



**United Kingdom
Mathematics Trust**

Mentoring Scheme

Supported by **Ox**FORD
ASSET MANAGEMENT

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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. Abby holds six pieces of string in her hand with the ends of each of the strings sticking out above and below her hand. Rhiannon ties the upper ends together in pairs, and then does the same with the lower ends. If she ties the pairs randomly, what is the probability that all six pieces of string will form a single loop?

2. Find all pairs of integers x and y such that $xy + 3x - 4y = 29$.

3. Suppose that

$$x + \frac{1}{x} = 5$$

(a) What is the value of

$$x^2 + \frac{1}{x^2}$$

(b) What is the value of

$$x^5 + \frac{1}{x^5}$$