# Mathematics Form 11

**English**

1. A coin is tossed a number of times, where the two possibilities “head” and “tail” both have the probability 1/2 of occurring. A and B play the following game. A wins as soon as the combination head, tail directly after each other occurs, while B wins as soon as the combination tail, tail directly after each other occurs. What is the probability that A wins?

2 The points C and D lie on opposite sides of a line which passes through the points A and B. Show that the sum of the angles ACB and ACD is less than 180° if there is a circle such that A and B lie within the circle and C and D lie outside the circle.

3. Show that for every whole number a, the equation $x^2 – y^2 = 8a$ has whole number roots x and y.

4. What is the largest whole number which cannot be written in the form 7a + 10b where a and b are non-negative whole numbers?

5. Consider the set T of all the sub-sets of {1,2,3,4,5,6,7} that contain three elements. A sub-set S of T is said to be sparse if two sets in S contain not more than one joint element. For example, the following sub-set of T is sparse

{{1.2.3},{3.4.5},{5,6,7}}

How large can a sparse sub-set of T be? Indicate such a sub-set of maximum size.