Name: _____

AP Statistics - Chapter 5 - Probability
Section 5.3 Practice

1. Real estate ads suggest that 64% of homes for sale have garages, 21% have swimming pools, and 17% have both features. What is the probability that a home for sale has
   a. pool or a garage?

   b. neither a pool nor a garage?

   c. a pool but no garage?

   d. If a home for sale has a garage, what's the probability that it has a pool, too?

   e. Are having a garage and pool independent events?

   f. Are having a garage and a pool mutually exclusive (disjoint)?

2. A coin is flipped three times. Event A consists of observing exactly 2 heads. Event B consists of observing one or more tails.
   a. List the members of event A.

   b. List the members of event B.

   c. Find the union of event A and event B.

   d. Find the intersection of event A and event B.

   e. Find P(A|B)

3. If $P(A) = 0.2$ and $P(B) = 0.3$, find $P(A \cup B)$ if
   a. A and B are independent

   b. A and B are mutually exclusive

4. A survey of students in a large Introductory Statistics class asked about their birth order (first or only child, second, etc.) and which college of the university they were enrolled in. The data is below. Suppose we select a student at random from this class.

	First or only	Second or later	Total
Arts & Sciences	**34**	**23**	**57**
Agriculture	**52**	**41**	**93**
Human Ecology	**15**	**28**	**43**
Other	**12**	**18**	**30**
Total	**113**	**110**	**223**

a. What is the probability we select a Human Ecology student?

b. What is the probability that we select a first-born student?

c. What is the probability that the person is first-born and a Human Ecology student?

d. What is the probability that the person is first-born or a Human Ecology student?

e. What is the probability that the person is an Arts & Sciences student who is a second child (or more)?

f. Among the Arts & Sciences students, what's the probability a student was a second child (or more)?

g. Among second children (or more), what's the probability the student is enrolled in Arts & Sciences?

h. What's the probability that a first or only child is enrolled in the Agriculture College?

i. What is the probability that an Agriculture student is a first or only child?

j. Are enrolling in Agriculture & Human Ecology mutually exclusive? Explain.

k. Are enrolling in Agriculture & Human Ecology independent? Explain.

l. Are being first-born and enrolling in Human Ecology mutually exclusive? Explain.

m. Are being first-born and enrolling in Human Ecology independent? Explain.

5. Luggage. Leah is flying from Boston to Denver with a connection in Chicago. The probability her first flight leaves on time is 0.15. If the flight is on time, the probability that her luggage will make the connecting flight in Chicago is 0.95, but if the first flight is delayed, the probability that the luggage will make it is only 0.65.

   a. Are the first flight leaving on time and the luggage making the connection independent events? Explain.

   b. What is the probability that her luggage arrives in Denver with her?

   c. Suppose you pick her up at the Denver airport, and her luggage is not there. What is the probability that Leah's first flight was delayed?

6. Vote for Dole. In 1999, Elizabeth Dole was a candidate to become the first woman president in US history, and many observers assumed that she would have particular strength among women. According to a Gallup poll, "She did slightly better among Republican women than among Republican men, but this strength was not nearly enough to enable her to challenge Bush. In the October poll, Dole received the vote of 16% of Republican women, compared to 7% of Republican men." [Source: www.gallup.com (2000).] With the additional information that the Republican party is about 60% male, find the probability that a Republican randomly selected from the October survey would have voted for Dole.

7. Aids Testing. Screening large numbers of blood sample for HIV, the virus that causes AIDS, uses an enzyme immunoassay (EIA) test that detects antibodies to the virus. Samples that test positive are retested using a more accurate "western blots" test. Applied to people who have no HIV antibodies, EIA has probability of about 0.006 of producing a false positive. If the 140 employees of a medical clinic are tested and all 140 are free of HIV antibodies, what is the probability that at least one false positive will occur?

8. A company that manufactures video cameras produces a basic model and a deluxe model. Over the past year, 40% of the cameras sold have been the basic model. Of those buying the basic model, 30% purchase an extended warranty; whereas, 50% of all purchasers of the deluxe model buy an extended warranty. Draw a tree diagram of this situation showing the probabilities of all possible events.If you learn that a randomly selected purchaser bought an extended warranty, what is the probability that he or she has a basic model?

9. In April 2003, Science magazine reported on a new computer-based test for ovarian cancer, "clinical proteomics," that examines a blood sample for the presence of certain patterns of proteins. Ovarian cancer, though dangerous, is very rare, afflicting only 1 of every 5000 women. The test is highly sensitive, able to correctly detect the presence of ovarian cancer in 99.97% of women who have the disease. However, it is unlikely to be used as a screening test in the general population because the test gave false positives 5% of the time. Why are false positives such a big problem? Draw a tree diagram and determine the probability that a woman who tests positive using this method actually has ovarian cancer.

10. A researcher surveyed students majoring in business and asked what type of car they own.

	Bought New	Bought Used
Male	21	32
Female	44	15

a. What is the probability that a female student purchased a new car?

b. What is the probability that a male student purchased a used car?

c. What is the probability that a student purchased a new car?

d. What is the probability that a student is female?

e. Given that a student is female what is the probability that she purchased a used car?

f. Given that a car is new what is the probability that the owner is a male?

g. Is being a male and buying a used car independent or dependent occurrences?

11. A study found that on a given day 72% of women and 46% of men made their beds. In the U.S. women comprise 52% of adults. Find the following:

a. The percentage of all adults who are men and made their beds.

b. The percentage of all adults who are women and made their beds.

c. The percentage of all adults who made their beds.

d. If a person has made their bed, what is the probability that that person is a woman?

12. Microcomputers are shipped to the University bookstore from three factories A, B, and C. You know that factory A produces 20% defective microcomputers, whereas B produces 10% defectives and C only 5% defectives. The manager in the store receives a new shipment of microcomputers and discovers that 40% are from factory C, 40% are from factory B, and 20% are from factory A. (Hint: make a tree diagram)

a. What is the probability of finding a defective microcomputer in this shipment?

b. Are the events "microcomputer comes from factory A" and "microcomputer comes from factory B" mutually exclusive? Are they independent?

c. Suppose the manager randomly selects one microcomputer, and discovers that it is defective. What is the probability that it came from factory A?

13. Let $P(A \cap B) = \frac{3}{6}$ $P(A^c \cap B) = \frac{1}{6}$ $P(A \cap B^c) = \frac{1}{6}$

a. Draw and label a Venn Diagram for events A and B.

b. $P(A^c \cap B^c) =$

c. $P(A^c \quad B^c) =$

d. Are A and B mutually exclusive (disjoint)?

e. Are A and B independent?

14. For a family living in Southern Mississippi, the probability of owning a dog is 0.4, the probability of owning a cat is 0.5, and the probability of owning both a cat and a dog is 0.12.

a. Use a Venn Diagram to show the Union of the two events.

b. Use a Venn Diagram to show the Intersection of the two events.

c. What is the probability that a family living in Southern Mississippi does not own a dog?

d. What is the probability that a family living in Southern Mississippi owns a cat or a dog?

e. What is the probability that a family living in Southern Mississippi owns neither a cat nor a dog?

f. Are events A and B independent? Explain.

g. Are events A and B mutually exclusive (disjoint)? Explain.

15. The probability that the space shuttle is launched on the designated day is 80%. Assume that shuttle launches are independent from each other. Suppose four launches are scheduled in the next three months.

a. What is the probability that each one is launched on the designated day?

b. What is the probability that exactly one is launched on the designated day?

c. What is the probability that the first two are launched on the designated day, but the last two are not?

16. It is estimated that 22% of the households in America are headed by a single adult. Out of these single adult households, 21% are headed by men. What percent of American households are headed by single men?

17. A craftsperson makes stuffed animals for sale. Eighty-five percent of the animals she makes are bears while the remaining 15% are rabbits. Suppose she sells 75% of her bears at craft shows but only 50% of her rabbits are sold at craft shows. What proportion of her animals does she sell at craft shows? (Hint: use a tree diagram)

18. Suppose $P(A) = .35$, $P(B) = .6$ and $P(A \cap B) = .27$. Determine

    a. $P(A^c)$ (A^c represents the complement of A)

    b. $P(A * B)$

    c. $P(A \mid B)$

    d. are A and B independent events?

19. Of the 60 obese teenagers in a recent study, 25% had type II diabetes, 30% had high blood pressure, and 17% had both high blood pressure and type II diabetes. Suppose one of these 60 obese teenagers is randomly selected. Given that the teenager has type II diabetes, what is the probability that he or she also has high blood pressure?

20. The probability that Michael misses a free throw shot is .15. If he goes to the line to shoot three free throws (due to a foul on a three-point shot).

a. What is the probability that Michael misses all three shots? What assumptions did you make in order to calculate this probability?

b. What is the probability that Michael makes at least one of the three shots?

c. What is the probability that Michael makes the first shot but not the second or third?

21. A new detergent is found to remove excess dirt and stains satisfactorily on 88% of the items washed. Assume that 3 items are to be washed with the new detergent.

a. What is the probability of satisfactory results on all 3 items?

b. What is the probability that none are cleaned satisfactorily?

c. What is the probability that at least one is not cleaned satisfactorily?

22. For an interstellar space truck stop the probability that the owner comes from the planet Orkbak is 0.62. Of the Orkbakians, 88% are giants. What is the probability that the owner of a randomly chosen interstellar truck stop is an Orkbakian giant?