



# 2002 QAMT Competition Year 11 & 12 Paper



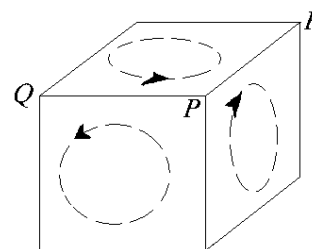
Attempt as many problems as you can in the time allowed. Working and explanations (even for the multiple choice problems) should be set out fully in clear English. The judges will take into consideration the quality of expression and ingenuity of your attempts at solutions.

**You must put your full name and school on all working handed in.**

**Q1. (1 point)** The last two digits of  $2^{222}$  are:

- (A) 84,    (B) 24,    (C) 64,    (D) 04,    (E) 44

**Q2. (1 point)** One ant is placed on each face of a suspended cube. Each ant walks a circuit around the edges of its own face. An edge of the cube is said to be *contested* if the two ants using it do so in opposite directions. Thus, in the diagram, PQ is contested, but PR is not. What is the least possible number of contested edges?



- (A) 2,    (B) 3,    (C) 4,    (D) 5,    (E) 6

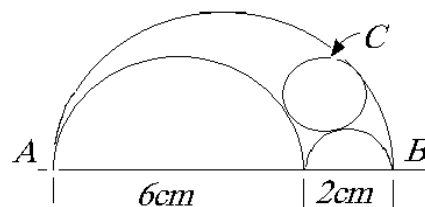
**Q3. (2 points)** Mixture I consists of lemon juice, oil and vinegar in the proportions 1:2:3, while mixture II has them in proportions 3:4:5. Which of the following proportions lemon juice: oil: vinegar is obtainable by combining mixtures I and II?

- (A) 2:5:8,    (B) 4:5:6,    (C) 3:5:7,    (D) 5:6:7,    (E) 7:9:11

**Q4. (2 points)** For which values of the constant  $c$  does there exist a pair of real numbers  $(x, y)$  which satisfies all four conditions:

$$\begin{aligned} 2x + y &< 5 \\ x - y &< 7 \\ 4x - y &> 4 \\ x + y &= c ? \end{aligned}$$

**Q5. (2 points)** You have a semicircle with diameter AB of length 8cm, inside which are drawn non-overlapping semicircles of diameters 6cm and 2cm. A circle C is drawn, touching all three semicircles as shown. Show that the perpendicular distance from the centre of this circle C to the diameter AB is equal to the diameter of the circle C.



**Q6. (2 points)** Find all positive integers  $x, y, z$  where  $x \leq y \leq z$  and

$$\frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx} = \frac{1}{3}$$



Casio Calculators



Comalco



MIM



UQ Maths



UQ Engineering