



UNITED NATIONS COLLEGE IED
PREPARATORY WORKSHOP FOR COMPETENCIES TEST
FIRST TERM
MATH 11th



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

Delivery date: April 2nd, 2024

1. Pedro Ramirez owned several intermediate and executive urban service buses in Bogotá several years ago. The profit obtained on each intermediate bus was 500 pesos per passenger, with the fare being 650 pesos during the day and 700 pesos at night; and the profit he obtained on each executive bus was 600 pesos per passenger, with the fare being 750 pesos during the day and 800 pesos at night. Pedro was thinking about changing the pay rate for intermediate bus drivers and had the following options:

Option 1: For each passenger 100 pesos, and if you pick up more than 400 passengers per day you will earn 55,000 pesos.

Option 2: For each passenger 150 pesos throughout the day, and from 300 passengers, 50 pesos more for each passenger.

Propose the functions that correspond to each of the options, with x being the number of passengers and $f(x)$ the gain in pesos for the drivers.

2. The number of millions of live bacteria in a culture, after applying a treatment, is given by the expression:

$$f(x) = 1 + \sqrt{10 - x}$$

where x is the number of days that have passed since the treatment was applied. What is the set of all values of x for which $f(x)$ is a possible real number under this situation?

3. The expression $x = 200 + 5t$ represents the distance in meters traveled by a car that makes a linear movement in t seconds. How much minimum time must elapse for the mobile phone to travel a distance of no less than 500 m?
4. A truck weighs 890 kg. The difference between the weight of the empty truck and the weight of the load it carries must be at least 410 kg. If the truck must carry 4 equal boxes, how much can each weigh at most? one, so I can transport them in the truck?
5. Mike Powell holds the world long jump record with 8.95 meters, which he achieved at the World Athletics Championships in Tokyo in 1991. The previous world record was held by Bob Beamon, with 8.9 meters. What distances can an athlete achieve that does not exceed the current world record and is greater than or equal to the previous one? Express it in interval notation.

ANSWER QUESTIONS 6 AND 7 ACCORDING TO THE FOLLOWING INFORMATION

In a group of 38 applicants for a position in a foreign company, 19 speak English, 14 speak French and 15 speak German. If 5 speak English and French; 7 speak English and German; 3 speak French and German; 2 speak all three languages.

6. How many people speak only 1 of these languages?
7. How many applicants do not speak any of these three languages?

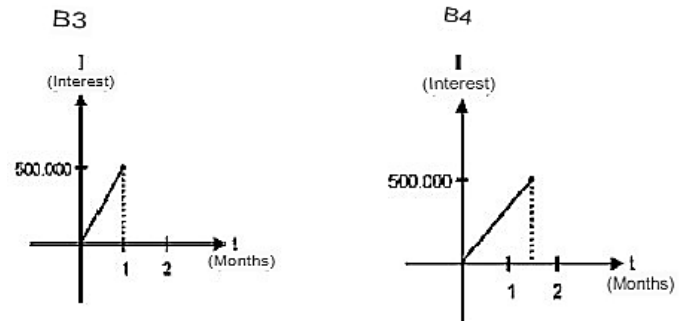
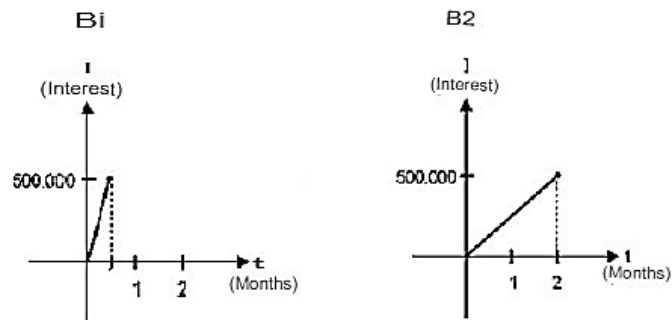
ANSWER QUESTIONS 8, 9 AND 10 ACCORDING TO THE FOLLOWING INFORMATION

Each of the 40 students in a course practices at least one of these sports: soccer, basketball or volleyball. It is known that 18 play soccer, 20 practice basketball, 27 volleyball, 7 practice soccer and basketball; 12 play basketball and volleyball; 9 practice only volleyball and 4 practice all three sports.

- 8. How many students practice soccer and volleyball at the same time?
- 9. How many play soccer and volleyball, but not basketball?
- 10. How many students only play soccer?
- 11. Treated water is extracted from a tank to irrigate a plantation, according to the following periodic dynamics: when the tank is full, the conduit that releases the water is opened, until it reaches the minimum level, at which time The inlet pipe is opened and the outlet pipe is closed, until the tank is filled; Again, the exit is opened and the entry is closed. Represent the process on a graph, taking as moment zero a moment in which the tank is full.

ANSWER QUESTIONS 12 TO 14 ACCORDING TO THE FOLLOWING INFORMATION

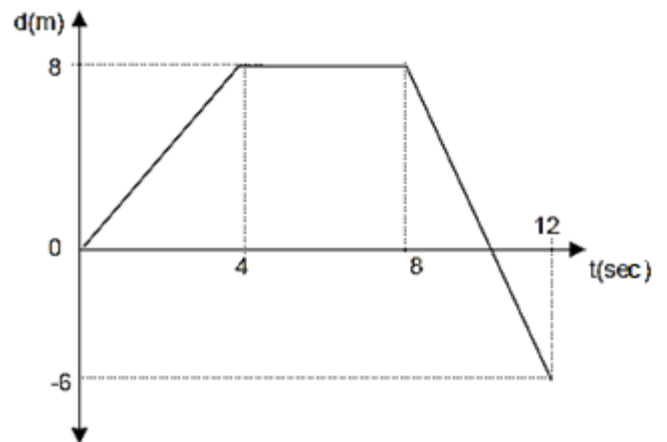
A person wants to deposit a certain amount of money P , at a certain monthly interest rate r , for t months in a bank. The interest on any of these entities can be calculated using the function $I(t) = Prt$. The following graphs show the interest earned in different banks B1, B2, B3 and B4 for the same amount of money P .



- 12. Which bank offers the highest profitability?
- 13. For bank B1 and bank B2 to produce the same amount of money in interest, is it required that the amount invested in bank B2 be twice the amount invested in bank B1?
- 14. If A person decides to leave an amount of money C , for two months, in one of the banks and then withdraw it to leave it in another bank for one month. What is the option where you earn the most money when you use, in order, the banks' service?

ANSWER QUESTIONS 15 TO 18 ACCORDING TO THE FOLLOWING INFORMATION

The following graph represents the position with respect to time of a objet during 12 seconds. The movement is performed in three intervals of 4 seconds each.



- 15. Describe the movement made by the objet in each of the three time intervals shown on the graph.

16. Express the algebraic function that the movement of the object during the 12 seconds.

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

- The object decreased the speed it had been maintaining in the range of 4 to 8 seconds. _____
- The object reduced the space traveled during the four seconds compared to the previous intervals. _____
- The object traveled the same distance in the interval from 8 to 12 seconds as in the interval from 0 to 8, but it took longer. _____
- The object traveled a total of 22 meters, returning six meters, from where it started. _____

18. Represente la gráfica que relaciona la velocidad y el tiempo respecto al movimiento realizado por el cuerpo durante los tres intervalos.

ANSWER QUESTIONS 19 TO 21 ACCORDING TO THE FOLLOWING INFORMATION

Two employees in a company receive salaries of 50 units per month each. After one year, the manager decides that the two employees will have an annual increase, earning a salary for the next three (3) years as shown in graphs 1 and 2.

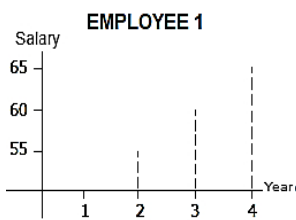


Figure 1

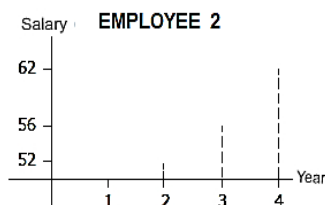


Figure 2

19. Based on this information, is the salary of worker 1 always above the salary of worker 2?

20. How does each person's salary increase?

21. Which of the two workers will receive the highest salary in the sixth year?

ANSWER QUESTIONS 22 AND 23 ACCORDING TO THE FOLLOWING INFORMATION

In a laboratory, two researchers carry out experiments with a certain type of bacteria. To analyze its reproduction, they introduced the bacteria into a glass container at 1:00 pm and observed that for every minute that passes, the number of bacteria doubles.

22. If the container was filled at 2:00 pm, at what time did the bacteria occupy half of the container?

23. The researchers found that the expression $N(t) = 2^t$ establishes the relationship between the number of bacteria $N(t)$ and the elapsed time (t). How many bacteria did the container contain when 8 minutes had passed?

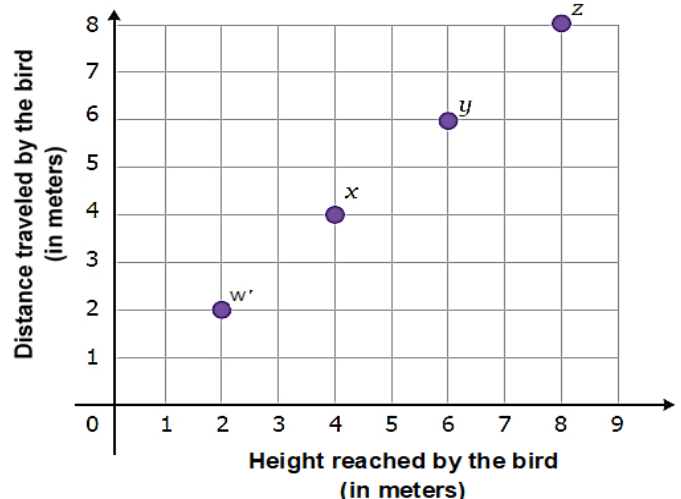
24. The table presents information on advertising spending and profits of a company during the years 2000 to 2002.

YEAR	ADVERTISING EXPENDITURE	PROFIT EARNED
2000	200	8.000
2001	280	10.400
2002	250	9.500

* Data in millions of pesos.

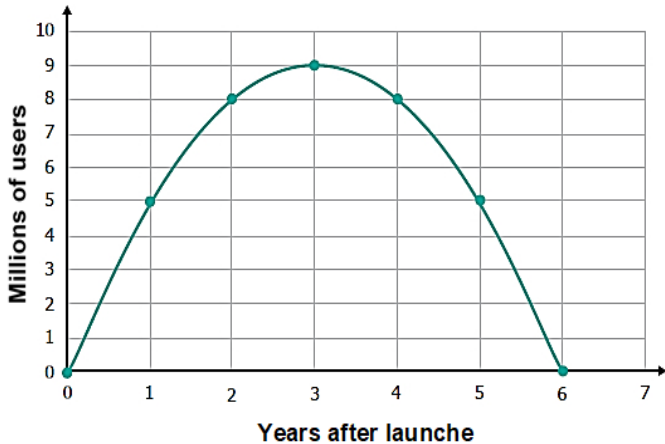
Determine the function that represents the profit obtained G , in millions of pesos, as a function of advertising expenditure p ?

25. The following graph illustrates some moments of a bird's flight from the moment it begins on the ground.



According to the graph, what type of relationship exists between the height reached by the bird and the distance traveled? Constant, exponential, linear quadratic. Explain your answer.

26. A company develops a computer game. The graph shows the projection that the company made about the number of users the game will have after its launch.



Write the equation corresponding to the graph that relates the time x since the launch of the game with the number y of users it has?

27. A gardener plants several trees in the park and monitors their growth. Each month he recorded in a table the number of trees that were more than 10 cm tall.

Month	Number of trees
1	17
2	29
3	41
4	53

If x represents the month, write the algebraic expression that represents the number of trees that were more than 10 cm tall in that month.

28. In a factory that makes sports jerseys, costs and income are calculated using two functions that depend on the number x of jerseys sold:

- **Cost function: $C(x) = 300x + 12.000$**
- **Income function: $I(x) = 900x$**

How many sports jerseys must be sold in one day for costs to equal income?

29. In a factory, a survey is administered to employees to find out the means of transportation they use to get to work, and then decide whether to implement a route service. The results showed, among others, these three conclusions on a group of 100 employees who live near the factory and who travel only by bus or on foot:

- 60% of the group are women.
- 20% of women travel by bus.
- 40% of men get around by walking.

Organize the information provided above into a table, indicating the number of men and women who use each type of transportation.

30. Julián has carried out a study on his company and has found that from the initial capital of \$800, each year the company has lost \$25. These data are recorded in a graph of the behavior of said capital for the first 6 years. Design the graph that correctly illustrates this situation.