1-3. If you draw an M&M candy at random from a bag of the candies, the candy you draw will have one of six colors. The probability of drawing each color depends on the proportion of each color among all candies made. Assume that the table below gives the probability that a randomly chosen M&M bag has each color.

<table>
<thead>
<tr>
<th>Color</th>
<th>Brown</th>
<th>Red</th>
<th>Yellow</th>
<th>Green</th>
<th>Orange</th>
<th>Tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.3</td>
<td>0.3</td>
<td>?</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

1. The probability of drawing a yellow candy is
   (a) 0.1
   (b) 0.2
   (c) 0.3
   (d) impossible to determine from the information given.

2. Referring to the above problem, the probability that you do not draw a red candy is
   (a) 0.1
   (b) 0.3
   (c) 0.7
   (d) 0.9

3. Referring to the above problem, the probability that you draw neither a brown nor a green candy is
   (a) 0.1
   (b) 0.3
   (c) 0.4
   (d) 0.6

4. Event A occurs with probability 0.2. Event B occurs with probability 0.8. If A and B are mutually exclusive (disjoint), then
   (a) P(A and B)=0.16  (b) P(A or B)=1.0   (c) P(A and B)=1.0  (d) P(A or B)=0.16

5. Which one of the following is not true?
   (a) \( \binom{10}{1} = \binom{10}{9} \)
   (b) \( \binom{10}{1} \neq \binom{10}{9} \)
   (c) \( \binom{10}{10} = 10! \)
   (d) \( \binom{10}{0} = \binom{10}{10} \)

6. Idaho state's department of transportation plans to develop a new section of I-84 highway around Boise and receives 16 bids for the project. The state plans to hire four of the bidding companies. How many different combinations of four companies can be selected from the 16 bidding companies?
   (a) \( 16P_4 \)
   (b) \( 16C_4 \)
   (c) 4!
   (d) None of the above

7. A multiple-choice quiz has three questions, each with five answer choices. Only one of the choices is correct. Suppose that you have no idea what the answer is to any question and have to guess each answer. What is the probability of answering the first question correctly?
   (a) 0     (b) 1/3    (c) 1/5     (d) 1/9
8. Which of the following is true?
   (a) Any probability is a number between 0 and 1, inclusive.
   (b) The sum of all the probabilities of all outcomes in the sample space must be exactly 1.
   (c) The sample space in a random experiment is the set of all possible outcomes.
   (d) All of the above.

9. Which of the following is the best definition of independent outcomes?
   A. Two outcomes are independent if knowing the outcome of one does not affect the outcome of the other.
   B. Two outcomes, A and B, are independent if \( P(A \cap B) = 0 \).
   C. Two outcomes, A and B, are independent if \( P(A) = 1 - P(B) \).
   D. Exactly two of the above are correct.
   E. None of the above are correct.

10. Consider an event A and its complement event \( A^c \). Which of the followings is true?
    A. always mutually exclusive (disjoint).
    B. \( P(A) = 1 - P(A^c) \)
    C. \( P(A \cup A^c) = P(A) + P(A^c) \)
    D. All of the above
    E. None of the above

11. U.S. postal deliveries are summarized in the following table.

<table>
<thead>
<tr>
<th></th>
<th>Number of letters mailed</th>
<th>Number of arriving on time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>500</td>
<td>425</td>
</tr>
<tr>
<td>New York</td>
<td>500</td>
<td>415</td>
</tr>
<tr>
<td>Washington, D.C.</td>
<td>500</td>
<td>405</td>
</tr>
<tr>
<td>Nationwide</td>
<td>6000</td>
<td>5220</td>
</tr>
</tbody>
</table>

What is the probability that two letters mailed in NEW YORK are both delivered on time when we suppose that the two mails are delivered independently?
   A. 0.8523    B. 0.6889    C. 0.1927    D. 0.8734    E. 0.5690

12. In a certain college, the students engage in recreational sports in the following proportions:
    Football : 20%
    Basketball : 50%
    Both football and basketball : 15%

What is the probability that a student selected at random will play neither football nor basketball?
   A. 0.35    B. 0.45    C. 0.55    D. 0.65    E. 0.70
13. For which of the following counts would a binomial probability model be reasonable?
   A. A couple decides to continue to have children until their first girl is born; the total number of
   children the couple has
   B. The number of white balls when two balls are drawn without replacement from a box containing
   5 white balls and 5 black balls.
   C. The number of white balls when two balls are drawn with replacement from a box containing
   5 white balls and 5 black balls.
   D. None of the above

14. When \( Y \sim B(3, 0.2) \), which of the following is false?
   A. \( \text{E}(Y) = 2.4 \)
   B. \( \text{Var}(Y) = 0.48 \)
   C. The success probability is 0.2.
   D. The total number of trials is 3.
   E. All trials are independent each other.

15. Standard normal random variable, \( Z \) has mean 0 and standard deviation 1.
   What is \( \text{P}(-2.25 < Z < 1.77) \)?
   A. 0.8238  B. 0.8973  C. 0.9072  D. 0.9494

16. What is the value \( Z_{0.025} \) such that \( \text{P}(Z < - Z_{0.025}) = 0.025 \) when \( Z \) is standard normal random variable?
   A. 1.645  B. -1.645  C. 1.96  D. -1.96  E. 2.58  F. -2.58

17. Two much cholesterol in the blood increases the risk of heart disease. Young women are generally
    less afflicted with high cholesterol than other groups. The cholesterol levels for women aged 20 to 34
    follow a normal distribution with mean 185 milligrams per deciliter (mg/dL) and standard deviation
    30 mg/dL. Suppose that cholesterol levels above 245 mg/dL demand medical attention. What percent
    of young women have levels above 245 mg/dL?
   A. 1.45%  B. 2.28%  C. 3.41%  D. 7.93%

18-19. A pizza shop sells pizzas in four different sizes. The 1000 most recent orders for a single pizza
    gave the following probability table for the various sizes. Suppose that the random variable \( X \) denote
    the size of pizzas.

<table>
<thead>
<tr>
<th>Size(X)</th>
<th>12”</th>
<th>14”</th>
<th>16”</th>
<th>18”</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(X=x)</td>
<td>0.2</td>
<td>0.25</td>
<td>0.5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

18. What is the probability that the size of pizza is less than 14”?
   A. 0.2  B. 0.45  C. 0.95  D. 1

19. What is the expectation of the size of pizza, \( \text{E}(X) \) ?
   A. 12.4  B. 14.8  C. 15.2  D. 16.7

20. Suppose that \( A \) and \( B \) are independent events, with \( P(A)=0.6 \) and \( P(B)=0.2 \).
    What are \( P(A|B) \) and \( P(B|A) \)?
   A. \( P(A|B)=0.2 \) and \( P(B|A)=0.6 \)
   B. \( P(A|B)=0.6 \) and \( P(B|A)=0.2 \)
   C. \( P(A|B)=0.8 \) and \( P(B|A)=0.2 \)
   D. \( P(A|B)=0.2 \) and \( P(B|A)=0.8 \)
   E. \( P(A|B)=0.2 \) and \( P(B|A)=0.2 \)