



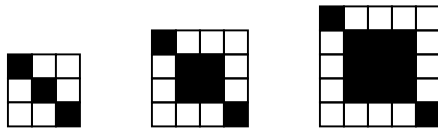
NACIONES UNIDAS SCHOOL IED
PREPARATORY WORKSHOP FOR COMPETENCIES TEST
SECOND TERM
MATH 11th



This workshop must be solved in the mathematics notebook, as a requirement to take the competency test.

Delivery date: July 16th, 2024

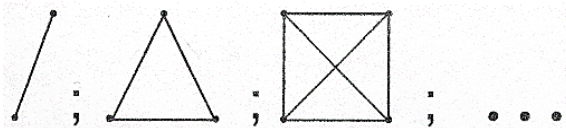
- A bacterial crop starts with a population of 2^3 bacteria. If the population doubles every hour, *how many bacteria will the culture have after 4 hours?*
- A company in charge of designing and selling tiling models launched its new line called "squares" on the market, which is characterized by its distribution of black and white square tiles forming different sizes and designs. The following graphs represent some of the models that the company has available.



... Size 3 Size 4 Size 5 ...

The patio of a client's house is size 11, from the previous design, how many tiles of each color should he buy?

- In the following drawing, each dot represents a person and each line segment a greeting. In this way, with two people there is one greeting, with three people, three greetings and so on.



When each person greets the others in two meetings, one of 7 and the other of 10 people, what number of greetings are presented in each meeting?

ANSWER THE QUESTIONS 4 TO 7 ACCORDING TO THE FOLLOWING INFORMATION

The owner of a recreational park plans to build three swimming pools and decorate their edges with white and blue tiles, as shown in figures 1, 2 and 3.



Children's pool
Figure 1



Recreation pool
Figure 2



Training pool
Figure 3

*Based on your observation of Figures 1, 2, and 3, write whether the statement is **TRUE OR FALSE**.*

- The number of blue tiles increases by six from one pool to the next size. _____
- The number of white tiles increases by eight as the size of the pools increases. _____
- The number of blue tiles is double the amount of white tiles in each pool. _____.
- The number of white tiles is one third of the amount of blue tiles. _____.

ANSWER THE QUESTIONS 8 TO 10 ACCORDING TO THE FOLLOWING INFORMATION

Annually in the "Las Ferias" neighborhood, an Intercollegiate basketball tournament is held in which each team plays only once against all the others. Scoring will be done as follows:

- Each team receives 2 points for the first game won.

- After the first match, every time you win, you double your accumulated score.
- If you lose or draw a match, you do not accumulate points.

8. What score does a team have that has won 5 games and lost two? Explain.

9. If in 2023, the champion team won all its games and had a score of 1,024 points, how many games did it win?

10. Find the general rule to determine how many games should be played in total if n teams participate.

11. In a theater in Bogotá they are going to do a remodeling in which they are going to change all the chairs. In the first row of the theater there are 25 chairs and in total there are 40 rows. Each row has one additional chair. To determine the number of new chairs that should go in each row, the n^{th} term must be found. Find the general formula of the situation.

12. In the following equation, p represents the number of individuals in a population that varies over time, and t represents the elapsed time in years:

$$p = 1,5(2^{t/4})$$

What is the number of individuals there are when 12 years have passed?

13. If a group of people hug each other (with each person, only once), the total number of hugs can be calculated using the following expression, where n is the number of people there are.

$$a = \frac{n(n-1)}{2}$$

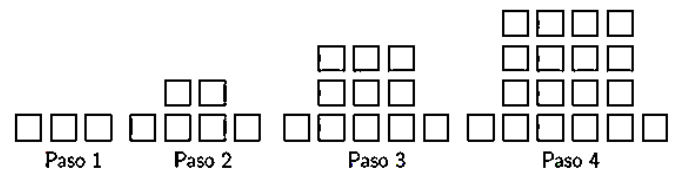
What is the value of a for a group of 8 people?

14. The coach of the swimming team at a university in Bogotá wants to increase the water resistance of his athletes. To do this, he proposes the routine found in the following table:

Day	1	2	3	4	5	... n
Training minutes	1	3	7	15	31	...

What is the general formula that allows determining the number of minutes that the swimming team should train on day n , maintaining the daily increase in training minutes, according to the routine recorded in the table?

15. Observe the following pattern:



If the pattern continues, what number of should be used in step 60? Explain.

16. Observe the following equalities:

$$\begin{aligned} 4 - 1 &= 3 \\ 16 - 1 &= 15 \\ 64 - 1 &= 63 \\ 256 - 1 &= 255 \dots \end{aligned}$$

What is the general formula of the previous equalities, which illustrate the fact that for every positive integer n , said expression is divisible by 3?

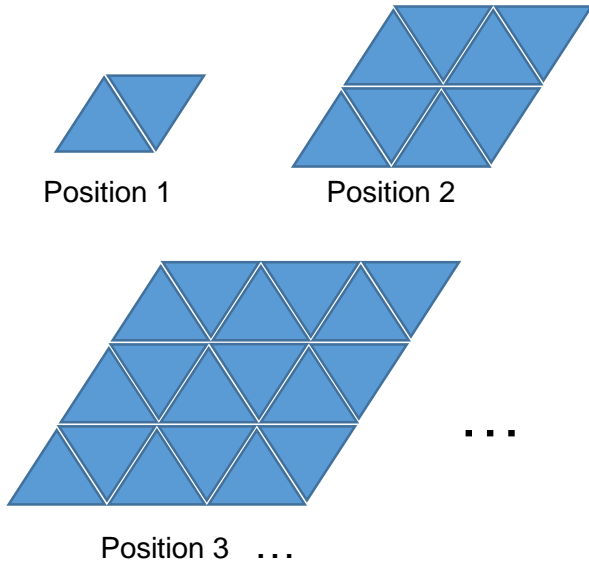
ANSWER THE QUESTIONS 17 TO 19 ACCORDING TO THE FOLLOWING INFORMATION

Observe the following sequence:

Row 1. $1 + 3 = 4$
 Row 2. $1 + 3 + 5 = 9$
 ...

Row 5. $1 + 3 + 5 + 7 + 9 + 11 = .?$

17. What is the largest addend in Row 4?
18. What is the result of the sum of the terms in row 12?
19. What is the general formula that allows us to determine the sum of the terms in Row n ?
20. With congruent equilateral triangles, the following sequence of parallelograms was constructed. For example, the parallelogram in position 1 has 2 congruent equilateral triangles.



How many congruent equilateral triangles does the parallelogram corresponding to position n have? (Find the general formula)

21. If the general term of a sequence is:

$$a_n = (-2)^{(n-1)}$$

What are the second and eighth terms?

22. The terms of a certain sequence are calculated with the following procedure:

Step 1: The first term of the sequence is $f(1) = 1$

Step 2: The term of position n is calculated using the term of the sequence $n-1$, by means of the formula:

$$f(n) = 1 + \frac{1}{f(n-1)}, \text{ For example:}$$

$$f(2) = 1 + \frac{1}{f(2-1)}$$

$$f(2) = 1 + \frac{1}{f(1)}$$

$$f(2) = 1 + \frac{1}{1} =$$

$$f(2) = 2$$

According to the previous procedure, what is the value for $f(4)$?

23. You can find rational numbers greater than an integer k , so that they are increasingly closer to him, calculated $k + \frac{1}{j}$ (with j positive integer). If the larger j , nearest k will be the rational constructed. **How many rational numbers can be constructed close to k that are less than $k + \frac{1}{11}$? Explain.**

24. Isabel wants to buy a car. At the dealership they offer three (3) different models with the following payment method: an initial payment and a certain number of monthly installments of the same value each, to complete the remaining value of the car. The table shows the models, the value of the installments and the number of installments.

Model	initial fee (\$)	monthly fee (\$)	Number monthly fee
J	3.000.000	500.000	36
K	5.000.000	2.000.000	12
L	10.000.000	1.000.000	24

Isabel decides to calculate the total value of each model and proposes the following operation:

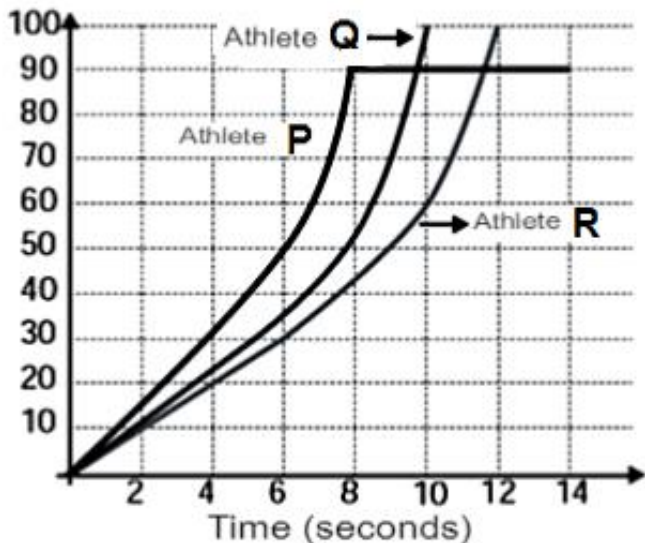
(Initial fee × number of monthly fee) + value of the monthly fee

Her brother, who accompanies her to the dealership, informs her that she is incorrectly using variables in her operation. Why?

25. Of a message that went viral on social networks, it is known that it was shared by one person to two others, who in turn, each shared it with two others, and then, each of these sent it to two more people, and so the chain continued successively. Design a graph in the Cartesian plane that models the situation in the first 3 or 4 moments in which the message is forwarded.

ANSWER THE QUESTIONS 26 TO 28 ACCORDING TO THE FOLLOWING INFORMATION

The graph represents the distance (in meters) traveled by athletes P, Q and R, as a function of the time (in seconds) spent by them during a 100-meter race



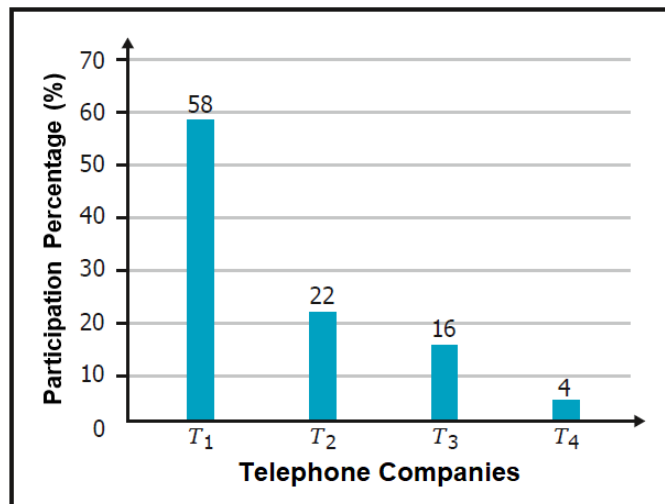
According to the graph, write whether the statement is TRUE or FALSE.

- 26. Athlete P traveled only 90 km. _____.
- 27. Athletes Q and R arrived at the same time. _____.
- 28. El primero en llegar a la meta fue el atleta Q. _____.

ANSWER THE QUESTIONS 29 AND 30 ACCORDING TO THE FOLLOWING INFORMATION

The graph shows the participation of four mobile phone companies in a country. Companies T1 and T2 are foreign, and companies T3 and T4 are

national. It is also known that there are approximately 50 million mobile phone users in that country.



- 29. According to the graph, what is the number of users that national mobile phone companies have?
- 30. To know the number of users that foreign mobile phone companies have, is it correct to carry out the following procedure? Explain your answer.

Step 1. Add the participation percentages of companies T1 and T2.

Step 2. Multiply the result from step 1 by the total number of mobile phone users in the country.

Step 3. Divide the result from step 2 by 100.