

# XXV Mathematics Olympiads



# 2013



FOUR GRADE - SIX GRADE

Identification number	
Date	
Start time	
Finish time	



Dear student:

Congratulations for been selected to take part in our twenty fifth Math Olympiad.

This test includes a total of ten (10) exercises. To get your best score remember to:

1. Read instructions carefully.
2. Include all computations in the space provided.
3. Organized your answer clearly.
4. Include any diagrams, formulas, or written explanations.

It is our best wish that this activity will form integral part of your mathematics learning experiences. Good luck!

Cordially yours,

Dra. Lillian Corcino

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University of Puerto Rico  
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1. Observe:

a. Given the following number sequence, fill in the next three terms of the sequence:

4, 8, 12, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

b. The photograph below portrays the locomotive known as “Hacienda Dolores” used to transport sugar cane from the sugar cane plantation to Hacienda Dolores. Carefully observe the photograph and explain if there is any relationship between the previous number sequence and some elements in the photo. ¿What did you observed?

c. From your answers to part a. and b., comment, in your own words what use you can derive from number sequences?



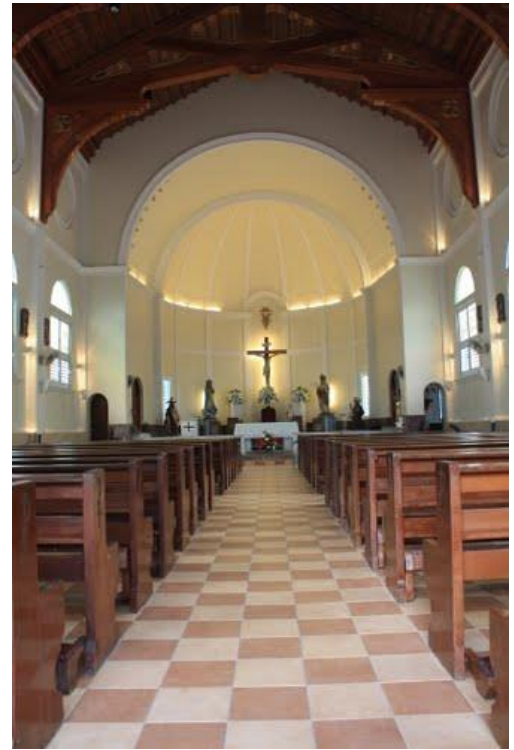
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A	
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TOTAL	

2.

According to historians, the church of San José in Peñuelas was founded in the year 1793. Originally, it was built with wood and straw. In 1918, the original building was destroyed due to an earthquake. In 1851, the church was reconstructed with sturdier materials.

In 1929, the church was relocated to the center of the actual town of Peñuelas.

Recently, a group of students from the **Adolfo Grana Rivera School** visited the church. One of the students posed the following challenge: without counting them, ¿how many pink tiles and how many white tiles has the church in the hallway depicted in the photo? Given that the length of the church is equal to 540 inches and the width of the hallway is equal to 60 inches, answer the following questions.



- a. ¿How many white tiles are there? \_\_\_\_\_
- b. ¿How many pink tiles are there? \_\_\_\_\_
- c. ¿How many total tiles does the hallway has? \_\_\_\_\_
- d. If each pink tile costs \$1.20 and each white tiles costs \$1.50, ¿what was the cost of all the tiles in the hallway? \_\_\_\_\_

USO OFICIAL	
A	
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TOTAL	

3.

The stairway to the church of San José has a total of nine rectangular steps. Each step has a length of 24 feet and a width of four feet. From this data, answer the following questions.



a. ¿What is the length of the staircase? \_\_\_\_\_

b. ¿What is the total area of the staircase? \_\_\_\_\_

c. If the width of the church entrance is one sixth of each step's length, ¿what is the width of the church door?  
\_\_\_\_\_

USO OFICIAL	
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C	
TOTAL	

4. Nailil visited Peñuelas's Luis Tite Arroyo municipal stadium. She was impressed with the number of entrances to the stadium. She counted the number of entrances and realizes that the total number of entrances was equal to 32 less than twice her age.



- a. If Nailil counted 18 entrances, ¿what is Nailil's age? \_\_\_\_\_
- b. The parking lot in front of the stadium has a total of eleven parking spaces; some are reserved for dignitaries and the rest for handicapped persons. If there are six handicapped spaces, write the equation to come up with the spaces reserved for dignitaries.

USO OFICIAL	
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TOTAL	

5. A student from Peñuelas is interested in the number of inhabitants in Peñuelas' wards. Searching in the internet, she found a map with Peñuelas' wards and a table with each ward and its corresponding population. Using the information provided in the table, answer the following questions



Censo 2000: Población por Barrios - Peñuelas	Habitantes
Barreal	267
Coto	1,244
Cuebas	430
Encarnación	1,344
Jaguas	2,662
Macaná	826
Peñuelas Pueblo	1,609
Quebrada Ceiba	5,345
Rucio	1,124
Santo Domingo	6,792
Tallaboa Alta	4,037
Tallaboa Poniente	697
Tallaboa Saliente	342
<b>Total</b>	<b>26,719</b>

- a. ¿How many inhabitants are there in **Quebrada Ceiba**? Write the number in words.

\_\_\_\_\_

- b. ¿Which ward has the smallest number of inhabitants?

\_\_\_\_\_

- c. ¿How many wards have more than 1,100 inhabitants?

\_\_\_\_\_

- d. ¿ How many wards have more than 1,100 inhabitants and less than 1,400?

\_\_\_\_\_

USO OFICIAL	
A	
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C	
D.	
TOTAL	

6. The emblem of Peñuelas was designed by the Instituto de Cultura Puertorriqueña. The stone wall on top of the emblem symbolizes perpetuity. The cross represents the Holy Christ of Health that stopped the sea from flooding the town. The purple arm signifies priesthood and the town of Peñuelas. The yellow color represents the sun. The white and blue waves represent the sea. Finally, the slogan in the lower part represents the Christian faith.



- a. You can figure out the date in which Peñuelas' emblem was designed by carrying out the following computations. The date has four digits. The sum of the first two digits is equal to 10; the sum of the last two digits is equal to the second digit and the difference is equal to the first digit.

¿In what year was Peñuelas' emblem designed? \_\_\_\_\_

- b. The population density is the result of dividing the number of inhabitants in a region by the surface area of the region. Peñuelas' population density is a three digit number that you can figure out by doing the following computations: the first two digits are pair and equal, and the third digit is twice the product of the first two.

\_\_\_\_\_ inhabitants / square kilometer

USO OFICIAL	
A	
B	
TOTAL	



7. The distance from San Juan to Peñuelas is 81 miles. The map on the right illustrates the shortest route from San Juan to Peñuelas.



Your friend Lillian lives in San Juan and is interested in visiting Peñuelas. A charter car driver will charge Lillian \$20 to take her from San Juan to Ponce. Once in Ponce, she will take another car to Peñuelas that will charge her 25 cents per mile.

- a. If the distance from San Juan to Ponce is 70 miles, ¿once in Ponce, how many miles left has Lillian to get to Peñuelas?

\_\_\_\_\_

- b. ¿How much money will Lillian have to pay to travel from Ponce a Peñuelas?

\_\_\_\_\_

- c. ¿How much will the whole trip costs?

\_\_\_\_\_

USO OFICIAL	
A	
B	
C	
TOTAL	

8. Of the thirteen (13) wards composing Peñuelas, nine (9) of them have more than 800 inhabitants. The table on your right lists the names of these nine wards.

Suppose that we write the name of each ward in a piece of paper and place all nine names in a bag.

Express the answers to the following questions in fractions. Give your answers in lowest terms.

Barrios de Peñuelas con más de 800 habitantes	
1	Coto
2	Encarnación
3	Jaguas
4	Macaná
5	Peñuelas Pueblo
6	Quebrada Ceiba
7	Rucío
8	Santo Domingo
9	Tallaboá Alta

- a. ¿What is the probability that if we choose a piece of paper from the bag at random, it will have the name of a ward ending in the letter 'o'?

\_\_\_\_\_

- b. ¿What is the probability that if we choose a piece of paper from the bag at random, it will have the name of a ward ending in the letter 'a'?

\_\_\_\_\_

- c. ¿What is the probability that if we choose a piece of paper from the bag at random, it will have the name of a ward ending in the letter 'o' or the letter 'a'?

\_\_\_\_\_

- d. ¿What is the probability that if we choose a piece of paper from the bag at random, it will have the name of a ward that does not end in 'o' nor in 'a'?

\_\_\_\_\_

USO OFICIAL	
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C	
D	
TOTAL	



9. Peñuelas has a band shell to celebrate concerts and cultural activities. The band shell has **semicircular** form and the radius of the band shell is 15 feet long.

**Remember:  $\pi = 3.14$**

With this information, answer the following questions.



- a. What is the diameter of the band shell?

\_\_\_\_\_

- b. What is the circumference of the band shell?

\_\_\_\_\_

- c. How many square feet do the area in front of the band shell has?

\_\_\_\_\_

USO OFICIAL	
A	
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C	
TOTAL	

10. A group of three friends from **Pedro Maldonado Torres** School decided to meet, in their free time, to play a game of marbles. Each marble in the jar is identified with a fraction. The jar contains a total of twelve marbles.



**Game instructions:**

- Without looking at the marbles, each of the students must remove four marbles from the jar.
- Then, the fraction in the marble should be classified and properly placed in one of the three containers illustrated below
- The student who deposits the greatest number of marbles in the correct container will be the winner.

$$\frac{1}{10}$$

$$\frac{5}{8}$$

$$\frac{1}{3}$$

$$\frac{7}{8}$$

$$\frac{12}{24}$$

$$\frac{2}{3}$$

$$\frac{2}{5}$$

$$\frac{3}{10}$$

$$\frac{11}{10}$$

$$\frac{3}{100}$$

$$\frac{4}{7}$$

$$\frac{9}{10}$$

**CLOSE TO 0**



**CLOSE TO 1/2**



**CLOSE TO 1**





Assuming that you will be the game's judge, answer the following questions:

- a. Write all the marble fractions that belong in the first container \_\_\_\_\_
- b. Write all the marble fractions that belong in the third container \_\_\_\_\_
- c. If Ricardo placed the marbles with the fractions  $\frac{12}{24}$ ,  $\frac{2}{3}$  y  $\frac{3}{10}$  in the second container, ¿did he placed all three marbles in the right container? \_\_\_\_\_

USO OFICIAL	
A	
B	
C	
TOTAL	