

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. (0.0156)
 - 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. (0.0129), (0.0153)
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.