

## Statistics 211 Tutorial #3

Note: whenever possible, draw a Venn diagram, box with tickets, tree diagram, contingency table etc. for the questions. It will help in answering the questions.

1. Patients arriving at a hospital outpatient clinic can select one of two stations for service. Suppose that physicians are randomly assigned to the stations and that the patients have no station preference. Three patients arrive at the clinic and their selection of stations is observed. Note: all three patients could go to the same station.
  - (a) List all possible outcomes.
  - (b) List the outcomes of the event A that each station received at least one patient.
  - (c) Find  $P(A)$ .
  
2. Among 32 dieters following a similar routine, 18 lost weight, 5 gained weight, and 9 remained the same weight. If one of these dieters is randomly chosen, find the probability that he or she
  - (a) gained weight
  - (b) lost weight
  - (c) neither gained nor lost weight
  
3. A small advertising firm consists of 2 men and 1 woman. The firm has two clients who are particularly difficult to deal with. To decide who sees the first client, one person is randomly selected from the three. The same procedure is followed for the second client. Note: It may help to write out all possible outcomes.
  - (a) Find the probability that both clients are served by the same person from the advertising firm.
  - (b) Find the probability that both clients are served by men.
  - (c) Find the probability that the events of (a) and (b) occur simultaneously.
  
4. A house is randomly chosen in Calgary. The probability is 0.35 that the house is occupied by a single parent and 0.03 that it is occupied by an elderly person (who is not a single parent – not that they couldn't be.)
  - (a) What is the probability the house chosen does not have a single parent as a resident?
  - (b) What is the probability the house chosen is occupied by single parent or an elderly person?
  - (c) What is the probability the house chosen does not have a single parent nor an elderly person living as a resident?
  
5. Suppose A and B are events such that  $P(A) = 0.25$ ,  $P(B) = 0.50$ , and  $P(A \text{ or } B) = 0.60$ 
  - (a) Determine
    - (i)  $P(A \text{ and } B)$
    - (ii)  $P(\text{not } A \text{ and not } B)$
    - (iii)  $P(\text{not } A)$
    - (iv)  $P(\text{not } B)$
    - (v)  $P(A \text{ given } B)$
    - (vi)  $P(B \text{ given } A)$
  
  - (b) Are A and B mutually exclusive? Independent?
  
6. 80% of the patrons at hockey games buy a soft drink. 60% buy popcorn and 50% purchase both. What is the probability that a person:
  - (a) buys only a soft drink?
  - (b) buys a soft drink or popcorn?
  - (c) doesn't buy a soft drink and popcorn?
  - (d) doesn't buy a soft drink or doesn't buy popcorn?
  
7. A stock is selected at random each morning from the Toronto Stock Exchange. It is observed that there is a 50% chance that a stock will go up that day, a 10% chance that it is worth more than \$100 and a 45% chance that it will go down and be worth \$100 or less.

- (a) What is the probability that the stock goes down and is worth more than \$100? (5%)
- (b) What is the probability that the stock goes up and is worth more than \$100?
8. A store has found that 80% of their customers purchase shoes, 40% purchase purses and 30% purchase both.
- (a) What is the probability that a customer will purchase only shoes?
- (b) If a person buys shoes, what is the probability that he/she will buy a purse?
- (c) If a person buys a purse, what is the probability that he/she will buy shoes?
- (d) What is the probability that a person buys neither shoes nor a purse?
- (e) Are the purchase of shoes and the purchase of purses independent? Explain
- (f) Are the purchase of shoes and the purchase of purses mutually exclusive? Explain
9. A survey of 50 randomly selected customers at a supermarket showed that 10 purchased milk, butter and eggs; 14 purchased milk and butter; 13 purchased milk and eggs; 12 purchased butter and eggs; 23 purchased milk; 21 purchased butter and 12 did not purchase any of these items. What is the probability that a person selected at random will buy:
- (a) only eggs?
- (b) eggs?
- (c) milk or butter?
- (d) milk or eggs?
- (e) milk and butter but no eggs?
- (f) milk or butter or eggs?
10. A survey of 50 randomly selected customers at a supermarket showed that 14 purchased milk and butter; 2 purchased butter and eggs; 23 purchased milk; 21 purchased butter and 12 did not purchase any of these items (milk, butter, eggs). Further, no one purchased milk and eggs. What is the probability that a person selected at random will buy:
- (a) only eggs?
- (b) only butter?
- (c) eggs?
- (d) milk or butter?
- (e) butter or eggs?
11. Two standard dice are rolled simultaneously. Find the probabilities of the following events:
- (a) the sum of the dice is an even number
- (b) the sum of the dice is at least 8
- (c) the sum of the dice is not greater than 9
12. A certain company encourages its employees to participate in some type of physical activity. A survey revealed that 40% play golf, 50% fish and 25% play golf and fish. Define the events as  
G: play golf                      F: fishes
- (a)  $P(\text{not } G \text{ or } F)$
- (b)  $P(G \text{ and not } F)$
- (c)  $P(G \text{ or } F)$
- (d)  $P(\text{not } G \text{ and not } F)$
13. The failure rate of a heart attack alarm in an ICU is 0.001. For improved safety, a duplicate alarm is installed. What is the probability that a heart attack will not be signaled if the alarms work independently of one another?

14. 50 people at a conference were classified by town of residence and sex, giving the following results:

Sex	City			Total
	Calgary (C1)	Red Deer (C2)	Edmonton (C3)	
Male (A1)	8	9	13	30
Female (A2)	2	6	12	20
Total	10	15	25	50

A person is selected at random from those attending the conference.

- What is the probability that the person selected is from Calgary?
- What is the probability that the person selected is not from Red Deer?
- What percentage of the participants are women?
- What is the probability that the person chosen is from Calgary and Red Deer?
- What is the probability that the person chosen is male and from Red Deer?
- What is the probability that the person chosen is from Red Deer or Edmonton?
- What is the probability that the person chosen is female or is from Edmonton?
- What is the probability that the person chosen is male if the person selected is from Edmonton?
- What is the probability that the person chosen is from Red Deer given that a male is selected?
- Are the events “Male” and “from Calgary” independent? Mutually exclusive? Explain using probability values from this question.

15. Tom is playing a game on the Price is Right. He is given 4 tags with prices on them. There are 4 items. In order to win an item, he must place the correct tag on the item.

- How many ways can he arrange the tags?
- If he is given 5 tags, how many ways can he arrange the tags for the 4 items?
- If he is given 5 tags and there are only 3 items, how many ways can he arrange the tags?

16. A meeting is held with 8 individuals. If each person shakes hands with another person only once, how many handshakes occurred at the meeting?

17. Bob bought a used cell phone from a friend but forgot to ask what the 4 number password was to unlock it. What’s the probability that Bob guesses the correct password on his first try?

18. In Calgary, incompatibility is given as a legal reason for divorce in 70% of all divorce cases. What is the probability that in the next 6 divorce cases filed in Calgary, 5 will be due to incompatibility?

19. An automobile safety engineer figures that 1 in 10 automobile accidents are due to driver fatigue. What is the probability that at least 3 out of 5 accidents are due to driver fatigue?

20. Based on past experience, the probability that a student will pass this course is 0.7. From a random sample of 8 students,

- What is the probability that all 8 students pass this course?
- What is the probability that at least 2 students pass this course?

21. Do as many questions from the text in chapter 13,14 and 15 (omit special review questions 6, 7,10-14 on page 265-267)