2015 UQ/QAMT Problem Solving Competition - Year 7 & 8 Paper

Two hours allowed. All questions have equal value. Non-CAS calculators may be used.

Question 1
A cycling road race involves a team of four cyclists. Three of the team members must be on the road at all times, while the fourth member rests in a van following the team. If each team member is expected to ride the same total distance and the race is 400 km long, what distance does each team member ride?

Question 2
In the figure below the points are all 1 unit apart. What is the area of the triangle ABC?
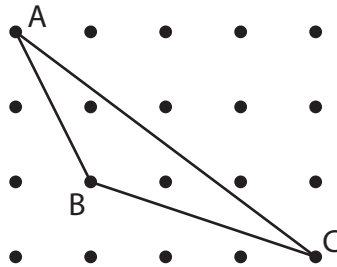
Question 3
Every digit of a given positive integer N is a 3 or a 4. Each occurs at least once. Moreover N is divisible by both 3 and 4. What is the smallest such N?

Question 4
A small pyramid is made from 35 white cubes with a layer of 5×5 cubes on the base, a layer of 3×3 cubes on the middle level, and 1 cube on the top. The complete surface of the pyramid, including the bottom, is painted blue. The figure is then separated into individual cubes. How many of the individual cubes have exactly four blue faces?

Question 5
2014 people are sitting around a circular table, numbered 1 to 2014 clockwise (so #2014 sits next to #1). On the table is a personal destructor beam. Person #1 takes the weapon. At each stage, the person holding the weapon atomizes the next survivor located clockwise of him, and gives the weapon to the next survivor after that. So initially #1 kills #2 and gives weapon to #3. Then #3 kills #4 and gives his weapon to #5, and so on. Eventually #2013 kills #2014 and passes the weapon to #1. Now #1 kills the next person clockwise of him (#3) who is still alive, and passes the weapon to the person after that (#5). Who is the last survivor?

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