

REPUBLIKA HRVATSKA
XV. GIMNAZIJA
International Baccalaureate Department
Middle Years Programme



ENTRANCE EXAM 2023

MATHEMATICS, 3. 7. 2023.

60 minutes

PASSWORD (3 digits and 5 letters)

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digits

letters

1. The password consists of the combination of 3 digits and 5 letters written together.
2. Only black or blue ink is allowed for the test writing.

Date _____

Points gained from the test ____ / 24

Entrance exam points ____ / 4

1.

Evaluate $\sqrt{\frac{10}{27} \cdot \frac{3}{40} + \frac{2}{9} - \frac{1}{6} \cdot (2^2 - 3^2)^2}$.

1 pt

A. $-\frac{31}{3}$

B. $-\frac{11}{3}$

C. $-\frac{10}{3}$

D. $\frac{14}{3}$

2.

The expression $(a-1)^2 - (a+1)^2$ is equal to:

1 pt

A. -2

B. 0

C. $-2a$

D. $-4a$

3.

Which of the following conditions do we use to prove that triangles ABC and XYZ are congruent?

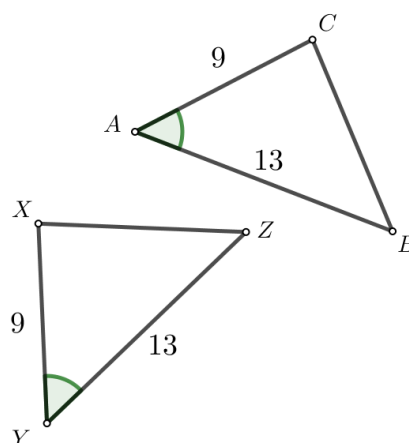
1 pt

A. SSS

B. SAS

C. SSA

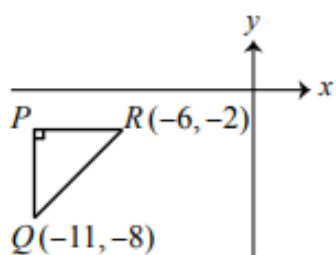
D. ASA



4.

1 pt

In triangle PQR below, side $\overline{PR}$ is horizontal and side $\overline{PQ}$ is vertical. The coordinates of point P are:



- A. $(-8, -2)$
- B. $(-11, -6)$
- C. $(-11, -2)$
- D. $(-8, -6)$

5.

1 pt

Andy lists the numbers 2, 3, 4, 5, 6, 7, 8, 10, 11. In his list, the ratio of the number of prime numbers to the number of composite numbers is

- A. 2 : 7
- B. 3 : 6
- C. 4 : 5
- D. 5 : 4

In the following tasks, show **all your work** (sketches, procedure, calculations) and write the **answer** in the space provided.

If you solve a part of the task by heart, explain and write how you did it.

6.

1 pt

The volume of a rectangular prism is 30 cm^3 . The length of the prism is doubled, the width is tripled, and the height is divided by four. Calculate the volume of the new prism.

Answer: _____

7.

1 pt

Solve for x : $\frac{x-1}{3} - 2 = \frac{2x-1}{6} + \frac{x-2}{4}$.

Answer: _____

8. Mary is buying new glasses. She asked for a discount and the salesperson gave her the following offers:
 Offer A: a single discount of 16 %.
 Offer B: successive discounts of 5 % and 11 %.
 Which of the offers is more favourable? Explain.

1 pt

Answer: _____

9. Segment $\overline{AE}$ is divided into ten equal parts. Which of the ratios is bigger, $\frac{|AC|}{|BD|}$ or $\frac{|CD|}{|BC|}$?

1 pt



Answer: _____

10. 2 pts	Eileen tries to guess how many people are at a concert, but she guesses 400 too many. Adam guesses 250 too few. The average of their guesses is 2575. Determine the exact number of people at the concert. <i>Answer:</i> _____
11. 2 pts	A book has pages numbered from 1 to 100 . If the book is opened to a random page, find the probability that the page number has digit '6' in the page number. <i>Answer:</i> _____

12. 2 pts	Solve the system of equations: $\begin{cases} 2 - 3(x - y) = x \\ 0.2x - 0.3y = 1 \end{cases}$ <i>Answer:</i> _____
13. 2 pts	It starts raining and an empty rainwater tank fills up at a constant rate of 1.5 litres per hour. By midnight, there are 13 litres of water in a rainwater tank. At what time did it start to rain? Give your answer in hours and minutes. <i>Answer:</i> At _____ h _____ min

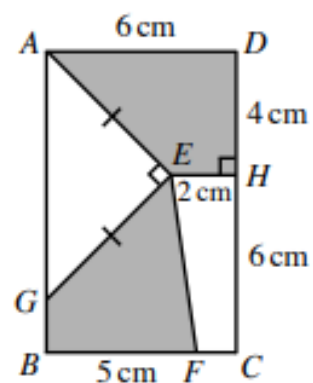
14.

3 pts

In the given rectangle $ABCD$ some distances are given. Also,

$|AE| = |GE|$, $\angle AEG = 90^\circ$, $\angle DHE = 90^\circ$.

a) Calculate the length $|AE|$.



Answer: a) _____

b) What is the area of the shaded part?

Answer: b) _____

15.

Each black tile in the following arrangement represents value +1, and each grey tile represents value -1. The value of the given arrangement is 1.

4 pts



Shown below are the first 4 arrangements in a sequence of tile arrangements.



$$v_1 = -2$$

$$v_2 = \underline{\hspace{2cm}}$$

$$v_3 = \underline{\hspace{2cm}}$$

$$v_4 = \underline{\hspace{2cm}}$$

$$v_5 = \underline{\hspace{2cm}}$$

a) Observe the pattern in the sequence and draw the next arrangement. Write down the missing values for the arrangements.

Complete the following statements. Explain how you arrived at your answer.

b) $v_{30} = \underline{\hspace{2cm}} ?$

c) If $v_n = -250$ then $n = \underline{\hspace{2cm}} .$

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