

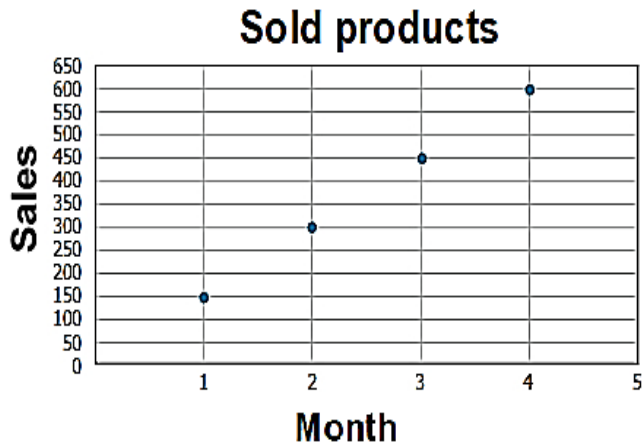


**UNITED NATIONS COLLEGE I.E.D.**  
**PREPARATORY WORKSHOP**  
**III TRIMESTER - 2024**  
**MATHEMATICS 9°**

This workshop must be copied and solved in the mathematics notebook, as a requirement to present the competency-based test.

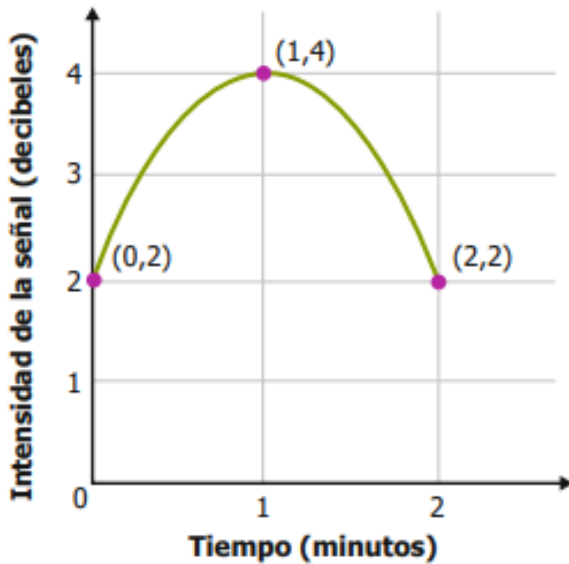
**DELIVERY DATE: November 12th**

1. The graph shows the sales in a supermarket of a product during the last four months.



Explain How have sales of the product performed over the last four months?

2. The graph shows the intensity of a signal, measured in decibels, for two minutes.

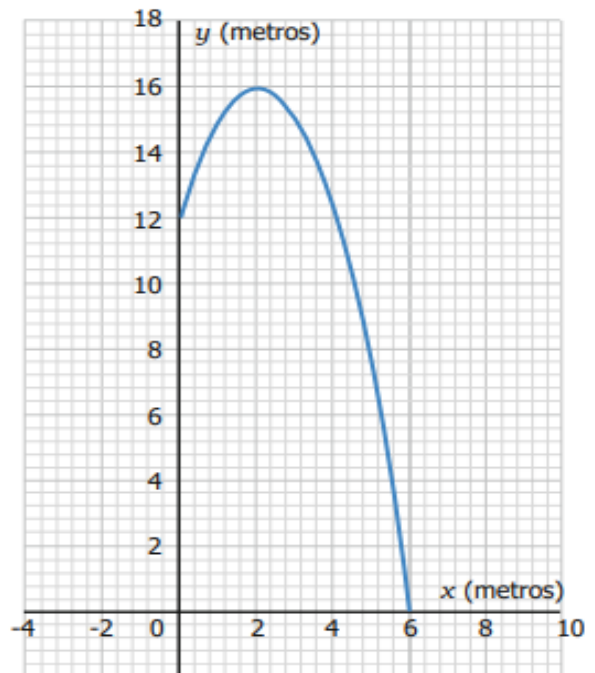


- a) Indicate the coordinate of the vertex and the intercept with the y-axis.  
 b) From the following algebraic expressions, circle the one that correctly relates the intensity  $y$  of the

signal, as a function of time  $x$ , during the two minutes.

$y = -x^2 + 2$	$y = x^2 + 2$
$y = -2x^2 + 4x + 2$	$y = 2x^2 - 4x + 2$

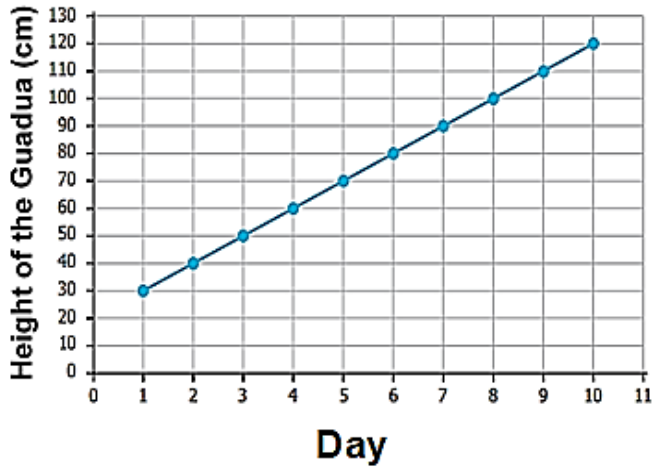
3. A cougar is standing on a tree branch 12 meters above the ground and jumps up to catch a prey. The motion of the cougar can be represented in a Cartesian plane by a parabola, as shown in the graph.



How far from the base of the tree did the cougar fall?

4. Guadua is one of the fastest growing plants. To identify how fast a guadua grows, an agronomist measured it for several days. He observed that on day 1 it measured 30 cm and that the height of the bamboo can be represented by the

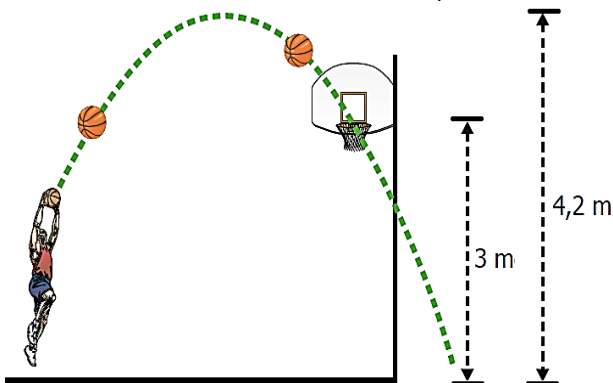
function  $y = 10x + 20$ . The image shows the graph of the height for the first 10 days.



- What kind of function does the graph represent?
  - What does the number 10 that appears in the algebraic representation of the function that represents the height of the bamboo mean?
  - How is the number 20 of the algebraic expression reflected in the graph?
5. Find the roots, the vertex, the y-intercept, and graph the following function:

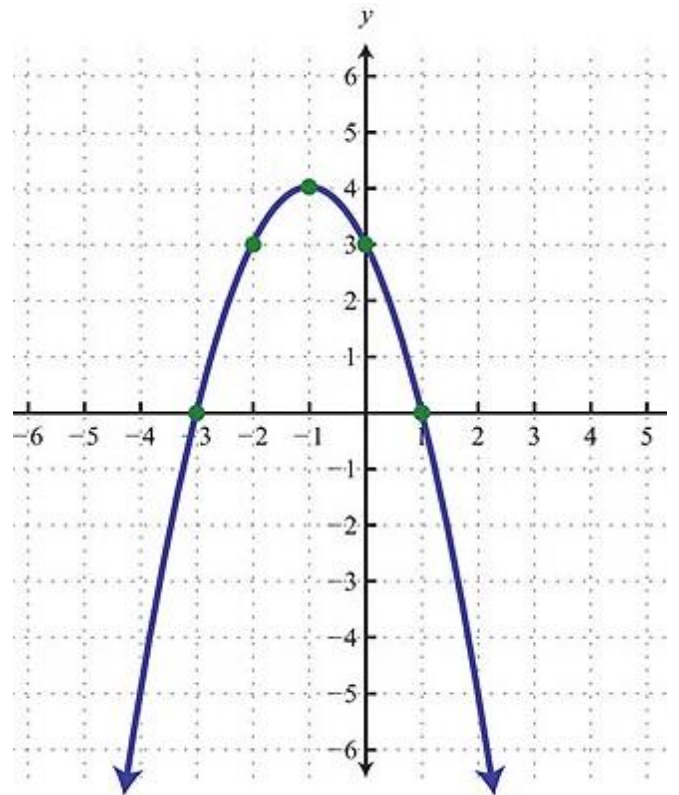
$$x^2 - 3x - 18 = 0$$

6. The position of a projectile with respect to the Earth is given by the expression:
- $$y = x^2 + 4x - 5,$$
- where  $x$  represents time. To find the points where he is on the surface of the Earth, you must solve the equation  $x^2 + 4x - 5 = 0$ . What are the solutions to the equation?
7. A basketball player takes a free throw shot, as shown in the following image:



According to the graph, write in front of each sentence if it is TRUE or FALSE.

- The ball reaches the minimum height when the player releases the ball and begins its trajectory. \_\_\_\_\_.
  - The ball passes through the hoop at a height of 4.2 meters. \_\_\_\_\_.
  - The ball reaches its maximum height at 3 meters. \_\_\_\_\_.
  - The ball reaches a height of 3 meters at various times during its trajectory. \_\_\_\_\_.
  - The ball reaches its maximum height at 4.2 meters. \_\_\_\_\_.
8. Analyze the following graph and write in front of each sentence if it is TRUE or FALSE.



- The vertex of the quadratic function shown on the graph is  $(4, -1)$ . \_\_\_\_\_
- The equation of the quadratic function shown on the graph is  $f(x) = x^2 - 2x + 3$ . \_\_\_\_\_

- The roots of the parabola are -3 and 1. \_\_\_\_\_.
- The y-intercept of the quadratic function shown on the graph is (3, 0). \_\_\_\_\_

9. Ana is three times the age of her son James. In 15 years, Ann's age will be twice that of her son's. How old are Ann and James?

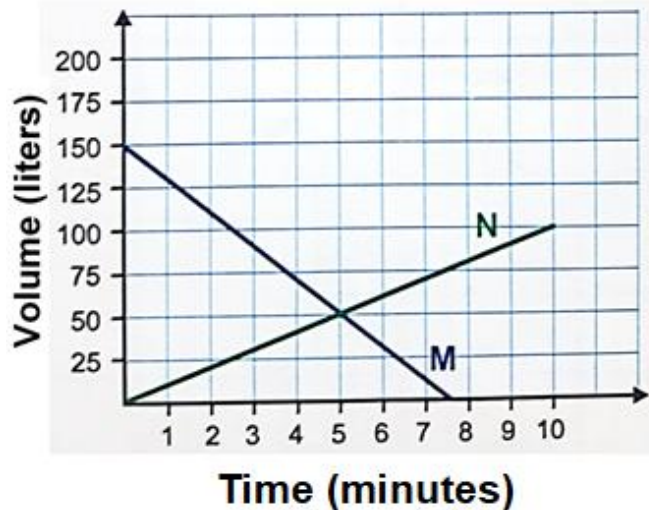
10. The relationship between the quantities **x** and **y** of two items produced in a factory is represented by the following system of equations:

$$\begin{cases} -x + y = 10 \\ x + 3y = 50 \end{cases}$$

What is the quantity **x** and **y** of each item?

**ANSWER QUESTIONS 11 TO 14 ACCORDING TO THE FOLLOWING INFORMATION**

Two water tanks, M and N, with a maximum capacity of 150 liters each, are related as follows: As M empties, N fills. (Look at the image)



11. At what point do the two tanks have the same amount of water?
12. How long did it take tank N to fill 100 liters?

13. How long did it take tank M to empty?

14. If the same behavior continues, how long will it take for the N tank to fill completely?

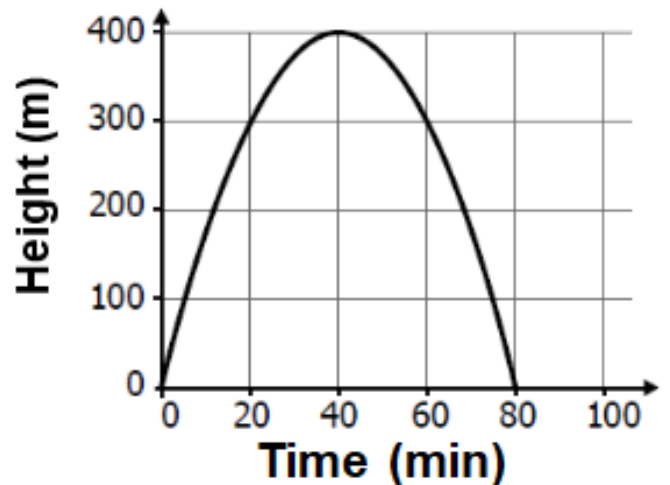
15. Felipe organized a celebration to reunite his schoolmates 10 years after graduation. He handed out 35 cards, and the owner of each card could go with one or two companions. On the day of the celebration, 100 people arrived at the meeting place, and all 35 cards were delivered at the entrance of the place. To find out the number of people who went to the celebration with one or two companions, you can solve a system of equations, where **x** represents the number of people who brought one companion and **y** the number of people who brought two companions:

$$\begin{cases} x + y = 35 \\ 2x + 3y = 100 \end{cases}$$

How many people brought one companion and how many brought two companions?


**ANSWER QUESTIONS 16 TO 19 ACCORDING TO THE FOLLOWING INFORMATION**





The graph shows the height of a balloon versus the time of rise.



Analyze the graph and write in front of each sentence if it is TRUE or FALSE.

16. The balloon reaches maximum height in 400 minutes. \_\_\_\_\_
17. The time that the balloon lasts flying is 40 minutes. \_\_\_\_\_.
18. The maximum height it reaches is 40 m. \_\_\_\_\_
19. Spend 80 minutes doing your entire route. \_\_\_\_\_
20. Observe the information in the table corresponding to the number of books in a school library.

Each  represents 100 books.

School Subject	Number of books for each school subject
Social	
Math	
Drawing	
Sciences	

If a book is chosen at random from the library, what school subject is it most likely to belong to? Why?

21. Karol designs earrings with three circular pieces united, with different color order. (Look at the photo).





How many different earrings can Karol create if she has circular pieces in six different colors?

22. Juan, Ana and María want to sit on a three-seat bench. In how many different ways can they sit,

if the bench is numbered with the digits 1, 2 and 3, as shown in the figure?



23. The table shows the number of triangles needed to build pyramids of different sizes.

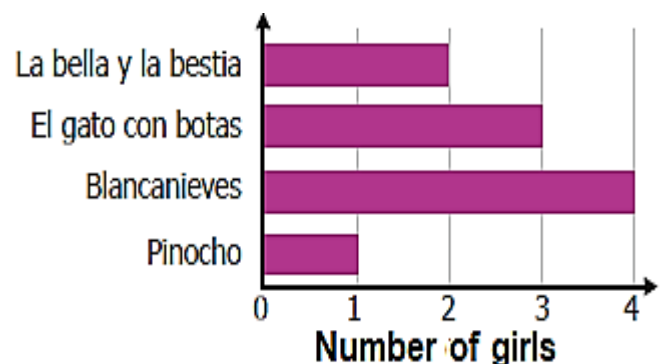
Pyramid	Number of Triangles
 Pyramid 1	1
 Pyramid 2	9

To calculate the number of triangles necessary to build the *n*th pyramid, the expression is used:

$$(2n - 1)^2$$

What pyramid would be built if 81 triangles were used? What position does the pyramid have?

24. Linda wants to read a story. To choose which story to read, she decides to ask 10 girls about their favorite story. The graph shows the answers she obtained.

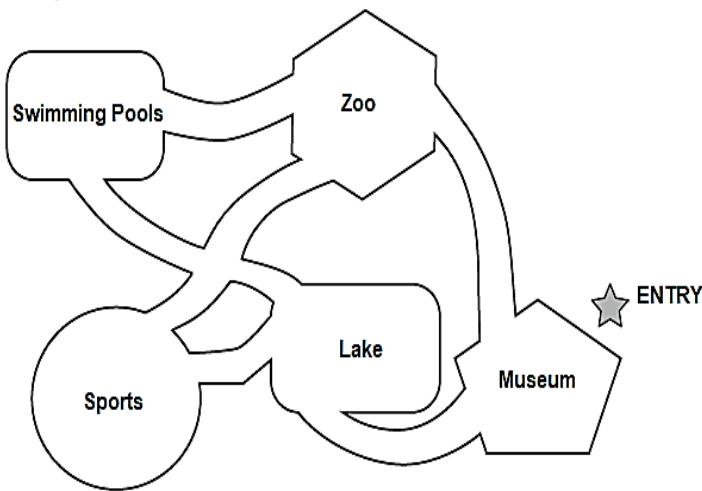


Then, she asked 10 boys the same thing. The table shows the answers she obtained.

Favorite Store	Number of boys
Pinocho	4
La bella y la bestia	2
Blancanieves	1
El gato con botas	3

When combining the answers of the boys and the answers of the girls, what is the story that they chose the most times as their favorite?

25. The figure corresponds to the map of a natural park.



When visitors enter, the following tour options are offered:

- Museum – Zoo – Swimming pools.
- Museum – Zoo – Sports.
- Museum – Lake – Sports.
- Museum – Lake – Swimming pools.

Represent these options with a **TREE DIAGRAM**.

26. The probability that Miguel will pass an exam on Saturday depends on the number of days he has studied that same week. According to Table 1, the probability that Miguel passes exam 1 is 60%.

Week 1	Monday	He studied
	Tuesday	He studied
	Wednesday	He did not study
	Thursday	He studied
	Friday	He did not study
	Saturday exam 1	Probability of approve the exam: 60 %

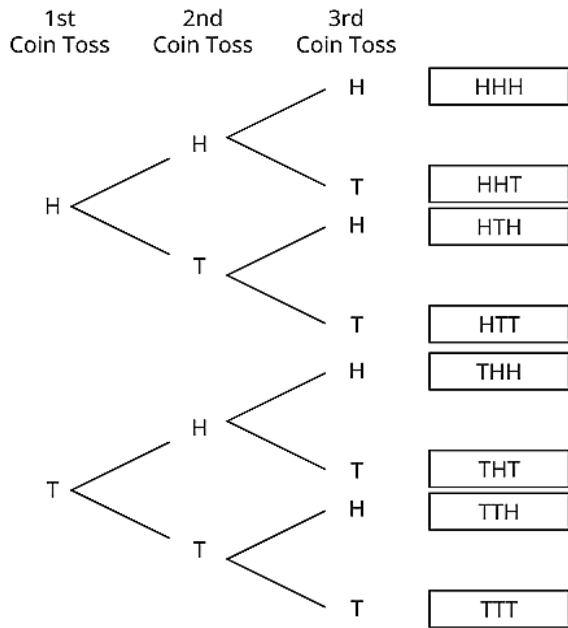
Table 1

Week 2	Monday	He did not study
	Tuesday	He did not study
	Wednesday	He studied
	Thursday	He did not study
	Friday	He did not study
	Saturday exam 2	?

Table 2

According to Table 2, what happens to the probability that Miguel passes exam 2, compared to exam 1? Does it decrease or increase by how much?

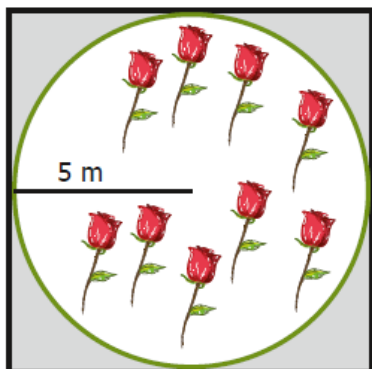
27. You have a common coin, that is, with the same probability of getting heads or tails. The diagram shows the possible results of tossing the coin three times.



According to the diagram, write in front of each sentence if it is TRUE or FALSE:

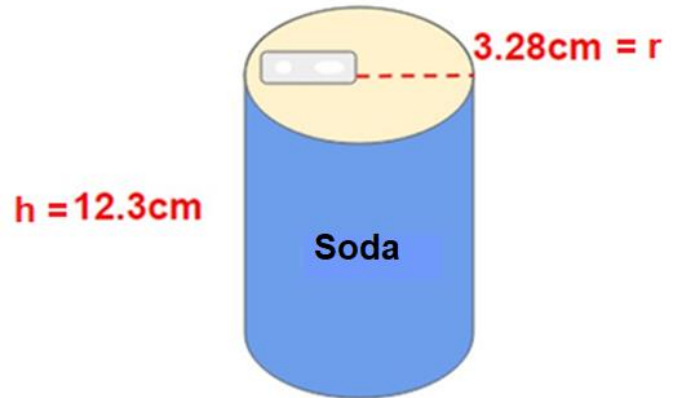
- It is possible to find the number of cases in which two consecutive **TAILS** are obtained. \_\_\_\_\_
- It is possible to determine the number of cases in which only **HEADS** are obtained. \_\_\_\_\_
- It is possible to determine in advance whether a **TAIL** appears on the next throw. \_\_\_\_\_
- It is possible to find the probability of getting **HEAD** on tosses. \_\_\_\_\_

28. María has an organic crop of roses in a circular field that has a radius of 5 meters. To protect it from pests, she planted garlic plants around it, until completing a square circumscribed by the land. The shaded part of the figure shows the area that María planted with garlic. Remember that the area of a circle of radius  $r$  is  $r^2\pi$ .

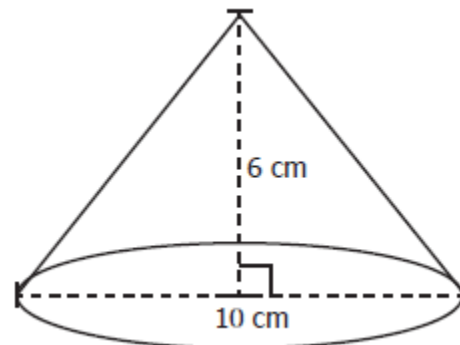


What is the surface area that was planted with garlic plants?

29. Fernanda buys a can of soda with the following measurements: (Look at the image) What is the capacity of the bottle?



30. The figure shows a right cone with a circular base:



The volume of a right cone with a circular base is one third of the result of multiplying the area of the base by the height. What is the volume of the cone, in  $\text{cm}^3$ , in the figure?

Remember that the area of a circle of radius  $r$  is  $r^2\pi$ .