Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on a separate sheet of paper.

Conditional probability

1. Suppose that we flip a coin three times, and all eight possibilities are equally likely. Moreover, suppose we know that the event F, that the first flip comes up tails, occurs. Given this information, what is the probability of the event E, that an odd number of tails appears?

Solution: Because the first fip comes up tails, there are only four possible outcomes: TTT, TTH, THT, and THH, where H and H represent heads and tails, respectively. An odd number of tails appears only for the outcomes TTT and THH. Because the eight outcomes have equal probability, each of the four possible outcomes, given that G occurs, should also have an equal probability of $1/4$. This suggests that we should assign the probability of $2/4 = 1/2$ to E, given that F occurs.

$p(E|F) = \frac{p(E \cap F)}{p(F)} = \frac{\frac{2}{8}}{\frac{4}{8}} = \frac{1}{2}$

2. Are events E and F independent?

Solution: $p(E \cap F) = \frac{2}{8} = \frac{4}{8} \cdot \frac{4}{8} = p(E) \cdot p(F)$

3. Exercise 9.3.1 from zyBooks

4. Exercise 9.3.6 from zyBooks