



2003 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.

Question 1. A credit card number (with 14 digits) is written in the boxes below. If the sum of any three consecutive digits is 20, then what is y ?

1 mark

			9				y				7		
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- A 3 B 4 C 5 D 7 E 9

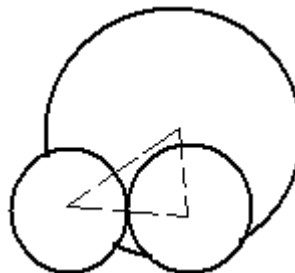
Question 2. If numbers a, b, c satisfy $a+b+c = 0$ and $a^2+b^2+c^2 = 1$ then what is $a^4+b^4+c^4$?

1 mark

- A $1/4$ B $1/2$ C 1 D 4 E None of these

Question 3. Three spheres are just touching each other. The radii of the spheres are 1, 1, and 2 units. What is the area of the triangle joining the centres of the spheres?

1 mark



- A π B $1/2$ C $2/\sqrt{2}$ D $2\sqrt{2}$ E None of these

Question 4: The whole numbers 1 up to 11 are arranged in any order at ten places on the circumference of a circle. Show that there must be three numbers next to each other in the arrangement whose sum is at least 19.

2 marks

Question 5: Find all integer solutions (m, n) to $m^2 + 2mn + 2m + n = m^2n + 1$.

2 marks

Question 6: Consider a rectangle with its vertices all on the boundary of a given triangle T . Let d be the shortest diagonal for any such rectangle. Find the maximum value of:

3 marks

$$\frac{d^2}{Area T} \text{ over all triangles } T.$$

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