

## Class Examples (Ch. 3)

1. A study was recently done that emphasized the problem we all face with drinking and driving. Four hundred accidents that occurred on a Saturday night were analyzed. Two items noted were the number of vehicles involved and whether alcohol played a role in the accident. The numbers are shown below:

Did Alcohol Play a Role?	Number of Vehicles Involved			Totals
	1	2	3 or more	
Yes	59	92	19	170
No	26	170	34	230
Totals	85	262	53	400

- a) What proportion of the accidents involved a single car without the effect of alcohol?
- b) What proportion involved No alcohol or a single car?
- c) Assuming No alcohol involvement, what proportion of the accidents involved a single car?
- d) What proportion of the accidents involved more than a single vehicle?
- e) What proportion involved alcohol or a single car?

2. A researcher at a large university wanted to investigate if a student's seat preference was related in any way to the gender of the student. The researcher divided the lecture room into three sections (1-front, middle of the room, 2-front, sides of the classroom, and 3-back of the classroom, both middle and sides) and noted where his students sat on a particular day of the class. The researcher's summary table is provided below.

	Area (1)	Area (2)	Area (3)	Total
Males	15	8	10	33
Females	15	13	11	39
Total	30	21	21	72

- a) What proportion of the class sat consists of females who sit in the front middle section of the classroom?
- b) What proportion of the class were either males or sitting in the back of the classroom?
- c) Suppose a person sitting in Area I is randomly selected to answer a question. Find the probability the person selected is a female.

d) Are the events person sitting in Area I and person selected is a female independent?

3. The managers of a Fortune 500 company were surveyed to determine the background that leads to a successful manager. Each manager was rated as being either a good, fair, or poor manager by his/her boss. The manager's educational background was also noted. The data appear below:

Educational Background

Manager Rating	H. S. Degree	Some College	College Degree	Master's or Ph.D.	Totals
Good	7	4	27	1	39
Fair	5	15	47	20	87
Poor	1	9	8	16	34
Totals	13	28	82	37	160

a) What proportion of the managers had earned at least college degree?

b) If we randomly selected one manager from this company, find the probability that he or she has an advanced (Master's or Ph.D.) degree and is a good manager.

c) What proportion of the managers are either good managers or have advanced degrees?

d) Given that a manager is only a fair manager, what is the probability that this manager has no college background?

4. A university received 11 personal computers. Unknown to the university, 6 of these new computers are defective. Assume that you are the computer technician that has been assigned the task of setting up the first of these new computers. Assume that you have randomly selected 3 of the computers to set up. Find the probability that neither of the computers that you selected is defective.

5. A standard poker deck of cards is made up of four suits with 13 cards in each suit. If we randomly sample 4 cards from a deck, find the probability that all four cards selected are spades.

6. A standard poker deck of cards is made up of four suits with 13 cards in each suit (total of 52 cards). If we randomly sample four cards from a standard poker deck, find the probability that at least one of the cards selected is a diamond.

7. A manufacturer of 35-mm cameras knows that a shipment of 38 cameras sent to a large discount store contains seven defective cameras. The manufacturer also knows that the store will choose two of the cameras at random, test them, and accept the shipment if neither is defective. Find the probability that at

least one of the cameras selected is defective.

8. A local country club has a membership of 600 and operates facilities that include an 18-hole championship golf course and 12 tennis courts. The club president would like to know how many members regularly use each facility. A survey of the membership indicates that 68% regularly use the golf course, 49% regularly use the tennis courts, and 5% use neither of these facilities regularly. Find the probability that a randomly selected member uses the golf or tennis facilities regularly.

9. A human gene carries a certain disease from the mother to the child with a probability rate of 60%. That is, there is a 60% chance that the child becomes infected with the disease. Suppose a female carrier of the gene has three children. Also assume that the infections of the three children are independent of one another. Find the probability that all three of the children get the disease from their mother.

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11. A study was conducted to study the customer satisfaction levels for one overnight shipping business. In addition to the customer's satisfaction level, the customers were asked how often they used overnight shipping. The results are shown below in the following table:

<b>Satisfaction Level</b>				
<b>Frequency of Use</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>TOTAL</b>
<b>&lt;2 per month</b>	<b>250</b>	<b>140</b>	<b>10</b>	<b>400</b>
<b>2-5 per month</b>	<b>140</b>	<b>55</b>	<b>5</b>	<b>200</b>
<b>&gt;5 per month</b>	<b>70</b>	<b>25</b>	<b>5</b>	<b>100</b>
<b>TOTAL</b>	<b>460</b>	<b>220</b>	<b>20</b>	<b>700</b>

a) What proportion of the respondents did not have a high level of satisfaction with the company?

b) What proportion of the customers were highly satisfied with the company and used the company greater than five times per month?

**12. Standard deck of card contains 52 cards. Find the probability of:**

a) Getting an ace or a jack

b) Choosing a club or a jack

c) If 3 cards are selected **with replacement** find the probability all three are diamonds.

d) If 3 cards are selected **without replacement** find the probability to get at least 1 Jack.

**13. Suppose  $P(A) = .5$ ,  $P(B) = .3$  and  $P(A \cup B) = .65$ .**

Find  $P(A \cap B)$  and check whether events A and B are independent.

**14. A manufacturer of 35-mm cameras knows that a shipment of 40 cameras sent to a large discount store contains nine defective cameras. The manufacturer also knows that the store will choose two of the cameras at random, test them, and accept the shipment if neither is defective. What is the probability that the shipment is accepted?**

a. 0.1788

b. 0.0462

c. 0.5962

d. 0.4038

**15. Suppose a basketball player is an excellent free throw shooter and makes 93% of his free throws. Assume that free throw shots are independent of one another. Suppose this player gets to shoot three free throws. Find the probability that he misses all three consecutive free throws.**

a. 0.8044

b. 0.1956

c. 0.9997

d. 0.0003

**16. The managers of a company were surveyed to determine the background that leads to a successful manager. His/her boss rated each manager as being either a good, fair, or poor manager. Educational background was also noted. The data appear below:**

**Educational Background**

<b>Manager Rating</b>	<b>High School Degree</b>	<b>Some College</b>	<b>College Degree</b>	<b>Advance Degree (Master's or Ph.D.)</b>	<b>Totals</b>

<b>Good</b>	<b>2</b>	<b>3</b>	<b>22</b>	<b>12</b>	<b>39</b>
<b>Fair</b>	<b>5</b>	<b>15</b>	<b>45</b>	<b>22</b>	<b>87</b>
<b>Poor</b>	<b>3</b>	<b>8</b>	<b>9</b>	<b>14</b>	<b>34</b>
<b>Totals</b>	<b>10</b>	<b>26</b>	<b>76</b>	<b>48</b>	<b>160</b>

- 1) What proportion of the managers had **at most college degree educational level**?
  
- 2) What proportion of the managers are **either fair or college degree** recipients?
  
- 3) If we randomly selected one manager from this company, find the probability that he/she **does not have an advanced degree and is a poor manager**?
  
- 4) **Given that** the manager is only a **good** manager, what is the probability that this manager has **at least some college background**?
  
- 5) Are the events (A) **Manager has only college degree** and (B) **Manager is a fair Manager** independent? Prove numerically.