

Math 321

Lab #3

Review Lab #2. Make sure you know it before moving on to this lab. Quiz 2 will cover labs 2&3.

1. 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. We are just interested in whether the stock goes up or down, not if it stays the same.
  - (a) What is the probability that the stock goes up and is worth more than \$100? (.05)
  - (b) What is the probability that the stock goes down and is worth more than \$100? (.05)
  - (c) Is the event of the stock rising or falling independent of the worth? Why? (yes)
  
2. A card is drawn from a well shuffled deck of 52 cards. Let
  - A = event a face card is selected
  - B = event a king is selected
  - C = event a heart is selected
  - D = card is a king or a heart
  - (a) Find the following probabilities
    - (i)  $P(A), P(B), P(C), P(D)$ . (3/13), (1/13), (1/4), (4/13)
    - (ii)  $P(B|A)$  (1/3)
    - (iii)  $P(B|\bar{A})$  (0)
    - (iv)  $P(C|A)$  (1/4)
    - (v)  $P(A|B)$  (1)
    - (vi)  $P(A|C)$  (3/13)
    - (vii)  $P(A|\bar{B})$  (1/6)
    - (viii)  $P(B|D)$  (1/4)
    - (ix)  $P(A \cup B \cup C)$  (11/26)
    - (x)  $P[A \cap (B \cup C)]$  (3/26)
    - (xi)  $P[A \cup (B \cap C)]$  (3/13)
  - (b) Determine whether or not the following pairs of events are independent: (Hint: use conditional probabilities)
    - (i) (A,B) (no)
    - (ii) (A,C) (yes)
    - (iii) (B,D) (no)
    - (iv) (B,C) (yes)
  
3. An automatic drilling machine produces good pieces 91% of the time. Faulty pieces are drilled either off-centre (C), at an incorrect angle (A), or both ( $A \cap C$ ). In the total production, 5% are drilled off-centre and 2% are drilled both off-centre and at an incorrect angle.
  - (a) What percentage is drilled at an incorrect angle? (6%)
  - (b) If a part is drilled off-centre, what is the probability that it will be drilled off-angle? (.4)
  - (c) Is "off-centre" drilling independent of "off-angle" drilling? Explain (No)
  
4. A balanced dime is tossed three times. Let
  - A = event the first toss is heads.
  - B = event the third toss is tails,
  - C = event the total number of heads is one.
  - (a) Compute  $p(A), P(B), P(C)$ . (.5) (.5) (.375)
  - (b) Compute  $P(B|A)$ . (.5)
  - (c) Compute  $P(C|A)$ . (.25)
  - (d) Compute  $P(A \cup B \cup C)$ . (7/8)
  - (e) Are A and B independent events? Why? (yes)
  - (f) Are C and A independent events? Why? (no)

5. The number of cars and trucks in use by age are as shown in the following table. Frequencies are in millions.

Type	Age (yrs)				Total
	Under 6	6-8	9-11	12 and over	
Truck	27.8	13.1	10.7	18.6	70.2
Car	46.2	26.9	23.3	26.8	123.2
Total	74.0	40.0	34.0	45.4	193.4

- A person is selected at random from his survey.
- What is the probability that the person drives a truck? (0.3630)
  - What is the probability that the person selected is not driving a vehicle that is 12 years or older? (0.7653)
  - What is the probability that the person chosen is driving a car and it is 12 years or older? (.1386)
  - What is the probability that the person chosen is driving a vehicle that is 9 years or older? (.4105)
  - What is the probability that the person chosen is driving a car that is 9 years or older? (.2590)
  - What is the probability that the person chosen is driving a truck given that it is 6-8 years old? (.3275)
  - What is the probability that the person chosen is driving a vehicle that is less than 9 years old if it's a car? (.5933)
  - Are the events "vehicle" and "age" independent? Explain using probability values from this question.
6. Suppose there is a 77.3% chance that a home buyer will purchase a resale home. In the next four home purchases, find the probability that
- The first three will be resales and the fourth will be a new home. (0.1048)
  - The first will be a resale, the second a new home, and the last two resales. (0.1048)
  - The first will be a resale, the next two new homes, and the last a resale. (0.0308)
  - At least 1 will be a resale. (.9973)
7. Three cards are randomly selected with replacement from an ordinary deck of 52 cards.
- Find the probability that all three cards are hearts. (.0156)
  - Find the probability that the first two cards are hearts and the third a spade. (0.0156)
  - If the cards are now drawn without replacement, find the answers to (a) and (b) from above. (.0129), (.0153)
8. Each computer chip produced by machine A is defective with a probability of 0.1, whereas each computer chip produced by machine B is good with a probability of 0.95. 42% of computer chips are produced by machine A, the remainder by machine B. A chip is chosen at random.
- What is the probability that the chip is defective? (0.071)
  - Given that the chip is defective, what is the probability the chip was produced by machine A? (0.5915)
9. There are 3 boxes with balls inside each. You select a box at random, and then randomly select a ball from it. The first box contains 4 red balls, 4 blue balls, and 4 green balls; the second box contains 4 red balls, 5 blue balls, and 6 white; the third contains 1 yellow ball and six blue balls.
- If the ball you selected was red, then what is the probability that you selected it from box 1? (5/9)
  - If the ball you selected was blue, then what is the probability that you selected it from box 3? (9/16)
  - If the ball you selected was yellow, then what is the probability that you selected box 3? (1)

**Do all the questions in sections 2-2.10 plus the supplementary exercises.**