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

Answer the question.

1) On a multiple choice test with four possible answers for each question, what is the probability of answering a question correctly if you make a random guess?

A) $\frac{1}{4}$
B) $\frac{3}{4}$
C) $\frac{1}{2}$
D) $\frac{1}{4}$

Find the indicated probability.

2) 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) $\frac{1}{3}$
B) $\frac{1}{5}$
C) $\frac{3}{10}$
D) $\frac{1}{7}$

Answer the question, considering an event to be "unusual" if its probability is less than or equal to 0.05.

3) Assume that a study of 500 randomly selected school bus routes showed that 486 arrived on time. Is it "unusual" for a school bus to arrive late?

A) No
B) Yes

Estimate the probability of the event.

4) In a certain class of students, there are 12 boys from Wilmette, 3 girls from Winnetka, 8 girls from Wilmette, 4 boys from Glencoe, 3 boys from Winnetka and 9 girls from Glencoe. If the teacher calls upon a student to answer a question, what is the probability that the student will be a boy?

A) 0.767
B) 0.308
C) 0.41
D) 0.487

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

5) Flip a coin three times.

A) HHT HTT HTH HHH TTH TTT
B) HHH HTT HTH TTT HTT HHH HHT THT
C) HHH HHT HTT HTH TTH THT TTT
D) HHH TTT HTT HTH HHT TTT HTH

5) C
Answer the question.

6) Suppose you are playing a game of chance. If you bet $7 on a certain event, you will collect $280 (including your $7 bet) if you win. Find the odds used for determining the payoff.

A) 1 : 39  
B) 40 : 1  
C) 39 : 1  
D) 280 : 287

Find the indicated probability.

7) Find \( P(\overline{A}) \), given that \( P(A) = 0.662 \).

A) 1.511  
B) 1.662  
C) 0  
D) 0.338

8) A spinner has equal regions numbered 1 through 15. What is the probability that the spinner will stop on an even number or a multiple of 3?

A) \( \frac{2}{3} \)  
B) \( \frac{7}{9} \)  
C) 12  
D) \( \frac{1}{3} \)

\[ P(\text{Even or Multiple of 3}) = \frac{7}{15} + \frac{5}{15} - \frac{2}{15} = \frac{10}{15} = \frac{2}{3} \]

9) A 6-sided die is rolled. Find \( P(3 \text{ or } 5) \).

A) 2  
B) \( \frac{1}{36} \)  
C) \( \frac{1}{3} \)  
D) \( \frac{1}{6} \)

\[ P(3 \text{ or } 5) = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3} \]

10) Find the probability of correctly answering the first 2 questions on a multiple choice test if random guesses are made and each question has 3 possible answers.

A) \( \frac{1}{8} \)  
B) \( \frac{1}{9} \)  
C) \( \frac{3}{2} \)  
D) \( \frac{2}{3} \)

\[ P(\text{2 Correct Answers}) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9} \]

11) You are dealt two cards successively (without replacement) from a shuffled deck of 52 playing cards. Find the probability that the first card is a King and the second card is a Queen.

A) \( \frac{4}{663} \)  
B) \( \frac{1}{663} \)  
C) \( \frac{13}{102} \)  
D) \( \frac{2}{13} \)

\[ P(\text{King, Queen}) = \frac{4}{52} \times \frac{4}{51} = \frac{1}{13} \times \frac{4}{51} = \frac{4}{663} \]

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

<table>
<thead>
<tr>
<th></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>between 21 and 40</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>
<tr>
<td><strong>Total</strong></td>
<td><strong>85</strong></td>
<td><strong>75</strong></td>
<td><strong>85</strong></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.

A) \( \frac{1}{2} \)  
B) \( \frac{2}{5} \)  
C) \( \frac{3}{5} \)  
D) \( \frac{1}{3} \)

\[ P(\text{over 40}) = \frac{85}{255} = \frac{1}{3} \]
Evaluate the expression.
13) \( \frac{10!}{4!} = 151,200 \)
   A) \( \frac{5}{2} \)   B) 40,000   C) 2!   D) 151,200

Solve the problem.
14) There are 8 members on a board of directors. If they must form a subcommittee of 5 members, how many different subcommittees are possible?
   A) 56   B) 120   C) 6720   D) 32,768
   \[ \text{Total No. of subcommittees} = \binom{8}{5} = 56 \]

15) How many ways can an IRS auditor select 4 of 10 tax returns for an audit?
   A) 5040   B) 210   C) 10,000   D) 24
   \[ \text{Total No. of audits} = \binom{10}{4} = 210 \]

16) A state lottery involves the random selection of six different numbers between 1 and 29. If you select one six number combination, what is the probability that it will be the winning combination?
   A) \( \frac{1}{720} \)   B) \( \frac{1}{342,014,400} \)   C) \( \frac{1}{475,020} \)   D) \( \frac{1}{594,823,321} \)
   \[ P(\text{Winning}) = \frac{1}{29 \times \binom{29}{6}} = \frac{1}{475,020} \]

17) A musician plans to perform 11 selections. In how many ways can she arrange the musical selections?
   A) 11   B) 479,001,600   C) 121   D) 39,916,800
   \[ \text{Total No. of arrangements} = 11! \times 1 = 39,916,800 \]

18) In a certain lottery, five different numbers between 1 and 36 inclusive are drawn. These are the winning numbers. To win the lottery, a person must select the correct 5 numbers in the same order in which they were drawn. What is the probability of winning?
   A) \( \frac{1}{45,239,040} \)   B) \( \frac{1}{36!} \)   C) \( \frac{1}{120} \)   D) \( \frac{120}{45,239,040} \)
   \[ P(\text{Winning}) = \frac{1}{36!} = \frac{1}{19,239,040} = \frac{1}{45,239,040} \]

Identify the given random variable as being discrete or continuous.
19) The number of oil spills occurring off the Alaskan coast
   A) Discrete   B) Continuous

20) The braking time of a car
   A) Continuous   B) Discrete
Find the mean of the given probability distribution.

21) The random variable $x$ is the number of houses sold by a realtor in a single month at the Sendom's Real Estate office. Its probability distribution is as follows.

<table>
<thead>
<tr>
<th>Houses Sold $(x)$</th>
<th>Probability $P(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.24</td>
</tr>
<tr>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>2</td>
<td>0.12</td>
</tr>
<tr>
<td>3</td>
<td>0.16</td>
</tr>
<tr>
<td>4</td>
<td>0.01</td>
</tr>
<tr>
<td>5</td>
<td>0.14</td>
</tr>
<tr>
<td>6</td>
<td>0.11</td>
</tr>
<tr>
<td>7</td>
<td>0.21</td>
</tr>
</tbody>
</table>

$\bar{x} = 3.6$

A) 3.35  B) 3.60  C) 3.50  D) 3.40

Solve the problem.

22) Find the variance for the given probability distribution.

$x | P(x)$

<table>
<thead>
<tr>
<th>0</th>
<th>0.17</th>
</tr>
</thead>
<tbody>
<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>

\[ \text{Var} = (\bar{x} - \mu)^2 \]

\[ \text{Var} = (\bar{x} - \mu)^2 = 2.46 \]

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

23) A contractor is considering a sale that promises a profit of $23,000 with a probability of 0.7 or a loss (due to bad weather, strikes, and such) of $13,000 with a probability of 0.3. What is the expected profit?

\[ \text{Expected Profit} = 23000 \times 0.7 - 13000 \times 0.3 = 8 \, 1200 \]

A) $12,200  B) $25,200  C) $10,000  D) $16,100

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

24) Rolling a single die 19 times, keeping track of the numbers that are rolled.

A) Procedure results in a binomial distribution.

B) Not binomial: there are more than two outcomes for each trial.

C) Not binomial: the trials are not independent.

D) Not binomial: there are too many trials.

25) Rolling a single "loaded" die 58 times, keeping track of the numbers that are rolled.

A) Procedure results in a binomial distribution.

B) Not binomial: there are too many trials.

C) Not binomial: there are more than two outcomes for each trial.

D) Not binomial: the trials are not independent.
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.

26) \( n = 6, x = 3, p = \frac{1}{6} \)

\[
P(x=3) = C_3 \left(\frac{1}{6}\right)^3 \left(1-\frac{1}{6}\right)^3 = 0.0536
\]

Find the indicated probability.

27) 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.

\[
\]

\[
= 1 - P(9) - P(10) - P(11) - P(12) = 0.914
\]

28) Find the probability of at least 2 girls in 10 births. Assume that male and female births are equally likely and that the births are independent events.

\[
P(2G) = \binom{10}{2} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^8 = 0.044
\]

At least 2 girls \( = 7/12 G \approx 0.9167 \approx 0.989 \)

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

29) \( n = 20; p = 3/5 \)

\[
\mu = np = 20 \times \frac{3}{5} = 12
\]

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.

30) \( n = 25; p = 3/5 \)

\[
\sigma = \sqrt{np(1-p)} = \sqrt{25 \times \frac{3}{5} \times \frac{2}{5}} = \sqrt{6}
\]