Exam 02 Review: chs 4, 5

1. An experiment consists of three steps. There are four possible results on the first step, three possible results on the second step, and two possible results on the third step. The total number of experimental outcomes is
   a. 14
   b. 9
   c. 24
   d. 36

2. If \( P(A) = 0.50, P(B) = 0.60, \) and \( P(A \cap B) = 0.30 \), then events A and B are
   a. conditionally exclusive events
   b. mutually exclusive events
   c. independent events
   d. not independent events

3. If a penny is tossed three times and comes up heads all three times, the probability of heads on the fourth trial is
   a. \( \frac{1}{16} \)
   b. larger than the probability of tails
   c. smaller than the probability of tails
   d. \( \frac{1}{2} \)

4. A student has to take 9 more courses before he can graduate. If none of the courses are prerequisite to others, how many groups of four courses can he select for the next semester?
   a. 36
   b. 81
   c. 126
   d. 144

5. If \( P(A) = 0.50, P(B) = 0.40, \) and \( P(A \cup B) = 0.88 \), then \( P(B \mid A) = \)
   (hint: this problem requires two steps...)
   a. 0.04
   b. 0.03
   c. 0.02
   d. 0.05

Case Study A
Assume you have applied for two scholarships, a Merit scholarship (M) and an Athletic scholarship (A). The probability that you receive an Athletic scholarship is 0.18. The probability of receiving both scholarships is 0.11. The probability of getting at least one of the scholarships is 0.3.

6. Refer to Case Study A:
   What is the probability that you will receive a Merit scholarship?
   a. .23
   b. .3429
   c. .625
   d. .4783

7. Refer to Case Study A:
   What is the probability of receiving the Athletic scholarship given that you have been awarded the Merit scholarship?
   a. .4783
   b. .2322
   c. .6111
   d. .3429
Case Study B
An automobile dealer has kept records on the customers who visited his showroom. Forty percent of the people who visited his dealership were female. Furthermore, his records show that 35% of the females who visited his dealership purchased an automobile, while 20% of the males who visited his dealership purchased an automobile. Let

\[ A_1 = \text{the event that the customer is female} \]
\[ A_2 = \text{the event that the customer is male} \]

8. Refer to Case Study B:
What is the conditional probability that a customer entering the showroom will buy an automobile given that the customer is male?
- a. .60
- b. .20
- c. .30
- d. .55

9. Refer to Case Study B:
A car salesperson has just informed us that he sold a car to a customer. What is the probability that the customer was female?
- a. .35
- b. .54
- c. .65
- d. .80

10. Oriental Reproductions, Inc. is a company that produces handmade carpets with oriental designs. The production records show that the monthly production has ranged from 1 to 5 carpets. The production levels and their respective probabilities are shown below.

<table>
<thead>
<tr>
<th>Production Per Month</th>
<th>Probability f(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>3</td>
<td>0.10</td>
</tr>
<tr>
<td>4</td>
<td>0.80</td>
</tr>
<tr>
<td>5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

The expected monthly production level is
- a. 3.0
- b. 3.5
- c. 3.8
- d. 4.0

11. The key difference between the binomial and hypergeometric distribution is that with the hypergeometric distribution
- a. the probability of success changes from trial to trial
- b. the random variable is continuous
- c. the trials are independent of each other
- d. the probability of success must be less than 0.5
Case Study C
The student body of a large university consists of 60% female students. A random sample of 8 students is selected.

12. Refer to Case Study C. What is the probability that among the students in the sample exactly two are female?
   a. 0.2936
   b. 0.0413
   c. 0.0007
   d. 0.0896

13. Refer to Case Study C. What is the probability that among the students in the sample at least 7 are female?
   a. 0.0168
   b. 0.0896
   c. 0.1064
   d. 0.8936

Case Study D
The probability that Pete will catch fish when he goes fishing is .8. Pete is going to fish 3 days next week. Define the random variable X to be the number of days Pete catches fish.

14. Refer to Case Study D. The probability that Pete will catch fish on exactly one day is
   a. .8
   b. .008
   c. .104
   d. .096

15. Refer to Case Study D. The expected number of days Pete will catch fish is
   a. .8
   b. .6
   c. 2.4
   d. 3

16. Refer to Case Study D. The variance of the number of days Pete will catch fish is
   a. .48
   b. 2.4
   c. .8
   d. .16

Case Study E
The random variable x is the number of occurrences of an event over an interval of ten minutes. It can be assumed that the probability of an occurrence is the same in any two-time periods of an equal length. It is known that the mean number of occurrences in ten minutes is 5.3.

17. Refer to Case Study E. The expected value of the random variable x is
   a. 2.30
   b. 10
   c. 2
   d. 5.3
18. Refer to Case Study E. The probability that there are 8 occurrences in ten minutes is
   a. .0241
   b. .9107
   c. .0771
   d. .1126

Case Study F
A local bottling company has determined the number of machine breakdowns per month and their respective probabilities as shown below:

<table>
<thead>
<tr>
<th>Number of Breakdowns</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.12</td>
</tr>
<tr>
<td>1</td>
<td>0.38</td>
</tr>
<tr>
<td>2</td>
<td>0.25</td>
</tr>
<tr>
<td>3</td>
<td>0.18</td>
</tr>
<tr>
<td>4</td>
<td>0.07</td>
</tr>
</tbody>
</table>

19. Refer to Case Study F. The probability of at least 3 breakdowns in a month is
   a. 0.75
   b. 0.25
   c. 0.88
   d. 0.93

20. Four percent of the customers of a mortgage company default on their payments. A sample of five customers is selected. What is the probability that exactly two customers in the sample will default on their payments?
   a. 0.2592
   b. 0.0142
   c. 0.9588
   d. 0.7408

21. A production process produces 2% defective parts. A sample of five parts from the production process is selected. What is the probability that the sample contains exactly two defective parts?
   a. 0.0004
   b. 0.0038
   c. 0.10
   d. 0.02

Exhibit 5-4
Forty percent of all registered voters in a national election are female. A random sample of 5 voters is selected.

22. Refer to Exhibit 5-4. The probability that the sample contains 2 female voters is
   a. 0.0778
   b. 0.7780
   c. 0.5000
   d. 0.3456
23. Refer to Exhibit 5-4. The probability that there are no females in the sample is
   a. 0.0778
   b. 0.7780
   c. 0.5000
   d. 0.3456

Exhibit 5-7
The probability that Pete will catch fish when he goes fishing is .8. Pete is going to fish 3 days next week. Define the random variable \( X \) to be the number of days Pete catches fish.

24. Refer to Exhibit 5-7. The probability that Pete will catch fish on one day or less is
   a. .008
   b. .096
   c. .104
   d. .8

25. The sum of the probabilities of two complementary events is
   a. Zero
   b. 0.5
   c. 0.57
   d. 1.0

26. Events A and B are mutually exclusive if their joint probability is
   a. larger than 1
   b. less than zero
   c. zero
   d. infinity

27. If \( A \) and \( B \) are independent events with \( P(A) = 0.4 \) and \( P(B) = 0.25 \), then \( P(A \cup B) = \)
   a. 0.65
   b. 0.55
   c. 0.10
   d. 0.75

28. If a six sided die is tossed two times, the probability of obtaining two "4s" in a row is
   a. 1/6
   b. 1/36
   c. 1/96
   d. 1/216

Case Study: Gun Plants
Ryan owns two gun plants. One in Park City and the other in Las Vegas. The Park City plat has 40 employees; the Las Vegas plant has 20. A random sample of 10 employees is to be asked to fill out a benefits questionnaire.

29. What is the probability that one of the employees in the sample works at the plant in Las Vegas?
   a. .0725
   b. .9275
   c. .0894
   d. .9106
Case Study: Passing Class
A student hopes to pass a hard class. The student initially felt like there was an equal chance of passing or failing the class. However, the teacher of the class asked the student to give a 5 minute presentation on the student’s final paper. Past experience indicates that for 75% of students who pass and 40% of students that do not pass, the professor asks students to give a presentation.

30. Given that the professor asked the student to give a presentation on the final paper, compute the probability that the student will pass the class.
   a. .500
   b. .375
   c. .652
   d. .348