

NAME:

**Problem 1 (5 points):** A TA is teaching two sections of a math class. Section 1 has seven students and section 2 has six students. Three of the section 1 students forgot to staple their homework and four of the section 2 students forgot to staple their homework. The TA chooses a homework at random and notes that it is unstapled. What is the probability that a student from section 1 submitted it?

**Solution:**

$$\Pr[\text{section 1}|\text{unstapled}] = \frac{\Pr[\text{section 1} \cap \text{unstapled}]}{\Pr[\text{unstapled}]} = \frac{\frac{3}{13}}{\frac{7}{13}} = \frac{3}{7}.$$

**Problem 2 (5 points):** There are 3 green balls and 5 blue balls in a jar. A ball is selected at random, its color is noted, and it is replaced. The selection is repeated twice more. Find the probability that fewer than 2 blue balls are selected.

**Solution:** We must add the probability of choosing 0 blue balls to the probability of choosing 1 blue ball. Using the formula for Bernoulli trials, the answer is:

$$C(3,0)\left(\frac{5}{8}\right)^0\left(\frac{3}{8}\right)^3 + C(3,1)\left(\frac{5}{8}\right)^1\left(\frac{3}{8}\right)^2 = 1\left(\frac{3^3}{8^3}\right) + 3\left(\frac{5 \cdot 3^2}{8^3}\right) = \frac{27 + 135}{512} = \frac{162}{512}.$$

**Problem 3 (5 points):** There are 8 balls in a bag: 4 yellow, 2 red, and 2 green. I select two at random: one after the other without replacement. What is the probability that the second is yellow?

**Solution:** Drawing a tree diagram, and adding the probabilities of drawing yellow then yellow, red then yellow, and green then yellow gives:

$$\frac{4}{8} \cdot \frac{3}{7} + \frac{2}{8} \cdot \frac{4}{7} + \frac{2}{8} \cdot \frac{4}{7} = \frac{12}{56} + \frac{8}{56} + \frac{8}{56} = \frac{28}{56} = \frac{1}{2}.$$