

## STAT 340

### Chapter 9 – Practice Questions

#### Part I

1. A couple has two children. Assume the chances that the couple has a boy or girl are the same.

- a. What is the sample space for the genders of the 2 children?

$S = \{ (\text{boy, boy}), (\text{girl, girl}), (\text{boy, girl}), (\text{girl, boy}) \}$

- b. What is the sample space for the number of girls?

$(\text{boy, boy}) - 0, (\text{girl, girl}) - 2, (\text{boy, girl}) - 1, (\text{girl, boy}) - 1$

The sample space is  $\{0, 1, 2\}$

- c. What is the probability that the couple has one boy and a girl?

Possible outcomes are  $(\text{boy, girl})$  and  $(\text{girl, boy})$

$$\frac{2}{4} = 0.5$$

- d. What is the probability that the couple has two boys?

Possible outcome is  $(\text{boy, boy})$

$$\frac{1}{4} = 0.25$$

- e. What is the probability that the children are of the same gender?

Possible outcomes are  $(\text{boy, boy})$  and  $(\text{girl, girl})$

$$\frac{2}{4} = 0.5$$

2. A couple has 3 children. Assume the chances that the couple has a boy or girl are the same.

- a. What is the probability that the couple has exactly 2 girls?

Let B = boy and G = girl

Sample Space  $S = \{ \text{BBB, BBG, BGB, GBB, GGG, GGB, GBG, BGG} \}$

$G = \{ \text{The couple has exactly 2 girls} \} = \{ \text{GGB, GBG, BGG} \}$

$$P(G) = \frac{3}{8} = 0.375$$

- b. What is the probability that the couple does not have exactly two girls?

$$P(G') = 1 - P(G)$$

$$P(G') = 1 - \frac{3}{8} = 0.625$$

3. Fit each probability to its description.

0.0, 0.02, 0.85, 1.0

- Impossible, this event will never happen: **0.0**
- Certainly, this event will always happen: **1.0**
- Very unlikely, but this event does happen once in a while: **0.02**
- Likely, this event happens more often than not: **0.85**

4. The following table gives the probability for grades.

|   |      |
|---|------|
| A | 0.25 |
| B | 0.30 |
| C | 0.20 |
| D | 0.15 |
| F | 0.05 |

- Is this a good/valid probability model?  
 $0.25 + 0.30 + 0.20 + 0.15 + 0.05 = 0.95$   
 No, the probabilities do not add to 1.
- Find  $P(C \text{ or better})$ .  
 $P(A) + P(B) + P(C) = 0.25 + 0.30 + 0.20 = 0.75$

5. Let  $X$  be the number of glasses of soda consumed by an adult on a typical day. The researcher found the following probability model for  $X$ .

|             |      |      |      |      |    |
|-------------|------|------|------|------|----|
| $X$         | 0    | 1    | 2    | 3    | 4+ |
| Probability | 0.52 | 0.28 | 0.09 | 0.04 | ?  |

Consider the following two events.

$A = \{\text{number of glasses of soda is 1 or greater}\}$

$B = \{\text{number of glasses is less than 2}\}$

- What is  $P(4+)$ ?  
 $P(X = 4+) = 1 - (0.52 + 0.28 + 0.09 + 0.04) = 0.07$
- What outcomes make up event A? What is  $P(A)$ ?  
 $A = \{1, 2, 3, 4+\}$   
 $P(A) = P(X = 1) + P(X = 2) + P(X = 3) + P(X = 4+) = 0.28 + 0.09 + 0.04 + 0.07 = 0.48$
- What outcomes make up event B? What is  $P(B)$ ?  
 $B = \{0, 1\}$   
 $P(B) = P(X = 0) + P(X = 1) = 0.52 + 0.28 = 0.80$
- What outcomes make up the event “A or B”? What is  $P(A \text{ or } B)$ ?  
 $A \text{ or } B = \{0, 1, 2, 3, 4+\} = S$   
 $P(A \text{ or } B) = P(S) = 1$
- Why is  $P(A \text{ or } B)$  not equal to  $P(A) + P(B)$ ?  
 A and B are NOT disjoint events as they have a common outcome 1.

