# Mathematica Centrum

Together, let's shape the mathematicians of the future

**EULER PREPARATORY TEST 2024**

1. $(\sqrt{9})^2 + (\sqrt{4})^2 = ?$

   A) 97      B) 13      C) 85      D) 12      E) 36

2. The value of (-3 + 9) x (-9 + 3) is equal to

   A) 16      B) 0      C) -12      D) -36      E) 36

3. The number of divisors of 10 is equal to

   A) 6      B) 2      C) 4      D) 3      E) 5

4. If 1/4 of N is equal to (1/3 - 1/4) x 2/3, what is the value of N?

   A) 2/9      B) 1/16      C) 1/21      D) -3/18      E) 1/18

5. A grasshopper hops along the number line. It jumps from the number 1/3 and lands on number X, the point from which it rebounds to the number 7/9. What is the value of number X if it lies 9/10 of the distance between 1/3 and 7/9?
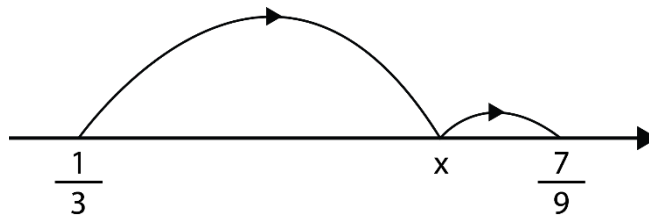


   A) 31/45      B) 2/3      C) 11/15      D) 2/5      E) 16/45

6. The number of cube numbers smaller than 200 is equal to

   A) 3      B) 7      C) 6      D) 4      E) 5

7. Which of the answers below is closest in value to a speed of 100 km/h?

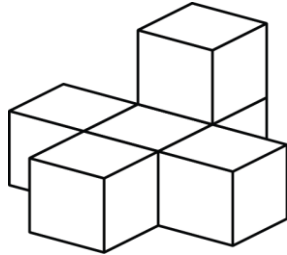   A) 28 m/s      B) 27 m/s      C) 29 m/s      D) 26 m/s      E) 30 m/s

**8.** What is the value of $(10\%)^2$ of 200?

A) 1           B) 2           C) 3           D) 4           E) 5

**9.** The average value of an angle in a hexagon is

A) 100⁰      B) 105⁰      C) 110⁰      D) 115⁰      E) 120⁰

**10.** Six blocks were glued together as shown in the diagram. How many faces of these blocks are covered with glue?



A) 6           B) 14           C) 8           D) 10           E) 12
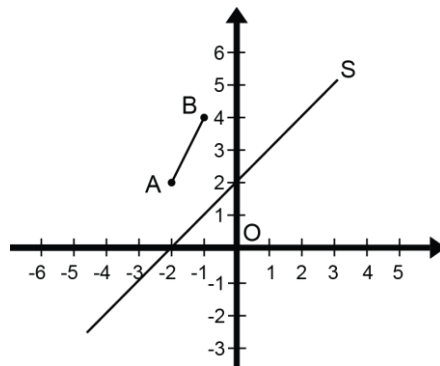
**11.** The value of n in the equation $10^4 \times 10^2 \times n = 8 \times 100^3$ is

A) 10           B) 7           C) 8           D) 6           E) 5

**12.** Which of the suggested numbers has the most prime factors?

A) 15           B) 30           C) 60           D) 45           E) 26

**13.** What are the coordinates of the image of point A of line segment AB if it is first reflected in the axis of symmetry S, and then is moved (translation) by a value of t (5, 5)?
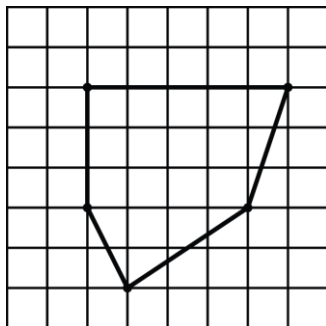


A) A'(5, 5)     B) A'(5, 4)     C) A'(4, 4)     D) A'(5, 6)     E) A'(4, 5)

**14.** The GCD and LCM of 12 and 16 are respectively
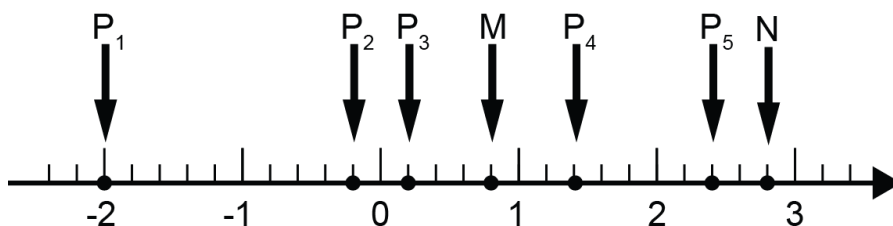
A) 6 and 36    B) 4 and 96    C) 4 and 36    D) 4 and 48    E) 48 and 8

**15.** Each vertex of the pentagon below coincides with the vertex of a small square. What is the area of the pentagon if the area of each small square of the grid is 9 cm²?



A) 157.5 cm²    B) 158 cm²    C) 158.5 cm²    D) 159 cm²    E) 160 cm²

**16.** What point on the number line is 3 times farther from N than from M?



A) $P_1$    B) $P_5$    C) $P_2$    D) $P_3$    E) $P_4$

**17.** The area of a triangle is twice that of a square. We double the side of the square and double the height of the triangle. Which of the following represents the ratio of the area of the new square compared to the area of the new triangle?

A) 1    B) 1.1    C) 0.9    D) 1.5    E) 2

**18.** Which answer corresponds to (20%)%?

A) 0.004    B) 1/25    C) 0.002    D) 2/5    E) 3/50

**19.** If x = 2, what is the value of $1 + 2x + x^2 - 2x^3$?

A) 7    B) -7    C) -8    D) -6    E) 25

**20.** Look carefully at the diagram below which represents the first 4 steps (step 0, step 1, step 2, and step 3) in the transformation of a triangle. In step 0, the transformation has not yet begun and the the triangle is intact. In step 1, 1 triangle is removed. In step 2, three more triangles are removed. How many triangles will be removed in step 11 of the transformation (Sierpinski fractal)?



$$0 \qquad 1 \qquad 2 \qquad 3$$
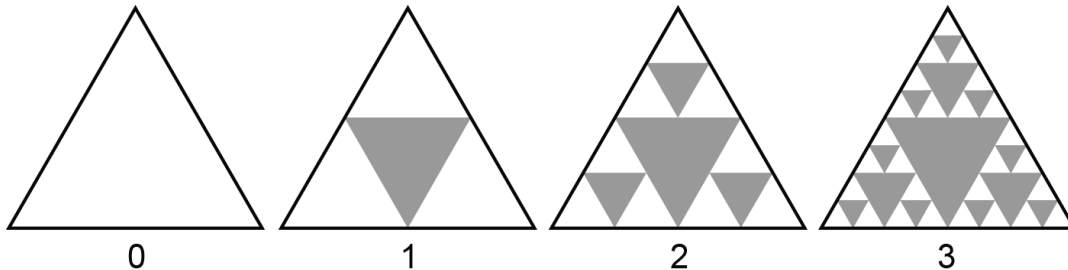
A) $3^9$      B) $3^{10}$      C) $3^{11}$      D) $3^8$      E) $3^7$

**21.** The measures of the 3 angles of a triangle are in the ratio 2: 3: 4. What is the value of the largest angle?

A) $85^0$      B) $90^0$      C) $75^0$      D) $65^0$      E) $80^0$

**22.** Andrea is going to conduct a 3-part experiment. Firstly, she will randomly pick a ball in a box containing 3 red balls and 4 blue balls. Then, she will spin only once the arrow of the spinner with numbers and finally, she will spin only once the arrow of the spinner with the letters. What is the probability that she will get a red ball, the number 3, and the letter E?
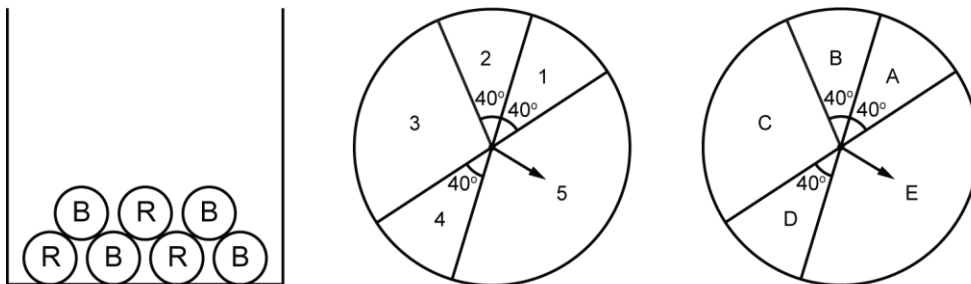


A) 1/5      B) 1/9      C) 6/124      D) 5/108      E) 5/81

**23.** How many minutes did Mathilda spend in Switzerland if she visited the country for n days, 2n hours, and 3n minutes?

A) 1 440n min      B) 1 563n min      C) 1 560n min      D) 1 460n min      E) 1 540n min

**24.** What is the product of the digits of the smallest natural number that is divisible by 2, 3, 4, and 7?

A) 28      B) 36      C) 42      D) 48      E) 32

**25.** Pythagoras' theorem states that, in a right-angled triangle, if c is the length of the hypotenuse and a and b are the lengths of the other two sides, then $a^2 + b^2 = c^2$. If a = 6 and b = 8, then $c^2 = 6^2 + 8^2 = 100$ and c = $\sqrt{100}$ = 10. What is the length of c if b = 1 and a = 1?



A) 2          B) 1.8          C) $\sqrt{3}$          D) $\sqrt{2}$          E) 1.2

**26.** Mathusalem prepares 600 g of a mixture of sand and water, of which 95% is water. An hour later, he draws water from the initial mixture and transforms it into a new mixture containing 90% water. How many grams of water did he draw from the initial mixture?

A) 120 g          B) 300 g          C) 330 g          D) 270 g          E) 275 g