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

Solve the problem.

1) A recent article in the paper claims that business ethics are at an all-time low. Reporting on a recent sample, the paper claims that 38% of all employees believe their company president possesses low ethical standards. Suppose 20 of a company’s employees are randomly and independently sampled and asked if they believe their company president has low ethical standards and their years of experience at the company. Could the probability distribution for the number of years of experience be modelled by a binomial probability distribution?

A) No, the employees would not be considered independent in the present sample.
B) No, a binomial distribution requires only two possible outcomes for each experimental unit sampled.
C) Yes, the sample is a random and independent sample.
D) Yes, the sample size is \( n = 20 \).

2) For a binomial distribution, which probability is not equal to the probability of 1 success in 5 trials where the probability of success is .4?

A) the probability of 4 failures in 5 trials where the probability of success is .4
B) the probability of 1 success in 5 trials where the probability of failure is .6
C) the probability of 4 failures in 5 trials where the probability of failure is .6
D) the probability of 4 failures in 5 trials where the probability of success is .6

3) Compute \( \binom{9}{4} \).

A) 3024  B) 84  C) 126  D) 15,120

4) Which binomial probability is represented on the screen below?

A) \( P(x < 4) \)  B) \( P(x > 4) \)  C) \( P(x = 4) \)  D) \( P(x \leq 4) \)

Find the specified probability distribution of the binomial random variable.

5) A multiple choice test consists of four questions. Each question has five possible answers of which only one is correct. A student guesses on every question. Find the probability distribution of \( X \), the number of questions she answers correctly.

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6) In one city, 21% of the population is under 25 years of age. Three people are selected at random from the city. Find the probability distribution of \( X \), the number among the three that are under 25 years of age.

\[
\begin{array}{c|c}
\text{x} & P(X=x) \\
0 & 0.4930 \\
1 & 0.1311 \\
2 & 0.0348 \\
3 & 0.0093 \\
\end{array}
\]

7) 43% of the murder trials in one district result in a guilty verdict. Five murder trials are selected at random from the district. Determine the probability distribution of \( X \), the number of trials among the five selected in which the defendant is found guilty.

\[
\begin{array}{c|c}
\text{x} & P(X=x) \\
0 & 0.0602 \\
1 & 0.2400 \\
2 & 0.3424 \\
3 & 0.2583 \\
4 & 0.0844 \\
5 & 0.0147 \\
\end{array}
\]

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

A test has 12 multiple-choice questions with four answer choices for each question. Assume a student guesses on all questions.

8) In the situation above, find the probability that she gets exactly five correct answers.

9) In the situation above, find the probability that she gets at least three correct answers.

It has been found that 40% of the employees who complete a sequence of executive seminars go on to become vice presidents. Assume that 10 graduates of the program are randomly selected.

10) In the situation above, find the probability that exactly 5 become vice presidents.

11) In the situation above, find the probability that no one becomes a vice president.
12) In the situation above, find the probability that at least three become vice presidents.

13) In the situation above, find the probability that from two to four become vice presidents.

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

Find the indicated probability. Round to four decimal places.

14) In a study, 38% of adults questioned reported that their health was excellent. A researcher wishes to study the health of people living close to a nuclear power plant. Among 13 adults randomly selected from this area, only 3 reported that their health was excellent. Find the probability that when 13 adults are randomly selected, 3 or fewer are in excellent health.

A) 0.1317
B) 0.2083
C) 0.1404
D) 0.0765

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

15) A new drug is designed to reduce a person’s blood pressure. Sixteen randomly selected hypertensive patients receive the new drug. Suppose the probability that a hypertensive patient’s blood pressure drops if he or she is untreated is 0.5. Then what is the probability of observing 14 or more blood pressure drops in a random sample of 16 treated patients if the new drug is in fact ineffective in reducing blood pressure?

16) An automobile manufacturer has determined that 30% of all gas tanks that were installed on its 2002 compact model are defective. If 15 of these cars are independently sampled, what is the probability that more than half need new gas tanks?
1) B  
2) D  
3) C  
4) D  
5) D  
6) C  
7) D  
8) binomial distribution  
   0.103  
9) binomial distribution  
   0.609  
10) 0.201  
11) 0.006  
12) 0.833  
13) 0.587  
14) B  
15) Let \( x \) = the number of the 16 hypertensive patients whose blood pressure drops.  
    Then \( X \) is a binomial random variable with \( n = 16 \) and \( p = 0.5 \).  
    
    \[
P(\{ x \geq 14 \}) = P(\{ x = 14 \}) + P(\{ x = 15 \}) + P(\{ x = 16 \})  
    = 0.002090
\]
16) Let \( x \) = the number of the 15 cars with defective gas tanks. Then \( X \) is a binomial random variable with \( n = 15 \) and \( p = 0.30 \).  
    
    \[
P(\{ \text{more than half} \}) = P(\{ x > 7.5 \}) = P(\{ x \geq 8 \}) = 1 - P(\{ x \leq 7 \}) = 1 - 0.951 = 0.049 \text{ (from a binomial probability table)}
\]