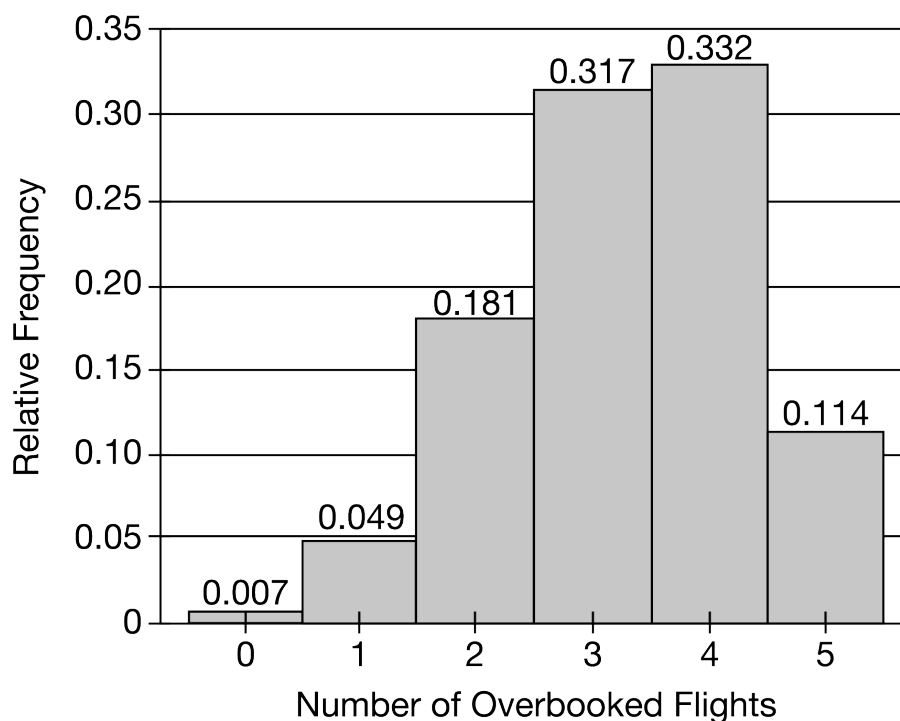


**Unit 4 Progress Check: MCQ Part A**

1. A consumer group is investigating the number of flights at a certain airline that are overbooked. They conducted a simulation to estimate the probability of overbooked flights in the next 5 flights. The results of 1,000 trials are shown in the following histogram.



Based on the histogram, what is the probability that at least 4 of the next 5 flights at the airline will be overbooked?

- (A) 0.114  
(B) 0.332  
(C) 0.446  
(D) 0.500  
(E) 0.886

**Answer C**

Correct. The sum of the relative frequencies of the bars for 4 and 5 is 0.446.

2. Consider rolling two number cubes, each of which has its faces numbered from 1 to 6. The cubes will be rolled and the sum of the numbers landing face up will be recorded. Let the event E represent the event of rolling a sum of 5. How many outcomes are in the collection for event E?

**Unit 4 Progress Check: MCQ Part A**

- (A) One
- (B) Two
- (C) Four
- (D) Five
- (E) Six

**Answer C**

Correct. There are four outcomes that sum to 5: 1 and 4, 4 and 1, 2 and 3, 3 and 2.

3. In a certain population of birds, about 40 percent of the birds have a wingspan greater than 10 inches. Biologists studying the birds will create a simulation with random numbers to estimate the probability of finding 1 bird in a sample of 6 birds with a wingspan greater than 10 inches. Which of the following assignments of the digits 0 to 9 will model the population?
- (A) Let the even digits represent birds with a wingspan greater than 10 inches and the odd digits represent birds with a wingspan less than or equal to 10 inches.
  - (B) Let the digits 0 and 1 represent birds with a wingspan greater than 10 inches and the remaining digits represent birds with a wingspan less than or equal to 10 inches.
  - (C) Let the digits from 0 to 2 represent birds with a wingspan greater than 10 inches and the remaining digits represent birds with a wingspan less than or equal to 10 inches.
  - (D) Let the digits from 0 to 3 represent birds with a wingspan greater than 10 inches and the remaining digits represent birds with a wingspan less than or equal to 10 inches.
  - (E) Let the digits from 0 to 4 represent birds with a wingspan greater than 10 inches and the remaining digits represent birds with a wingspan less than or equal to 10 inches.

**Answer D**

Correct. The four digits 0, 1, 2, and 3 represent 40% of the 10 digits and would model 40% of the population.

4. Each person in a group of twenty people at a hotel orders one meal chosen from oatmeal, eggs, or pancakes and one hot beverage chosen from coffee or tea. One person will be selected at random from the twenty people. What is the sample space for the meal and beverage for the person selected?

**Unit 4 Progress Check: MCQ Part A**

- (A)  $\{(\text{oatmeal, coffee}), (\text{oatmeal, tea}), (\text{eggs, coffee}), (\text{eggs, tea}), (\text{pancakes, coffee}), (\text{pancakes, tea})\}$  ✓
- (B)  $\{(\text{oatmeal, pancakes}), (\text{oatmeal, eggs}), (\text{eggs, pancakes}), (\text{coffee, tea})\}$
- (C)  $\{(\text{coffee, tea, oatmeal}), (\text{coffee, tea, eggs}), (\text{coffee, tea, pancakes})\}$
- (D)  $\{\text{oatmeal, coffee, pancakes, eggs, tea}\}$
- (E)  $\{(\text{oatmeal, eggs, pancakes}), (\text{coffee, tea})\}$

**Answer A**

Correct. There are three possible selections for a meal and two possible selections for a beverage, so there are  $3 \times 2 = 6$  ways of pairing a meal with a beverage. The sample space is a set of all six possible outcomes of one meal with one beverage.

5. At Mike's favorite coffee shop, the coffee of the day is either a dark roast, a medium roast, or a light roast. From past experience, Mike knows that the probability of the coffee being a light roast is 0.15 and the probability of the coffee being a dark roast is 0.25. What is the probability of the coffee of the day not being a light roast or a dark roast on the next day that Mike visits the coffee shop?
- (A) 0.15
- (B) 0.25
- (C) 0.40
- (D) 0.60 ✓
- (E) 0.85

**Answer D**

Correct. The event of the coffee not being a light roast or a dark roast is the complement of the event of the coffee being either a light roast or a dark roast, which is the same as the coffee being a medium roast (since there are only three options). The probability of the coffee being either a light roast or a dark roast is  $0.25 + 0.15 = 0.40$ , so the probability of the complement is  $1 - 0.40 = 0.60$ .

6. Amy has 12 brown golf tees, 8 white golf tees, 10 red golf tees, 6 blue golf tees, and 12 green golf tees in her golf bag. If she selects one of the tees from the bag at random, what is the probability that she selects a tee that is not brown or blue?

**Unit 4 Progress Check: MCQ Part A**

(A)  $\frac{3}{8}$

(B)  $\frac{5}{8}$

(C)  $\frac{21}{32}$

(D)  $\frac{3}{4}$

(E)  $\frac{7}{8}$

**Answer B**

Correct. There are 48 total tees in the bag, and 30 of the tees are a color other than brown or blue, so the probability is  $\frac{30}{48} = \frac{5}{8}$ .

7. A business journal reports that the probability that Internet users in the United States will use a mobile payment app is 0.60. The journal claims this indicates that out of 5 randomly selected Internet users, 3 will use the mobile payment app.

Is the business journal interpreting the probability correctly?

(A) No, because the Internet users are not independent of each other.

(B) No, because only 60% of all people use the Internet.

(C) No, because 0.60 represents probability in the long run for many Internet users.

(D) Yes, because Internet users are selected at random.

(E) Yes, because 3 out of 5 is equal to 60%.

**Answer C**

Correct. When surveying many Internet users, the long-run relative frequency of using the mobile payment app is 0.60, or 3 out of 5. Such a ratio does not necessarily apply to a single observation of 5 Internet users.

8. A financial analyst reports that for people who work in the finance industry, the probability that a randomly selected person will have a tattoo is 0.20.

Which of the following is the best interpretation of the probability 0.20 ?

**Unit 4 Progress Check: MCQ Part A**

- (A) For all workers in the United States, 20% will work in finance.
- (B) For all finance workers, 20% will have a tattoo. ✓
- (C) For all people with tattoos, 20% will work in finance.
- (D) For a specific group of 5 finance workers, 1 will have a tattoo.
- (E) For a specific group of 5 people with a tattoo, 1 will work in finance.

**Answer B**

Correct. In the long run, 0.20 is the relative frequency at which a finance worker will have a tattoo.

9. A certain spinner is divided into 6 sectors of equal size, and the spinner is equally likely to land in any sector. Four of the 6 sectors are shaded, and the remaining sectors are not shaded.

Which of the following is the best interpretation of the probability that one spin of the spinner will land in a shaded sector?

- (A) For many spins, the long-run relative frequency with which the spinner will land in a shaded sector is  $\frac{1}{3}$ .
- (B) For many spins, the long-run relative frequency with which the spinner will land in a shaded sector is  $\frac{1}{2}$ .
- (C) For many spins, the long-run relative frequency with which the spinner will land in a shaded sector is  $\frac{2}{3}$ . ✓
- (D) For 6 spins, the spinner will land in a shaded sector 4 times.
- (E) For 6 spins, the spinner will land in a shaded sector 2 times.

**Answer C**

Correct. The spinner has 6 possible outcomes. There are 4 outcomes where the spinner will land in a shaded sector. In the long run, the relative frequency with which the spinner lands in a shaded sector is  $\frac{2}{3}$ .

10. At a local elementary school, 35 percent of all students have brown eyes, 45 percent have brown hair, and 60 percent have brown hair or brown eyes. A student will be selected at random from the school. Let  $E$  represent the event that the selected person has brown eyes, and let  $H$  represent the event that the selected person has brown hair.

Are  $E$  and  $H$  mutually exclusive events?

## Unit 4 Progress Check: MCQ Part A

- (A) Yes, because  $P(E \cap H) = 0$ .
- (B) Yes, because  $P(E \cap H) = 0.2$ .
- (C) Yes, because  $P(E \cap H) = 0.6$ .
- (D) No, because  $P(E \cap H) = 0.2$ .
- (E) No, because  $P(E \cap H) = 0.6$ .



## Answer D

Correct. If  $E$  represents the event that the selected student has brown eyes and  $H$  represents the event that the selected student has brown hair, then

$P(E \cap H) = P(E) + P(H) - P(E \cup H) = 0.35 + 0.45 - 0.60 = 0.20$ . Because the probability  $P(E \cap H)$  is not equal to 0, the events are not mutually exclusive.

11. The students at a certain high school have an elective period, where each student chooses an elective from among four options. The following table shows the number of students who selected each elective for the 1,500 students at the high school.

Art	Music	Physical Education	Engineering	Total
385	365	380	370	1,500

One student from the school will be selected at random. What is the probability the selected student chose the art elective and the music elective?

- (A) 0

(B)  $\frac{385}{1,500}$

(C)  $\frac{365}{750}$

(D)  $\frac{750}{1,500}$

(E)  $\frac{385}{750}$



## Answer A

Correct. Choosing the art elective and choosing the music elective cannot occur at the same time because the total number of students in the four electives is equal to the total number of students in the high school, which indicates that no student selected more than one elective. They are mutually exclusive

## Unit 4 Progress Check: MCQ Part A

events, so the probability of choosing a student in both art and music is 0.

12. A survey of people on pizza preferences indicated that 55 percent preferred pepperoni only, 30 percent preferred mushroom only, and 15 percent preferred something other than pepperoni and mushroom. Suppose one person who was surveyed will be selected at random. Let  $P$  represent the event that the selected person preferred pepperoni, and let  $M$  represent the event that the selected person preferred mushroom.

Are  $P$  and  $M$  mutually exclusive events for the people in this survey?

- (A) Yes, because the joint probability of  $P$  and  $M$  is greater than 0.  
(B) Yes, because the joint probability of  $P$  and  $M$  is greater than 1.  
(C) Yes, because the joint probability of  $P$  and  $M$  is equal to 0. ✓  
(D) No, because the joint probability of  $P$  and  $M$  is equal to 1.  
(E) No, because the joint probability of  $P$  and  $M$  is equal to 0.

## Answer C

Correct. The percentages of the pizza preferences for the people in this survey adds to 1. Therefore, a person cannot select both pepperoni and mushroom as his or her favorite pizza topping, because  $P(P \cap M) = 0$ , which indicates the events are mutually exclusive.

13. For the lunch special at a high school cafeteria, students can get either salad or french fries as a side order. The following table shows the number of each side order for the lunch specials purchased on one day, classified by the grade of the student.

	Grade 9	Grade 10	Grade 11	Grade 12	Total
Salad	37	34	21	28	120
French fries	83	71	57	37	248
Total	120	105	78	65	368

From those who purchased the lunch special that day, one student will be selected at random. What is the probability that the student selected will be in grade 10 given that the student ordered french fries as the side order?

## Unit 4 Progress Check: MCQ Part A

- (A)  $\frac{71}{368}$   
(B)  $\frac{105}{368}$   
(C)  $\frac{71}{248}$   
(D)  $\frac{248}{368}$   
(E)  $\frac{71}{105}$



## Answer C

Correct. Of the 248 students who ordered french fries, 71 were in grade 10, so  $\frac{71}{248}$  is the probability that a student will be in grade 10 given that the student ordered french fries.

14. A high school theater club has 40 students, of whom 6 are left-handed. Two students from the club will be selected at random, one at a time without replacement. What is the probability that the 2 students selected will both be left-handed?
- (A)  $\frac{30}{1,600}$   
(B)  $\frac{30}{1,560}$   
(C)  $\frac{36}{1,600}$   
(D)  $\frac{6}{40}$   
(E)  $\frac{1,156}{1,600}$



## Answer B

Correct. If  $F$  represents the event that the first student selected is left-handed and  $S$  represents the event that the second student selected is left-handed, then

$$P(F \cap S) = [P(F)][P(S|F)] = \left(\frac{6}{40}\right)\left(\frac{5}{39}\right) = \frac{30}{1,560}.$$

15. At a large high school 40 percent of the students walk to school, 32 percent of the students have been late to school at least once, and 37.5 percent of the students who walk to school have been late to school at least once. One student from the school will be selected at random. What is the probability that the student selected will be one who both walks to school and has been late to school at least once?



**Unit 4 Progress Check: MCQ Part A**

(A) 0.12

(B) 0.15



(C) 0.1875

(D) 0.345

(E) 0.72

**Answer B**

Correct. If  $W$  represents the event that the selected student walks to school and  $L$  represents the event that the selected student has been late to school at least once, then by the conditional probability formula

$P(L|W) = \frac{P(L \cap W)}{P(W)}$ . Solving for the numerator gives

$$P(L \cap W) = [P(W)][P(L|W)] = (0.40)(0.375) = 0.15.$$