrees?

- (A) 30      (B) 45      (C) 135      (D) 145      (E) 150


14. The numbers  $a, b, c, d$  are distinct positive integers chosen from 1 to 10. What is the least possible value  $\frac{a}{b} + \frac{c}{d}$  could have?

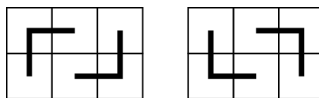
- (A)  $\frac{2}{10}$       (B)  $\frac{3}{19}$       (C)  $\frac{14}{45}$       (D)  $\frac{29}{90}$       (E)  $\frac{25}{72}$

15. The flag of Kanguria is a rectangle with side lengths in the ratio 3 : 5. The flag is divided into four rectangles of equal area as shown. What is the ratio of the side lengths of the white rectangle?

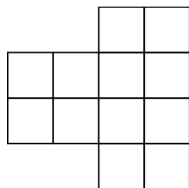


- (A) 1 : 3      (B) 1 : 4      (C) 2 : 7      (D) 3 : 10      (E) 4 : 15

16. A  $3 \times 2$  rectangle can be exactly covered by two of the L-shape figures  in two different ways as shown:



In how many different ways can the figure below be covered by the L-shape figures?

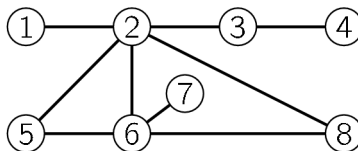


- (A) 1      (B) 2      (C) 3      (D) 4      (E) 48

**17.** Julio has two cylindrical candles with different heights and diameters. The first candle lasts 6 hours, while the second candle lasts 8 hours. He lit both candles at the same time and three hours later both candles were the same height. What was the ratio of their original heights?

- (A) 4 : 3                      (B) 8 : 5                      (C) 5 : 4                      (D) 3 : 5                      (E) 7 : 3

**18.** Peter painted each of the eight circles in the diagram either red, yellow or blue such that no two circles that are joined directly are painted the same colour. Which two circles are necessarily painted the same colour?



- (A) 5 and 8                      (B) 1 and 6                      (C) 2 and 7                      (D) 4 and 5                      (E) 3 and 6

**19.** Some three-player teams enter a chess tournament. Each player in a team plays exactly once against every player from all the other teams. For organisational reasons, no more than 250 games can be played in total. At most, how many teams can enter the tournament?

- (A) 11                      (B) 10                      (C) 9                      (D) 8                      (E) 7

**20.** A train is made up of 18 carriages. There are 700 passengers travelling on the train. In any block of five adjacent carriages, there are 199 passengers in total. How many passengers are in the middle two carriages of the train?

- (A) 70                      (B) 77                      (C) 78                      (D) 96                      (E) 103

5 points

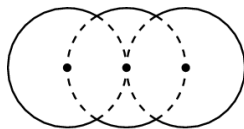
**21.** The triathlon consists of swimming, running, and biking. The biking is three-quarters of the total distance; the running is one-fifth; and the swimming is 2 km. What is the total distance of this triathlon, in km?

- (A) 10                      (B) 20                      (C) 38                      (D) 40                      (E) 60

**22.** Some diluted juice is to be made out of concentrate and water in the ratio 1 : 7 by volume. Juice concentrate is in a 1-litre flask, and the flask is half full. What fraction of this concentrate should be used to produce 2 litres of diluted juice?

- (A)  $\frac{1}{4}$                       (B)  $\frac{1}{2}$                       (C)  $\frac{2}{7}$                       (D)  $\frac{4}{7}$   
 (E) All of the concentrate.

23. The given shape is made of parts of three equal circles of radius  $R$  that have their centres on a straight line. The middle circle passes through the centres of the other two, as shown. What is the perimeter of the shape?



- (A)  $\frac{10\pi R}{3}$       (B)  $\frac{5\pi R}{3}$       (C)  $\frac{2\pi R\sqrt{3}}{3}$       (D)  $2\pi R\sqrt{3}$       (E)  $4\pi R$

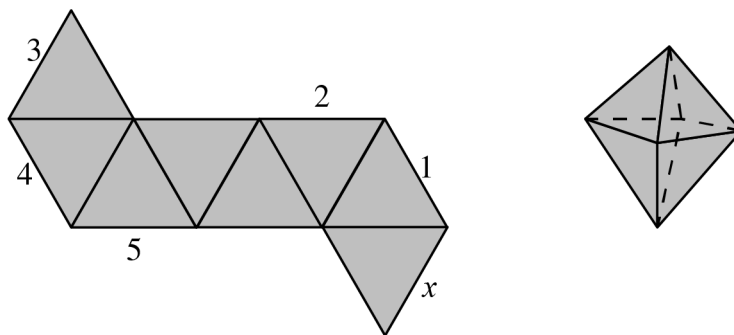
24. The seven digits of the telephone number  $\overline{aaabbbb}$  add up to the two digit number  $\overline{ab}$ . What is the sum  $a + b$ ?

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

25. 60 apples and 60 pears are packed into boxes so that each box contains the same number of apples, and no two boxes contain the same number of pears. What is the largest possible number of boxes that can be packed in this way?

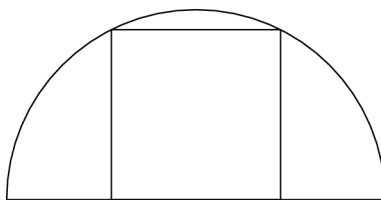
- (A) 20      (B) 15      (C) 12      (D) 10      (E) 6

26. The diagram shows a net of an octahedron. When this is folded to form the octahedron, which of the labelled line segments will coincide with the line segment marked with the  $x$ ?



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

27. A square has two of its vertices on a semicircle and the other two on the diameter of the semicircle as shown. The radius of the circle is 1 cm. What is the area of the square?

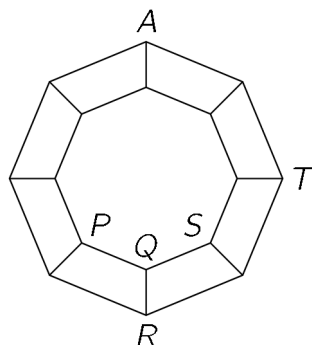


- (A)  $\frac{4}{5} \text{ cm}^2$       (B)  $\frac{\pi}{4} \text{ cm}^2$       (C)  $1 \text{ cm}^2$       (D)  $\frac{4}{3} \text{ cm}^2$       (E)  $\frac{2}{\sqrt{3}} \text{ cm}^2$

28. How many planes pass through exactly three vertices of a given cube?

- (A) 1                      (B) 2                      (C) 4                      (D) 8                      (E) 12

29. A graph consists of 16 vertices and some edges that connect them, as in the picture. An ant is now at the vertex labelled  $A$ . At each move, it can walk from one vertex to any neighbouring vertex crawling along a connecting edge. At which of the vertices labelled  $P$ ,  $Q$ ,  $R$ ,  $S$ ,  $T$  can the ant be after 2019 moves?



- (A) only  $P$ ,  $R$  or  $S$ , not  $Q$  and  $T$                       (B) only  $P$ ,  $R$ ,  $S$  or  $T$ , not  $Q$   
 (C) only  $Q$                       (D) only  $T$   
 (E) all of these are possible

30. When Ria and Flora compared their savings, they found that the ratio of their savings was 5 : 3. Then Ria bought a tablet for 160 Euro and the ratio of their savings changed to 3 : 5. How many Euro did Ria have before buying the tablet?

- (A) 192                      (B) 200                      (C) 250                      (D) 400                      (E) 420



## Answers

Name: \_\_\_\_\_

Institution: \_\_\_\_\_

Grade: \_\_\_\_\_

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