pg. 35

2) 120
3) 4495
4) 60 or 10
5) 95,040
6) 635,013,559,600 6.35013596E11
7) 2,024

Modeling Probability

- Many times, all the possible outcomes will be *equally likely*. We can develope mathematical models of theoretical probability.
  - It's equally likely to get any one of six outcomes from the roll of a fair die.
  - It's equally likely to get heads or tails from the toss of a fair coin.
- However, keep in mind that events are *not* always equally likely.
  - A skilled basketball player has a better than 50-50 chance of making a free throw.

Modeling Probability

- A random phenomenon is a situation in which we know what outcomes could happen, but we don't know which particular outcome did or will happen.
- Each occasion upon which we observe a random phenomenon is called a trial.
- At each trial, the value of the random phenomenon is called an outcome.
- When we combine outcomes, the resulting combination is an event.
- The collection of *all possible outcomes* is called the sample space.

Modeling Probability (cont.)

- The probability of an event is the number of outcomes in the event divided by the total number of possible outcomes.

$$P(\mathbf{A}) = \frac{\#\text{ of outcomes in } \mathbf{A}}{\#\text{ of possible equally likely outcomes}}$$

- Before you count outcomes to find a probability, be sure to check the

  Equally Likely Condition: The outcomes being counted are all equally likely to occur.

Basics of Probability

(tree diagrams, list of sets)

1. Sample Space → the set of all possible ways in which a probability experiment can turn out.
   a. Biased Sample → one or more parts of the population are favored over others
   b. Unbiased Sample → every possible sample has an equal chance of being selected

2. Favorable Outcomes (successes) → the number of outcomes that will make an event occur.

   Notation: $P(E) = \dfrac{\text{number of favorable outcomes}}{\text{total possible outcomes}}$

   P(E) → probability of an event

3. Some probability facts:

   a. P(E) ranges from 0 to 1
   or 0 to 100%

   b. P(E) = 0 if event E is impossible

   c. P(not E) = 1 - P(E)

   d. P(E) = 1 is event E is certain (definite)
   100%

   e. If events A and B have no successful outcomes in common, then

   add

   P(A or B) = P(A) + P(B) (called **mutually exclusive or disjoint** events)

   f. If events A and B have outcomes in common that are successes for both events, then

   P(A or B) = P(A) + P(B) - P(A and B)

   g. P(A and B) = P(A) * P(B)
   mult.

B. Theoretical Probability → what is expected to occur in an experiment. What **should** happen.

C. Experimental Probability → estimated from observed simulations or experiments. What **actually** happened.

Examples Using Theoretical Probability

1. A jar contains 2 red marbles, 3 white marbles, and 4 black marbles. If one marble is chosen at random, find

a. P(red) = $2/9$

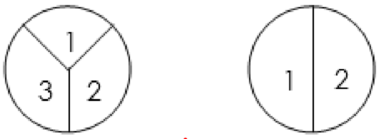
b. P(red or white) = $2/9 + 3/9 = 5/9$

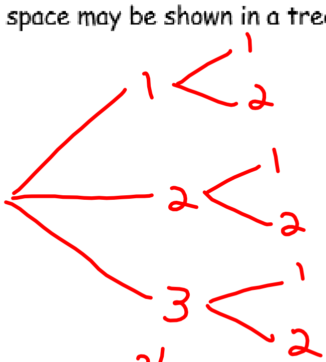
c. P(green) = 0

d. P(not red) = $7/9$

Many Stage Experiments:
1. tossing 2 coins
2. tossing 2 die
3. tossing a coin and tossing a die

3. Consider spinning each spinner once. The sample space may be shown in a tree diagram:





3 x 2

There are a total of 6 outcomes.

Find the probability of

a. P(3, 2) = 1/6

b. P(both odd) = 2/6
1,1 or 3,3

c. P(at least one even) = 4/6
1 or 2
1,2 2,1 2,2 3,2

d. P(at most one even) = 5/6
0 or 1 Even

e. P(odd, then even) = 2/6
1,2 3,2

Homework:

pg 43

#4, 6, 7, 8, 9, 11,