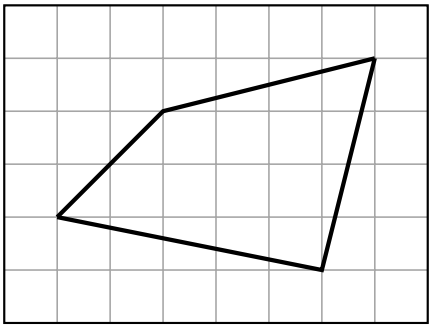
Sample Questions for KAUST Mathematics Competition
Final Round, Juniors Track

1. In an arithmetic sequence (one in which the difference between consecutive terms is constant), five consecutive terms are $a, x, b, c, 2x$. What is the value of $\frac{a+b}{c}$?

2. Find the area and the perimeter of the quadrilateral shown below, assuming each small square has side length 1, and the vertices of the quadrilateral are on grid points.



3. When 95 is divided by a positive integer N, the remainder is 4. What is the least possible value of N?

4. All positive even integers are written consecutively:

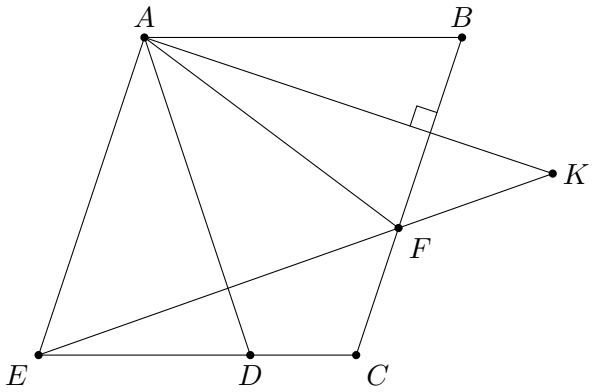
$$246810121416182022\ldots$$

Which digit appears in the 2026-th position?

5. Find all values of a, b and c that satisfy the system of equations:

$$\begin{cases} ab - a - b = -7 \\ bc - b - c = 7 \\ ca - c - a = -13. \end{cases}$$

6. In the diagram below, $ABCD$ is an isosceles trapezoid, $ABCE$ is a rhombus, and $\angle ABC = 72°$. The line AF bisects $\angle DAB$, and K is the point on EF such that $AK \perp BC$. Find $\angle AKE$.



7. Find all primes p, q, r and s (not necessarily distinct) that satisfy

$$p \cdot q \cdot r \cdot s = (p+1)(q+1)(r+1).$$

8. A stair shape consists of 100 rows, each containing three squares, where each row is shifted one square to the right relative to the row above it, as shown below. In how many ways can the numbers 1 to 300 be placed in the squares (one number per square, each used exactly once) so that the numbers increase from left to right in each row and from top to bottom in each column?