

2022 UQ/QAMT Problem Solving Competition - Year 7 & 8 Paper

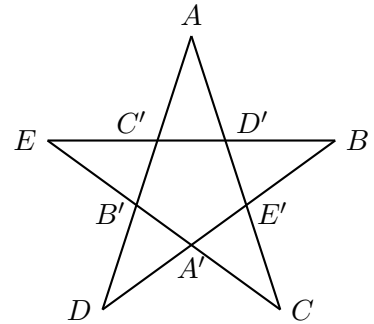
*Two hours allowed. Rulers and non-CAS calculators may be used.
All questions have equal value with marks for working as well as correct answers.*

Question 1

Two identical glasses are placed on a table, one in front of a pessimist and one in front of an optimist. Water is poured separately into the glasses so that the glass of the pessimist is 60% empty, and the glass of optimist is 60% full. The water in the glass of the pessimist is 46 millilitres less than in the optimist's glass. What is the volume of the glasses?

Question 2

The pentagram shown to the right has an outside perimeter of 9 units. Each of the five triangles $AB'C$, $BC'D$, $CD'E$, $DE'A$ and $EA'B$ have perimeters of 6 units. What is the perimeter of the pentagon $A'B'C'D'E'$?



Question 3

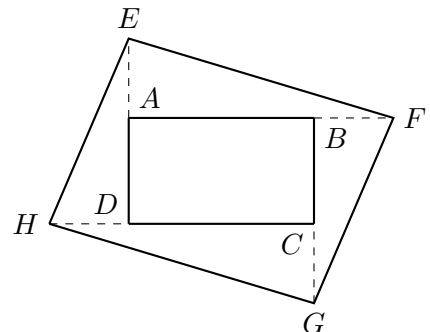
A teacher writes a two-digit number on the whiteboard. Three students in the class each make two statements about the number:

- Veronika says "the number ends with a 6" and "the number is divisible by 7"
- Ramiro says "the number is greater than 26" and "the number ends with an 8"
- Anna says "the number is divisible by 13" and "the number is less than 27"

Suppose each student made one correct statement and one incorrect statement. What number was written on the board?

Question 4

Suppose we have a rectangle $ABCD$ with an area of 1 m^2 . The side DA is extended to a point E , such that the length $|AE| = r|AD|$. The other three sides are also extended, each with the same ratio r , as shown.



If the total area of the new shape $EFGH$ is 25 m^2 , what is the value of r ?

Question 5

When you square the 2-digit number 25 you get 625, so the last two digits give the original number. How many 3-digit numbers n have this property, that the last three digits of n^2 give the original number n ?