



**UK Maths Trust**

## **Mentoring Scheme**

**Emmy Noether**

### **Sample questions**

These questions are taken from the first sheet and give a good indication of the level of difficulty and prerequisite knowledge required at the start of the programme.

1. 17:36 29/05/84 is a *pandigital* time and date as it uses each of the digits 0 – 9 exactly once.

What is the first pandigital time and date of each century?

2. A triangle has sides of length 13 cm, 14 cm and 15 cm.

(a) Show that this triangle can be split into two right angled triangles with integer side lengths (when measured in centimetres).

(b) A rectangle is drawn inside the triangle, with its base on one of the sides of the triangle.

What is the largest possible area of this rectangle?

3. (a) Aadya cycles down a hill at  $x$  m/s and up the same hill at  $y$  m/s. Barry then estimates her average speed by calculating  $\frac{x+y}{2}$  m/s.

Show that Barry's estimation is always greater than or equal to Aadya's true average speed.

(b) One day, Aadya cycled down the hill at  $x$  m/s and up the hill at 3 m/s. Both  $x$  and the difference between Barry's estimation of Aadya's speed and her true speed are integers.

What are the possible values of  $x$ ?