

Sample questions for KAUST Mathematics Competition Category B

1. Find the value of expression,

$$\frac{2^{-2} + 3^0}{(-0.5)^{-2} - 5 \cdot 2^{-2} + \left(\frac{2}{3}\right)^{-2}} + 3.75.$$

- (A) 4.25
- (B) 5
- (C) 4.75
- (D) 4
- (E) 5.25

2. A printer prints numbers in the sequence: 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, $\dots$, where each number n is printed exactly n times. What is the 5000th number printed?

- (A) 50
- (B) 99
- (C) 100
- (D) 101
- (E) None of these answers

3. Let $F(x) = x^2 + x + 1$, $G(x) = x^2 - x + 1$, and $H(x) = F(x + 1) + G(x - 1)$, what is the value of $H(3)$?

- (A) 18
- (B) 20
- (C) 21
- (D) 24
- (E) 28

4. Let $y^2 = x^3 - 4$, $x^2 = y + 5$ determine the value of

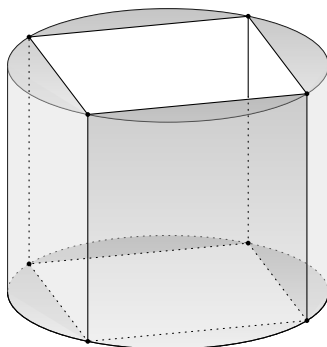
$$\frac{y^2 + 5}{x + 1} + x - y.$$

- (A) 4
- (B) 5
- (C) 6

(D) 7

(E) 8

5. A cube of the side length of 2 cm is inscribed in the cylinder, such that the upper and the lower faces of the cube are on the upper and the lower bases of the cylinder. Find the volume of the region between the cylinder and the cube.



(A) $4\pi - 4$

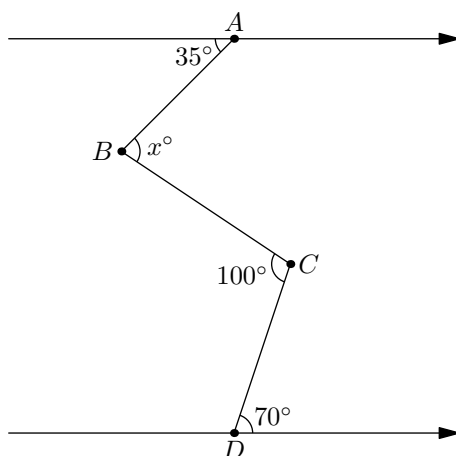
(B) $4\pi - 8$

(C) $4\pi - 12$

(D) $3\pi - 6$

(E) $2\pi - 4$

6. In the figure below, find the angle x .



(A) 65

(B) 45

(C) 55

- (D) 25
- (E) None of the Above

7. Integers a, b, c are sides of a triangle with perimeter 2025. Find $\max(a - 2c)$.

- (A) 1009
- (B) 1010
- (C) 1011
- (D) 1012
- (E) None of the above

8. A bus company offers buses for 27 or 36 passengers. A tour group consisting of 555 tourists wants to travel with buses of that company. These buses have been selected by the company so that the total number N of empty seats in the buses is as small as possible. Determine N .

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

9. A positive integer n satisfies the following conditions,

- (a) $n + 1$ is a perfect square,
- (b) $n + 2$ is prime,
- (c) $n + 3$ is divisible by 11,
- (d) $n + 4$ is a three-digit number.

Find the sum of the digits of $3n$.

- (A) 17
- (B) 18
- (C) 19
- (D) 20
- (E) 21

10. How many integer points (x, y) of the plane satisfy the inequality $|x| + |y| \leq 11$.

- (A) 245
- (B) 250
- (C) 255
- (D) 260
- (E) 265

11. Two six-sided dice are thrown. What is the probability that their sum is divisible by 5?

- (A) $\frac{1}{18}$
- (B) $\frac{1}{5}$
- (C) $\frac{1}{6}$
- (D) $\frac{7}{36}$
- (E) $\frac{11}{36}$

12. In a game for five players, one of them gets a point in every round. The game ends as soon as one of the players collects 10 points. How many rounds at most can the game have?

- (A) 44
- (B) 45
- (C) 46
- (D) 47
- (E) 48