The Scottish Mathematical Council

www.scot-maths.co.uk

MATHEMATICAL CHALLENGE 2014−2015

Entries must be the unaided efforts of individual pupils.
Solutions must include explanations and answers without explanation will be given no credit.
Do not feel that you must hand in answers to all the questions.

CURRENT AND RECENT SPONSORS OF MATHEMATICAL CHALLENGE ARE
The Edinburgh Mathematical Society, The Maxwell Foundation, Professor L E Fraenkel, The London Mathematical Society and The Scottish International Education Trust.

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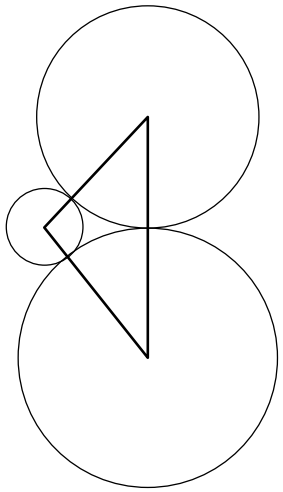
Junior Division: Problems 2

J1. In a singles tennis tournament there are 10 players. The organiser needs to arrange the 10 players into 5 pairs for the first round. In how many ways can this first round be drawn up?

J2.



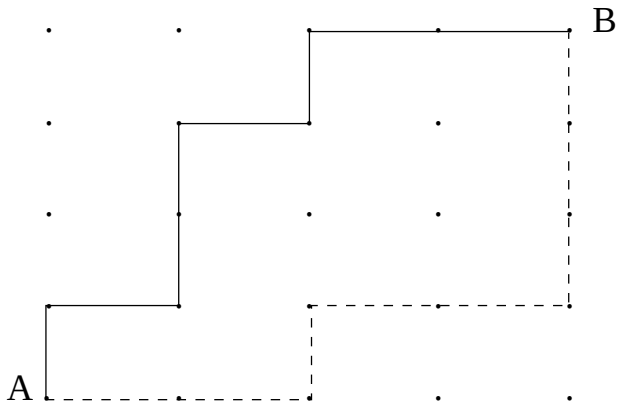
In the diagram (which is not drawn to scale) the lengths of the sides of the triangle are 8, 9 and 13 centimetres. The centres of the circles are at the vertices of the triangle, and the circles just touch. Find the radius of the largest circle.

J3. In a town some of the animals are really strange. Ten percent of the cats think they are dogs, and ten percent of the dogs think they are cats. All the other cats and dogs are perfectly normal. One day I tested all the cats and dogs in the town and found that 20% of them thought that they were cats. What percentage of them really were cats?

J4. The scales of a large fish are made up of arcs of circles with radius r cm. Each row of scales overlaps the row below. The scales within a row just touch, with their centres on a straight line. The next row of scales, which overlaps the previous row, is r cm above the previous row, with the centres of the scales above the points where the scales in the previous row touch.

What is the visible area of a single scale?

J5.



Paths from A to B can **only** proceed upwards or to the right: two example paths from A to B are shown. How many such paths are there from A to B that do not go through the centre dot?

END OF PROBLEM SET 2