

**SOLUTION TO THE QUESTION FOR MATH 343 FOR
THE LECTURE OF MONDAY 12 APRIL**

Problem 1. Roll one fair standard die. Let E be the event that the roll is even, and let F be the event that the roll is four or more. Find $\Pr(E|F)$. How does it compare with $\Pr(E)$? Are E and F independent?

Solution. We have

$$E = \{2, 4, 6\}, \quad F = \{4, 5, 6\}, \quad \text{and} \quad E \cap F = \{4, 6\}.$$

So

$$\Pr(E) = \frac{3}{6} = \frac{1}{2}, \quad \Pr(F) = \frac{3}{6} = \frac{1}{2}, \quad \text{and} \quad \Pr(E \cap F) = \frac{2}{6} = \frac{1}{3}.$$

Therefore

$$\Pr(E|F) = \frac{\Pr(E \cap F)}{\Pr(F)} = \frac{\left(\frac{1}{3}\right)}{\left(\frac{1}{2}\right)} = \frac{2}{3}.$$

This answer is different from $\Pr(E) = \frac{1}{2}$ (it is larger), so E and F are not independent. □