AP Statistics
Review Ch. 5 #2

Name _____

1. Suppose that 30 percent of subscribers to a cable television service watch the shopping channel at least once a week. You are to design a simulation to estimate the probability that none of five randomly selected subscribers watches the shopping channel at least once a week. Which of the following assignments of the digits 0 through 9 would be appropriate fro modeling an individual subscriber's behavior in this simulation?

(A) Assign "0, 1, 2" as watching the shopping channel at least once a week and "3, 4, 5, 6, 7, 8, and 9" as not watching.
(B) Assign "0, 1, 2, 3" as watching the shopping channel at least once a week and "4, 5, 6, 7, 8, and 9" as not watching.
(C) Assign "1, 2, 3, 4, 5" as watching the shopping channel at least once a week and "6, 7, 8, 9, and 0" as not watching.
(D) Assign "0" as watching the shopping channel at least once a week and "1, 2, 3, 4, and 5" as not watching; ignore digits "6, 7, 8, and 9".
(E) Assign "3" as watching the shopping channel at least once a week and "0, 1, 2, 4, 5, 6, 7, 8, and 9" as not watching.

2. Which of the following statements is true for two events, each with probability greater than 0?

(A) If the events are mutually exclusive, they must be independent.
(B) If the events are independent, they must be mutually exclusive.
(C) If the events are not mutually exclusive, they must be independent.
(D) If the events are not independent, they must be mutually exclusive.
(E) If the events are mutually exclusive, they cannot be independent.

3. A fair coin is to be flipped 5 times. The first 4 flips land "heads" up. What is the probability of "heads" on the next (5^{th}) flip of this coin?

(A) 1 (B) $\frac{1}{2}$ (C) $\binom{5}{1}\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)$ (D) $\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)$ (E) 0

4. Lynn is planning to fly from New York to Los Angeles and will take the Airtight Airlines flight that leaves at 8 am. The Web site she used to make her reservation states that the probability that the flight will arrive in Los Angeles on time is 0.70. Of the following, which is the most reasonable explanation for how that probability could have been estimated?

(A) By using an extended weather forecast for the date of her flight, which shoed a 30% chance of bad weather.
(B) By making assumptions about how airplanes work, and factoring all of those assumptions into an equation to arrive at the probability
(C) From the fact that, of all airline flight arriving in California, 70% arrive on time.
(D) From the fact that, of all airline flights in the United States, 70% arrive on time
(E) From the fact that, on all previous days this particular fight had been scheduled, it had arrived on time 70% of those days.

5. One hundred people were interviewed and classified according to their attitude toward small cars and their personality type. The results are shown in the table below.

		Personality Type		
		Type A	Type B	Total
Attitude Toward Small Cars	Positive	25	12	37
	Neutral	11	9	20
	Negative	24	19	43
	Total	60	40	100

Which of the following is true?

(A) Of the three attitude groups, the group with the negative attitude has the highest proportion of type A personality types.
(B) Of the three attitude groups, the group with the neutral attitude has the highest proportion of type B personality types.
(C) For each personality type, more than half of the 100 respondents have a neutral attitude toward small cars.
(D) The proportion that has a positive attitude toward small cars is higher among people with a type B personality type than among people with a type A personality type.
(E) More than half of the 100 respondents have a type A personality type and a positive attitude toward small cars.

6. An experiment has three mutually exclusive outcomes, A, B, and C. If $P(A) = 0.12$, $P(B) = 0.61$, and $P(C) = 0.27$, which of the following must be true?

I. A and C are independent.
II. $P(A \text{ and } B) = 0$
III. $P(B \text{ or } C) = P(B) + P(C)$

(A) I only
(B) I and II only
(C) I and III only
(D) II and III only
(E) I, II, and III

7. Ninety percent of the people who have a particular disease will have a positive result on a given diagnostic test. Ninety percent of people who do not have the disease will have a negative result on this test. If 5 percent of a certain population has the disease, what percent of that population would test positive for the disease?

(A) 4.5% (B) 5% (C) 10% (D) 14% (E) 90%

8. A complex electronic device contains three components, A, B, and C. The probabilities of failure for each component in any one year are 0.01, 0.03, and 0.04, respectively. If any one component fails, the device will fail. If the components fail independently of one another, what is the probability that the device will not fail in one year?

(A) Less than 0.01
(B) 0.078
(C) 0.080
(D) 0.922
(E) Greater than 0.99

9. The director of a technical school was curious about whether there is a relationship between students who complete one of the school's most popular health sciences certificate programs and whether those students go on to complete more advanced studies in the health sciences within two years of completing the certificate program. She randomly selected 100 students who completed the program. Data collected on these students are shown in the table below.

		Completed More Advanced Studies		
		Yes	No	Total
Completed Most Popular Health Sciences Certificate Program	Yes	35	25	60
	No	5	35	40
	Total	40	60	100

Which of the following statements is true for these 100 students?
(A) Being a person who completed more advanced studies is more likely than being a person who did not complete more advanced studies.
(B) Being a person who completed the program is less likely than being a person who did not complete the program.
(C) Being a person who completed the program and completed more advanced studies is less likely than being a person who did not complete the program and did not complete more advanced studies.
(D) Being a person who did not complete the program but completed more advanced studies is less likely than being a person who completed the program and completed more advanced studies.
(E) Being a person who completed the program but did not complete more advanced studies is more likely than being a person who did not complete the program and did not complete more advanced studies.

10. A mathematics competition uses the following scoring procedure to discourage students from guessing (choosing an answer randomly) on the multiple-choice questions. For each correct response, the score is 7. For each question left unanswered, the score is 2. For each incorrect response, the score is 0. If there are 5 choices for each question, what is the minimum number of choices that the student must eliminate before it is advantageous to guess among the rest?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

11. A local company is interested in supporting environmentally friendly initiatives such as carpooling among employees. The company surveyed all of the 200 employees at the downtown offices. Employees responded as to whether or not they own a car and to the location of the home where they live. The results are shown in the table below.

		Location of Home			
		Downtown Area In the City	Elsewhere In the City	Outside the City	Total
Car Ownership	Yes	10	15	35	60
	No	60	55	25	140
	Total	70	70	60	200

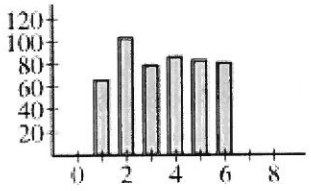
Which of the following statements about a randomly chosen person from these 200 employees is true?

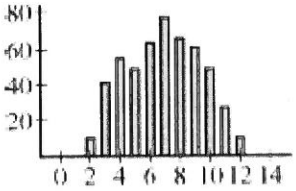
(A) If the person owns a car, he or she is more likely to live elsewhere in the city than to live in the downtown area in the city.
(B) If the person does not own a car, he or she is more likely to live outside the city than to live in the city (downtown area or elsewhere).
(C) The person is more likely to own a car if he or she lives in the city (downtown area or elsewhere) than if he or she lives outside the city.
(D) The person is more likely to live in the downtown area in the city than elsewhere in the city.
(E) The person is more likely to own a car than not to own a car.

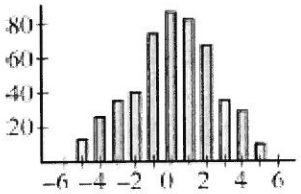
12. The probability that a new microwave oven will stop working in less than 2 years is 0.05. The probability that a microwave oven is damaged during delivery and stops working in less than 2 years is 0.04. The probability that a new microwave oven is damaged during delivery is 0.10. Given that a new microwave oven is damaged during delivery, what is the probability that it stops working in less than 2 years?

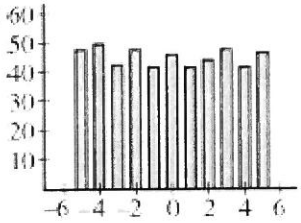
(A) 0.05 (B) 0.06 C) 0.10 (D) 0.40 (E) 0.50

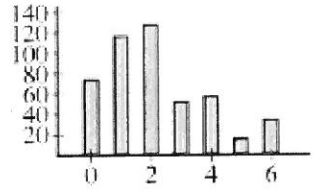
13. For a roll of a fair die, each of the outcomes 1, 2, 3, 4, 5, or 6 is equally likely. A red die and a green die are rolled simultaneously, and the difference of the outcomes (red – green) is computed. This is repeated for a total of 500 rolls of the pair of dice. Which of the following graphs best represents the most reasonable distribution of the differences?

(A)


(B)


(C)


(D)


(E)


14. The table below shows the political party registration by gender of all 500 registered voters in Franklin Township.

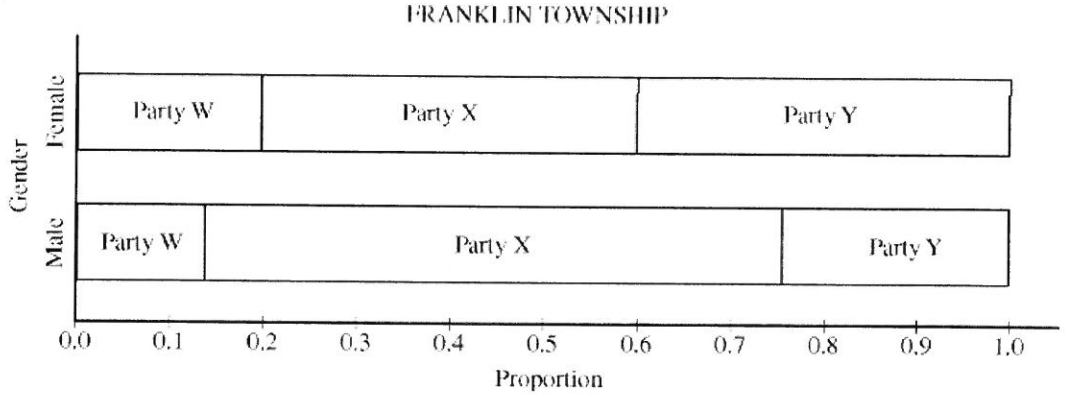
PARTY REGISTRATION–FRANKLIN TOWNSHIP

	Party W	Party X	Party Y	Total
Female	60	120	120	300
Male	28	124	48	200
Total	88	244	168	500

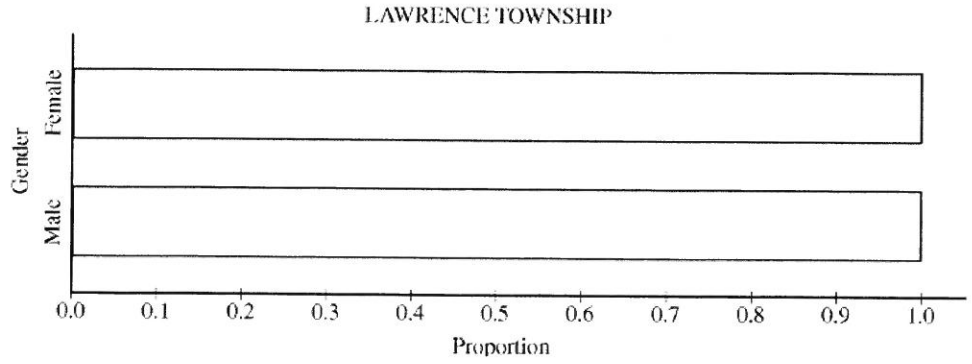
1. Given that a randomly selected registered voter is a male, what is the probability that he is registered for Party Y?

2. Among registered voters of Franklin Township, are the events "is a male" and "is registered for Party Y" independent? Justify your answer based on probabilities calculated from the table above.

3. One way to display the data in the table is to use a segmented bar graph. The following segmented bar graph, constructed from the data in the party registration–Franklin Township table, shows party-registration distributions for males and females in Franklin Township.



In Lawrence Township, the proportions of all registered voters for Parties W, X, and Y are the same as for Franklin Township, and party registration is independent of gender. Complete the graph below to show the distributions of party registration by gender in Lawrence Township.



Answers

1. A 2. E 3. B 4. E 5. B 6. D 7. D 8. D 9. D 10. C 11. A 12. D 13. C

17. Part (a): Of the 200 male registered voters in Franklin Township, 48 are registered for Party Y. Therefore, the conditional probability that a randomly selected voter is registered for Party Y, given that the voter is a male, is $\frac{48}{200} = 0.24$

Part (b): No, the events "is a male" and "is registered for Party Y" are not independent. One justification of this conclusion is to note that the conditional probability of the event "is registered for Party Y" given the event "is a male" — which was computed in part (a) — is not equal to the probability of the event "is registered for Party Y," as shown below.

$$P(\text{is registered for Party Y} \mid \text{is male}) = 0.24$$

$$P(\text{is registered for Party Y}) = \frac{168}{500} = 0.336$$

Because $0.24 \neq 0.336$, the two events are not independent.

Part (c): The marginal proportions of voters registered for each of the three political parties (without regard to gender) are given below.

$$\text{Party W: } \frac{88}{500} = 0.176$$

$$\text{Party X: } = \frac{244}{500} = 0.488$$

$$\text{Party Y: } = \frac{168}{500} = 0.336$$

Because party registration is independent of gender in Lawrence Township, the proportions of males and females registered for each party must be identical to each other and also identical to the marginal proportion of voters registered for that party. Using the order Party W, Party X, and Party Y, the graph for Lawrence Township is displayed below.