

2012 UQ/QAMT Problem Solving Competition - Year 8 Paper

All questions have equal value.

Question 1

Starting with a positive integer n , form the sum of decimal digits of n , then form the sum of digits of this new number and so on, until the process stabilizes. The result is called the *ultimate digital sum* of n . How many integers in the range 1, 2, 3, ..., 2012 have ultimate digital sum equal to 7?

Question 2

George Orwell's novel "1984" begins

It was a bright cold day in April and the clocks were striking thirteen.

The year 1984 is unusual in that there were 5 Wednesdays in February, and exactly three Friday the 13ths in the year, the maximum possible. What is the next such year?

Question 3

How many positive integer solutions x and y are there of the equation $x^2 - y^2 = 75$?

Question 4

The planet Snork is populated by 2 alien species: the Zorks, who always tell the truth, and the Gorks, who always lie. Unfortunately to human eyes the two species look identical. On the planet you meet 3 aliens: Alt, Balt and Calt. Alt and Balt make the following statements:

Alt: Balt and Calt are the same species.

Balt: At least one of Alt and Calt is a Gork.

Which species is Calt?

Question 5

A smaller square is placed inside a larger square. The sides of the two squares are parallel. If the areas marked are as shown, what is the area A ?

