## Section 7.2

## Estimated Probability

When an experiment is performed a number of times, the estimated probability or relative frequency of an event $E$ is the fraction of times that the event $E$ occurs. If the experiment is performed $N$ times and the event $E$ occurs $f r(E)$ times, then the estimated probability is given by

$$
P(E)=\frac{f r(E)}{N}
$$

The number $f r(E)$ is called the frequency of $E$. $N$, the number of times that the experiment is performed, is called the number of trials or the sample size.

Problem 1. The following table shows the frequency of outcomes when two indistinguishable coins were tossed 4000 times and the uppermost faces were observed.

| Outcome | HH | HT | TH | TT |
| :---: | :---: | :---: | :---: | :---: |
| Frequency | 1100 | 950 | 1200 | 750 |

a) Determine the relative frequency distribution.
b) What is the relative frequency that the second coin lands with heads up?
c) What is the relative frequency that tails comes up at least once?

Problem 2. The following table shows the crashworthiness ratings for 10 small SUVs. ( $3=$ Good, 2 =Acceptable, $1=$ Marginal, $0=$ Poor)

| Frontal Crash Test Rating | 3 | 2 | 1 | 0 |
| ---: | :--- | :--- | :--- | :--- |
| Frequency | 1 | 4 | 4 | 1 |

a) Find the relative frequency distribution for the experiment of choosing a small SUV at random and determining its frontal crash rating.
b) What is the relative frequency that a randomly selected small SUV will have a crash test rating of "Acceptable" or better?

Problem 3. The following table shows the result of a survey of 100 authors by a publishing company.

|  | New Authors | Established Authors | Total |
| ---: | :---: | :---: | :---: |
| Successful | 5 | 25 | 30 |
| Unsuccessful | 15 | 55 | 70 |
| Total | 20 | 80 | 100 |

Compute the relative frequencies of the given events if an author as specified is chosen at random.
a) An author is established and successful.
b) An author is a new author.
c) An author is unsuccessful.
d) A successful author is established.
e) An established author is successful.

