MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Answer the question.

1) Which of the following cannot be a probability?
   A) \( \frac{2}{3} \)  
   B) \( \frac{3}{5} \)  
   C) \( \frac{5}{3} \)  
   D) \( \frac{1}{2} \)

Find the indicated probability.

2) A die with 12 sides is rolled. What is the probability of rolling a number less than 11?
   A) \( \frac{1}{12} \)  
   B) \( \frac{11}{12} \)  
   C) \( \frac{5}{6} \)  
   D) 10

\[
P(x < 11) = 1 - \left[ P(11) + P(12) \right] = 1 - \frac{2}{12} = 1 - \frac{1}{6} = \frac{5}{6}
\]

3) A bag contains 2 red marbles, 3 blue marbles, and 5 green marbles. If a marble is randomly selected from the bag, what is the probability that it is blue?

   A) \( \frac{1}{7} \)  
   B) \( \frac{3}{10} \)  
   C) \( \frac{1}{5} \)  
   D) \( \frac{1}{3} \)

\[
P(\text{blue}) = \frac{3}{10}
\]

From the information provided, create the sample space of possible outcomes.

4) Two white mice mate. The male has both a white and a black fur-color gene. The female has only white fur-color genes. The fur color of the offspring depends on the pairs of fur-color genes that they receive. Assume that neither the white nor the black gene dominates. List the possible outcomes. \( W = \text{white} \) and \( B = \text{black} \)

   A) \( \text{WW, BW} \)  
   B) \( \text{WW, WW} \)  
   C) \( \text{WW, BB} \)  
   D) \( \text{WB, BW} \)

\[
\text{Sample Space: } \{WW, WB, BB\}
\]

Answer the question.

5) Find the odds against correctly guessing the answer to a multiple choice question with 5 possible answers.

   A) 1 : 5  
   B) 4 : 1  
   C) 1 : 4  
   D) 5 : 1

\[
P(\text{correct}) = \frac{1}{5} \rightarrow \text{odds against answering correctly are } 4:1
\]
Find the indicated probability.

6) The probability that Luis will pass his statistics test is 0.42. Find the probability that he will fail his statistics test.

\[ P(\text{Fail}) = 1 - P(\text{Pass}) \]
\[ = 1 - 0.42 = 0.58 \]

7) If you pick a card at random from a well-shuffled deck, what is the probability that you get a king or a spade?

\[ P(\text{King or a Spade}) = \frac{4}{52} + \frac{13}{52} = \frac{16}{52} = \frac{4}{13} \]

8) An unprepared student makes random guesses for the ten true-false questions on a quiz. Find the probability that there is at least one correct answer.

\[ P(\text{at least one correct answer}) = 1 - P(\text{all incorrect answers}) \]
\[ = 1 - \left(\frac{1}{2}\right)^{10} = 1 - \frac{1}{1024} = 1 - \frac{1}{1024} = \frac{1023}{1024} \]

9) The table below shows the soft drinks preferences of people in three age groups.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Cola</th>
<th>Root Beer</th>
<th>Lemon-Lime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21 years of age</td>
<td>40</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Over 21 and 40 years</td>
<td>35</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Over 40 years of age</td>
<td>20</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

If one of the 255 subjects is randomly selected, find the probability that the person is over 40 years of age.

\[ P(\text{Over 40}) = \frac{85}{255} = \frac{1}{3} \]

Solve the problem.

10) The library is to be given 3 books as a gift. The books will be selected from a list of 18 titles. If each book selected must have a different title, how many possible selections are there?

(A) 816
(B) 4896
(C) 1.067062284e+15
(D) 6.402373706e+15

Total No. of Selections = \[ 18 \cdot C_3 = 816 \]
11) A musician plans to perform 11 selections. In how many ways can she arrange the musical selections?

A) 479,001,600  B) 11  C) 39,916,800  D) 121

\[ \binom{11}{11} = 11! = 39,916,800 \]

Answer the question.

12) 11 wrestlers compete in a competition. If each wrestler wrestles one match with each other wrestler, what are the total numbers of matches?

A) 110  B) 132  C) 66  D) 55

\[ \text{Total no. of matches} = \binom{11}{2} = 55 \]

Solve the problem.

13) Find the variance for the given probability distribution.

<table>
<thead>
<tr>
<th>x</th>
<th>P(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.17</td>
</tr>
<tr>
<td>1</td>
<td>0.28</td>
</tr>
<tr>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>0.15</td>
</tr>
<tr>
<td>4</td>
<td>0.35</td>
</tr>
</tbody>
</table>

\[ \text{Variance} = \sigma^2 = 1.568^2 = 2.479 \]

\[ = 2.469 \]

A) 2.69  B) 2.46  C) 7.43  D) 2.63

14) Suppose you pay $3.00 to roll a fair die with the understanding that you will get back $5.00 for rolling a 3 or a 6, nothing otherwise. What is your expected value?

A) $1.33  B) $3.00  C) $5.00  D) $3.00

\[ P(3,6) = 2 \times \frac{1}{6} \]

\[ = \frac{1}{3} + \frac{2}{3} \]

\[ = -\frac{1}{3} - \frac{3}{3} \times \frac{1}{3} + \frac{2}{3} \times \frac{1}{3} = -\frac{4}{3} \]

Determine whether the given procedure results in a binomial distribution. If not, state the reason why.

15) Rolling a single die 46 times, keeping track of the "fives" rolled.

A) Not binomial: the trials are not independent.
B) Not binomial: there are too many trials.
C) Not binomial: there are more than two outcomes for each trial.
D) Procedure results in a binomial distribution.
Assume that a procedure yields a binomial distribution with a trial repeated n times. Use the binomial probability formula to find the probability of x successes given the probability p of success on a single trial.

16) n = 10, x = 2, p = \(\frac{1}{3}\)

\[
P(X = 2) = \binom{10}{2} \left(\frac{1}{3}\right)^2 \left(\frac{2}{3}\right)^8 = 0.1951
\]

A) 0.1929    B) 0.0028    C) 0.1951    D) 0.2156

Find the indicated probability.

17) A machine has 9 identical components which function independently. The probability that a component will fail is 0.2. The machine will stop working if more than three components fail. Find the probability that the machine will be working.

\[
P(\text{No failure}) = 1 - P(3 \text{ or more failures})
\]

\[= 1 - \left[ P(0) + P(1) + P(2) \right] = 0.914
\]

A) 0.086    B) 0.914    C) 0.980    D) 0.066

Find the standard deviation, \(\sigma\), for the binomial distribution which has the stated values of n and p. Round your answer to the nearest hundredth.

18) n = 574; p = 0.7

A) \(\sigma = 14.25\)    B) \(\sigma = 10.98\)    C) \(\sigma = 8.57\)    D) \(\sigma = 15.10\)

\[\sigma = \sqrt{np(1-p)} = \sqrt{574 \times 0.7 \times 0.3} = 10.98
\]

Find the mean, \(\mu\), for the binomial distribution which has the stated values of n and p. Round answer to the nearest tenth.

19) n = 33; p = 0.2

A) \(\mu = 6.1\)    B) \(\mu = 6.6\)    C) \(\mu = 7.3\)    D) \(\mu = 6.9\)

\[\mu = np = 33 \times 0.2 = 6.6
\]