Solution to PS # 1.0, Fall 2002
EECE-340, Probability and Statistics

1. The sample space associated with throwing a die is $S = \{1, 2, \ldots 6\}$.

2. Using relative frequency interpretation, probability of obtaining an even number on any trial is given by

$$\begin{aligned} P(2 \text{ or } 4 \text{ or } 6) &= P(2) + P(4) + P(6) \\ &= 0.1690 + 0.1740 + 0.1650 \\ &= 0.5080 \end{aligned}$$

   Theoretically the probability of getting the number 4 on any given trial is given by

$$\Pr(4) = \frac{\text{card}(\{4\})}{\text{card}(S)} = \frac{1}{6} = 0.167.$$

   Theoretically the probability of getting an even number is given by:

$$\Pr(2, 4, 6) = \frac{\text{card}(\{2, 4, 6\})}{\text{card}(S)} = \frac{3}{6} = 0.5$$

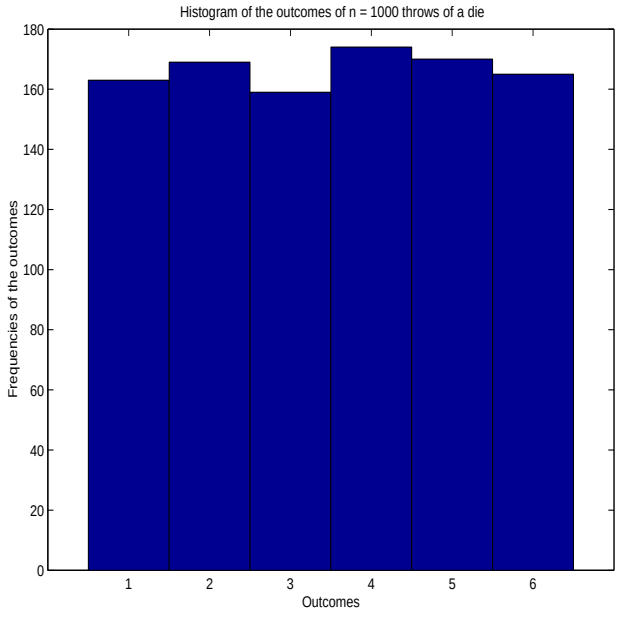
   Similarly, the probability of obtaining a multiple of 3 on any trial is given by

$$\begin{aligned} P(3 \text{ or } 6) &= P(3) + P(6) \\ &= 0.1590 + 0.1650 \\ &= 0.3240 \end{aligned}$$

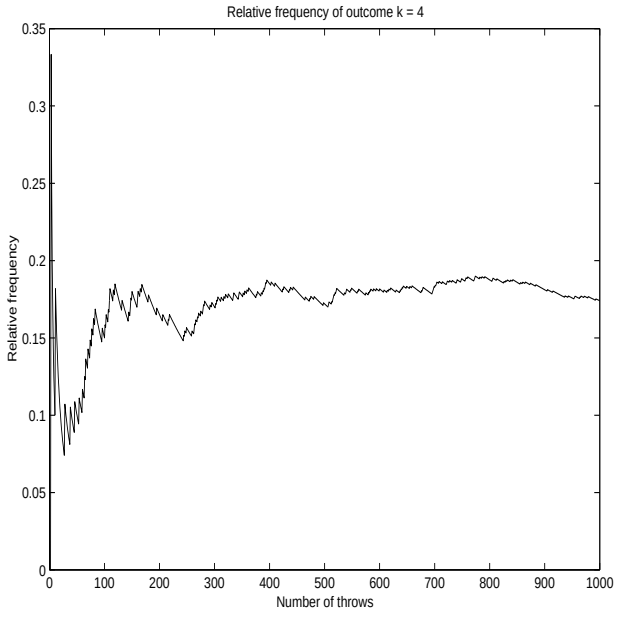
   Theoretically the probability of getting a multiple of 3 on any given trial is given by:

$$\Pr(3, 6) = \frac{2}{6} = 0.333.$$

Note that eventhough these theoretical probabilities were calculated using the set-theoretical approach, for the relative frequency estimate of probability to be reliable the die must be tossed a large number of times.



(a)



(b)

Figure 1: Die throw experiment: (a) histogram of frequencies for each outcome after $n = 1000$ throws of the die, (b) relative frequency of the outcome 4 as a function of the number of trials.