

Please write **Your name:** \_\_\_\_\_

**Show all work:** either write at least a sentence explaining your reasoning, or annotate your math work with brief explanations. Correct answer with no solution will give only a partial credit. There is NO need to simplify, and NO calculators are allowed. You may leave your answer in terms of sums, products, factorials or binomial coefficients, and fractions.

.....

(1) In a group of 3 students, what is the probability that at least two of them have birthday in the same month? Assume that birthdays are independent for different people, and that all months are equally likely.

**Answer:**  $1 - \frac{11 \cdot 10}{12^2} = \frac{17}{72}$

Suppose that we have 3 pens. Each pen can be Red, Blue or Green with equal probability  $1/3$ , and the colors of different pens are independent.

- What is the probability that all pens are Red?

**Answer:**  $1/27$

- What is the probability that all pens of the same color (all Red, or all Blue or all Green)?

**Answer:**  $1/9$

- What is the probability that all pens are of different colors (one Red, one Blue and one Green, in any order)?

**Answer:**  $2/9$