THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

2006 QAMT Problem-Solving Competition - Year 9 & 10 Paper

All questions have equal value.

Question 1
You lay out a 100 m rope flat on the ground in a straight line, anchored at both ends. Now suppose you play out 1 m of slack, so the 101m rope is anchored at both ends, but can be lifted slightly off the ground at the 50 m mark. How high can it be lifted?

Question 2
You have a 20 cm strip of paper that is 1 cm wide, and lots of 1 cm and 2 cm pieces of tape, also 1 cm wide. How many different ways can you cover the paper with the tape (without overlap)?
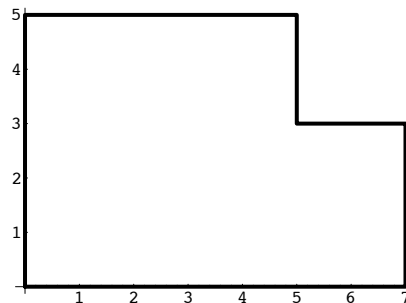
Question 3
In the rectangle ABCD a triangle AEF is drawn, where E lies on BC and F lies on CD, and the triangles ABE, ECF and ADF all have the same area. What is the ratio CF:FD?

Question 4
In front of you is a pile of coins, containing between 1500 and 3000 coins. If you divide it into groups of 7, 11 or 13 each time you have 4 coins left over. How many coins are in the pile?

Question 5
Consider the region in the plane shown in the following diagram. A line $y = mx$ splits the region into two subregions of equal area. What is the value of m?

Question 6
Tamref's First Theorem concerns the equation $n^x + n^y = n^z$ where n, x, y, z are all positive integers. Describe all solutions of this equation.