Chapter 4
Introduction to Probability

Learning Objectives

1. Understand probability as a numerical measure of the likelihood of occurrence.

2 Counting Rule:Combination and Permutation

3 Basic Relationship of Probability (Complement, Intersection, Union, Independence of two events)

4 Conditional Probability

5 Bayes' Theorem

Solutions:

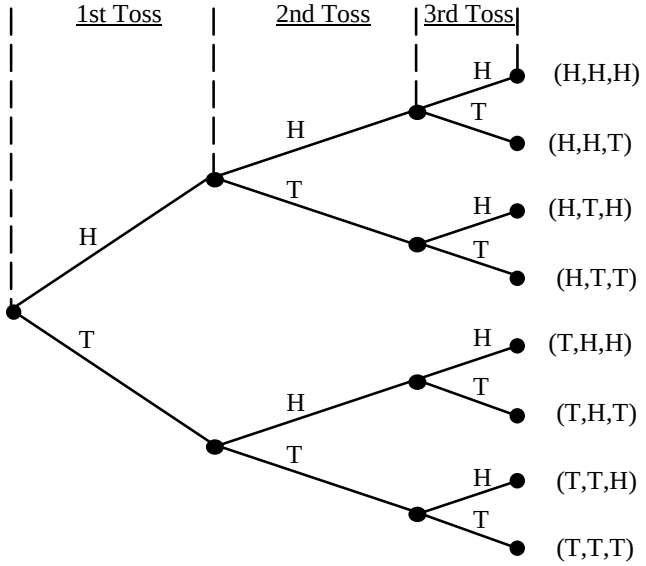
2. $\binom{6}{3} = \frac{6!}{3!3!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{(3 \cdot 2 \cdot 1)(3 \cdot 2 \cdot 1)} = 20$

ABC	ACE	BCD	BEF
ABD	ACF	BCE	CDE
ABE	ADE	BCF	CDF
ABF	ADF	BDE	CEF
ACD	AEF	BDF	DEF

3. $P_3^6 = \frac{6!}{(6-3)!} = (6)(5)(4) = 120$

BDF BFD DBF DFB FBD FDB

4. a.



b. Let: H be head and T be tail

(H,H,H) (T,H,H)
(H,H,T) (T,H,T)
(H,T,H) (T,T,H)
(H,T,T) (T,T,T)

c. The outcomes are equally likely, so the probability of each outcomes is 1/8.

11. a. Total drivers = 858 + 228 = 1086

$P(\text{Seatbelt}) = \frac{858}{1086} = .79$ or 79%

b. Yes, the overall probability is up from .75 to .79, or 4%, in one year. Thus .79 does exceed his .78 expectation.

c. Northeast $\frac{148}{200} = .74$

Midwest $\frac{162}{216} = .75$

South $\frac{296}{370} = .80$

West $\frac{252}{300} = .84$

The West with .84 shows the highest probability of use.

d. Probability of selection by region:

Northeast $\frac{200}{1086} = .184$

Midwest $\frac{216}{1086} = .200$

South $\frac{370}{1086} = .340$

West $\frac{300}{1086} = .286$

South has the highest probability (.34) and West was second (.286).

e. Yes, .34 for South + .286 for West = .626 shows that 62.6% of the survey came from the two highest usage regions. The .79 probability may be high.

If equal numbers for each region, the overall probability would have been roughly

$$\frac{.74 + .75 + .80 + .84}{4} = .7825$$

Although perhaps slightly lower, the .78 to .79 usage probability is a nice increase over the prior year.