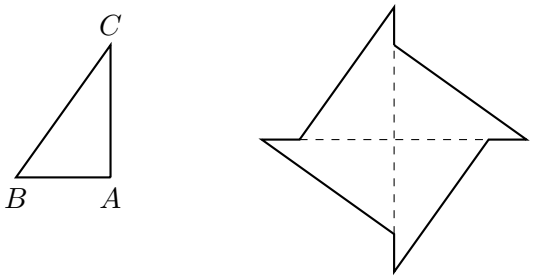
THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

2021 UQ/QAMT Problem Solving Competition - Year 9 & 10 Paper

Two hours allowed. Rulers and non-CAS calculators may be used.
All questions have equal value with marks for working as well as correct answers.

Question 1

Suppose we have a triangle ABC such that the perimeter is 24 cm and three times the length AC equals four times the length AB. Four such triangles are arranged into a 'windmill' figure with no overlaps, as shown. What is the perimeter of this new figure?



Question 2

What are all the pairs of integers (a, b) that satisfy the following three conditions?

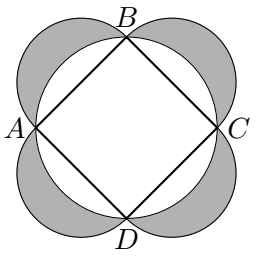
(1) There are three consecutive integers whose product is equal to a;
(2) b is the sum of these three numbers;
(3) a is five times b.

Question 3

Ramiro computed the sum of 99 consecutive odd numbers and obtained 12375. What is the largest number he summed?

Question 4

Suppose the square $ABCD$ is inscribed in a circle. Four semicircles are then drawn with each of the square's sides as a diameter, as shown in the following diagram. If the perimeter of the square is 48 cm, what is the area of the shaded region?



Question 5

What is the smallest positive integer n for which the number $n! = n(n-1)(n-2)\cdots 1$ ends in at least 2021 zeros?