

## 2009 UQ/QAMT Problem Solving Competition - Year 9 & 10 Paper

*All questions have equal value.*

### Question 1

How many positive integers divide at least one of  $10^{35}$  and  $40^{22}$ ?

### Question 2

You have a bottle and a jug, both containing orange juice. The bottle is one third full, and the jug is one sixth full. Water is added to both containers until they are full, and they are then both poured into a bucket. If the mixture in the bucket is one fifth orange juice, and the capacity of the bottle is 1 litre, what is the capacity of the jug?

### Question 3

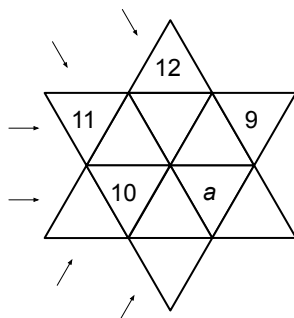
Triangle ABC is isosceles with  $|AB| = |AC|$ . D is a point on AC and E, F are points on AB with  $|AE| = |ED| = |DF| = |FC| = |BC|$ . What is the angle ACE?

### Question 4

What positive integer  $a$  is such that one of the roots of the quadratic equation  $ax^2 - 4x - 4 = 0$  has decimal representation beginning 0.2009...?

### Question 5

A *magic* hexagram has twelve triangles in which the numbers 1 to 12 are placed so that the sum along any of the six lanes is 32. (Each number is used exactly once.) Four numbers have been given in the hexagram below. To make a magic hexagram, what must be the value of  $a$ ?



### Question 6

Among all collections of positive integers whose total sum is 2009, what is the maximum value of their product?