

**Week in Review—Additional Material sections 7.1, 7.2, and 7.3**

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**Section 7.1: Experiments, Sample Spaces, and Events.**

- An **experiment** is an activity with observable results.
  - **Sample space**,  $S$ , is the set consisting of all possible outcomes of an experiment.
  - The outcomes of an experiment are also called **sample points**.
  - An **event** is a subset of a sample space.
    - The impossible event is the empty set
    - The certain event is the sample space.
  - The events  $E$  and  $F$  are mutually exclusive if  $E \cap F = \phi$ .
1. Suppose a card is randomly drawn from a standard deck of cards and the face value (denomination) is recorded. Find the sample space.
  2. An experiment consists of selecting a letter at random from the letters in the word **REPRESENTATIVE** and observing the outcome.
    - (a) Describe an appropriate sample space.
    - (b) How many events does this sample space have?
    - (c) Describe the event “the letter selected was a vowel”.
  3. An experiment consists of picking an integer from 0 to 10.
    - (a) Describe an appropriate sample space.
    - (b) Describe the event  $E$  that the number picked was even.
    - (c) Describe the event  $F$  that the number was a multiple of 3.
    - (d) Describe the event  $G$  that the number was a multiple of 5.
    - (e) Describe the event  $H$  that the number was odd and greater than 5.
    - (f) Find the event  $F^C \cap (H \cup G)$ .
    - (g) Which pairs of event,  $E$ ,  $F$ ,  $G$ , and  $H$  are mutually exclusive?
    - (h) If the number 6 was picked, which of the events  $E$ ,  $F$ ,  $G$  and  $H$  occurred?
  4. The numbers 0, 1, 2, 3, 4 are on separate pieces of paper in a hat. Two pieces of paper are drawn at the same time and the product of the numbers is recorded. Find the sample space.
  5. Three quarters, four dimes and a nickel are in a piggy bank. Two coins are drawn at the same time and the total dollar amount is recorded.
    - (a) Find the sample space.
    - (b) describe the event a quarter is drawn.
    - (c) Describe the event the total is less than \$0.33.

**Section 7.2: Definition of Probability.****Section 7.3: Rules of Probability.**

- the relative frequency,  $\frac{m}{n}$ , means in  $n$  trials,  $E$  occurs  $m$  times.
- for large number of trials, the relative frequency will approach the empirical probability.
- probability properties
  - $0 \leq$  probability of any outcome(simple event)  $\leq 1$ .
  - the sum of the probability of all of the outcomes is 1
- a probability distribution is a chart that shows the outcomes and the probability associated to each outcome.
- For a uniform (equally likely) sample space, each outcome will have the same probability,  $\frac{1}{n(S)}$ .
- To find the probability of an event  $E$ , add the probabilities of all of the outcomes in the event.
- Probability formulas
  - $P(E \cup F) = P(E) + P(F) - P(E \cap F)$
  - if  $E$  and  $F$  are mutually exclusive then  $P(E \cap F) = 0$
  - $P(E \cup F \cup G) = P(E) + P(F) + P(G) - P(E \cap F) - P(E \cap G) - P(F \cap G) + P(E \cap F \cap G)$
  - $P(E) + P(E^C) = 1$  or  $P(E) = 1 - P(E^C)$

6. A sample of 100 college students were asked their party affiliation and whether they favor state lottery money used for welfare.

	Favor	Not Favor	Unsure
Democrat	23	6	7
Republican	14	25	4
Independent	18	3	0

A person is selected at random from the sample. What is the probability the person

- (a) Does not favor the use of lottery money for welfare?
  - (b) Is a Republican?
  - (c) Is an Independent who is not sure?
7. One card is selected from a standard deck of cards. What is the probability that the card is a heart or a face card?
8.  $S$  is the sample space with events:  $A$ ,  $B$ , and  $C$ . Use this information to answer these questions.

$$S = \{s_1, s_2, s_3, s_4, s_5, s_6, s_7, s_8\}$$

$$A = \{s_1, s_2, s_5, s_6, s_8\}$$

$$B = \{s_1, s_2, s_4, s_5\}$$

$$C = \{s_3, s_5, s_7\}$$

$$P(C) = \frac{12}{43}$$

outcome	$s_1$	$s_2$	$s_3$	$s_4$	$s_5$	$s_6$	$s_7$	$s_8$
prob.	$\frac{2}{43}$	$\frac{7}{43}$	$\frac{1}{43}$	$\frac{11}{43}$	$\frac{6}{43}$	$\frac{2}{43}$		

- (a)  $P(s_7) =$   
 $P(s_8) =$
  - (b)  $P(A^C) =$
  - (c)  $P(A \cap B) =$
9. A jar contains six red marbles numbered 1 to 6 and eleven purple marbles numbered 1 to 11. A marble is drawn at random from the jar. Find the probability that
- (a) the marble is purple.
  - (b) the marble is even.
  - (c) the marble is purple or even.
10. If  $P(E^C) = .4$ ,  $P(F \cap E^C) = .1$ , and  $P(F) = .5$  compute the following.
- (a)  $P(E \cup F) =$
  - (b)  $P(F^C \cap E) =$