MA 110 SECTION 8.1: SAMPLE SPACES, EVENTS, & PROBABLILITES
HOMEWORK: 1, 3, 5, 7, 9, 23, 29, 37, 39, 41, 43, 51, 89, 91

1. **SAMPLE SPACE:** The set of all simple outcomes that can occur for a given experiment.

2. **EXAMPLES:**

   A. **EXPERIMENT: TOSS A COIN**

   B. **EXPERIMENT: ROLL A SIX-SIDED DIE**

   C. **EXPERIMENT: BUILD A BEAR** *A tree diagram can help determine all the possible outcomes. You can use the multiplication principle to count the number of possible outcomes.*

   At the Build-A-Bear store you have the choice of three animals: bear, hippo, or monkey. You can dress your animal in your choice of six outfits: cheerleader, police officer, princess, football player, soccer player, or ballerina.

3. **EVENT:** Any subset of sample space S.

   A. E is **simple** event if E contains only one element.
   B. E is a **compound event** if E contains more than one element.
   C. Event E is said to occur if any of the simple events in E occur.

4. **EXAMPLE:** *Referring to the above sample from experiment C.*

   A. E = {An even die was rolled.} =

   B. F = {A head was tossed.} =

   C. Both E and F are both compound events. A simple event would contain just one element – so you would have to specify the result of the coin and die toss, say a tail was tossed and a 4 was rolled. G= {T4}

5. **PROBABILITY OF THE EVENT (IN A SAMPLE SPACE):**

If S = { e_1, e_2, …, e_n} $P(e_i)$ is the probability of the event, then

1. $0 \leq P(e_i) \leq 1$
2. $P(e_1) + P(e_2) + …. + P(e_n) = 1$

If both conditions are met, you have an **acceptable probability assignment**

6. When we make probability assignments, we assign reasonable expected probabilities.

A. **Exp A:** S = {Head, Tail} then P(Head) = P(Tail) =

B. **Exp B:** S = {1, 2, 3, 4, 5, 6} then P(1) = P(2) = …. = P(6) =

C. **Exp C:** S = { BC, BPO, BP, BF, BS, BB, HC, HPO, HP, HF, HS, HB, MC, MPO, MP, MFM, MS, MB}

then P(each choice) =

7. **PROBABILITY OF AN ARBITRARY EVENT E P(E).**

A. If E is the empty set P(E) = 0

B. If E is a simple event, then the probability has been defined by the probability assignment of the sample space.

C. If E is a compound event, then P(E) is the sum of the probabilities of the simple events in E.

D. If E = S, then P(E) = P(S) = 1

8. **EQUALLY LIKELY ASSUMPTION: If a sample space S contains n elements all of which we assume is equally likely to occur, then we assign the probability of 1/n to each simple event.**

The probability of an arbitrary event E under an equally likely assumption is P(E) = n(E)/n(S).

9. **EXAMPLES:**

A. For S = { 1, 2, 3, 4, 5, 6} E = " a number greater than 2"

P(E) =

B. For S = { BC, BPO, BP, BF, BS, BB, HC, HPO, HP, HF, HS, HB, MC, MPO, MP, MFM, MS, MB}

E = {A sports animal} =

F = {A princess animal} =

P(E) =

P(F) =

10. A fair die is painted so that 3 sides are red, 2 sides are white, and 1 side is blue. The die is rolled once. Find the probability that

   i. The top side is red or white

   ii. The top side is not white

11. Six popular brands of cola are to be used in a blind taste study for consumer recognition.

   i. If 3 distinct brands are chosen at random form the 6 and if a consumer is not allowed to repeat any answers, what is the probability that all 3 brands could be identifies by just guessing?

   ii. If repeats are allowed in the 3 brands chosen at random from the 6 and if the consumer is allowed to repeat answers, what is the probability of correct identification of all 3 by just guessing?

12. A 4-person grievance committee is to be composed of employees in 2 departments, A and B, with 15 and 20 employees, respectively. If the 4 people are selected at random from the 35 employees, what is the probability of selecting

   i. 3 from A and 1 from B?

   ii. 2 from A and 2 from B?

   iii. All from A?