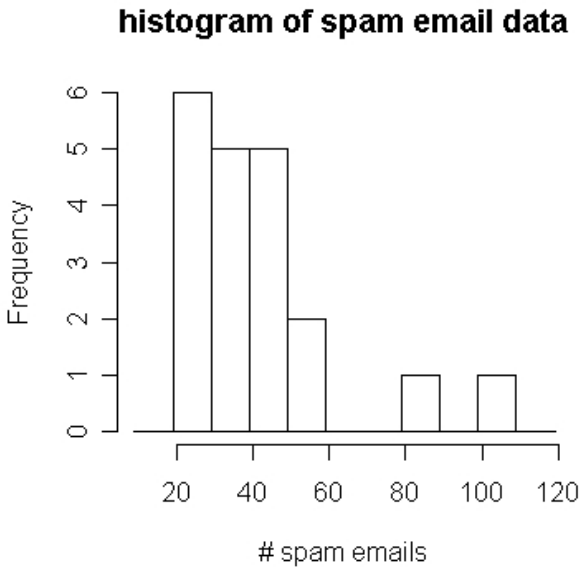
1. Harris recently installed a spam filter software, but he still saw spam emails in his inbox. He made a daily record of the number of spam emails that were delivered to his inbox over the past 20 days. The following is a frequency histogram for his data. The frequency refers to the number of days.



a) Harris also plotted a stemplot for the data. Which of the following is a correct stemplot for his data? Check only one answer. [2 marks]

___ Stemplot A
___ Stemplot B
___ Stemplot C

A.

```
 2 | 011355
 3 | 01467
 4 | 12479
 5 | 56
 6 |
 7 |
 8 | 0
 9 |
10 | 5
```

B.

```
 2 | 011355
 3 | 01467
 4 | 12479
 5 | 56
 8 | 0
10 | 5
```

C.

```
1 | 05
2 | 011355
3 | 01467
4 | 12479
5 | 56
6 |
7 |
8 | 0
```

b) What is the third quartile of the number of spam emails? Use the stemplot you have chosen in part (a) to answer this question. Check only one answer. [2 marks]

___ 23
___ 25
___ 47
___ 48

2. Consider the following two studies:

Study 1: A study compared 120 patients with brain cancer to 246 healthy patients without brain cancer. The patients' cell phone use was measured using a questionnaire. The brain cancer patients used cell phones more often, on the average.

Study 2: A study exposed rats to two common types of cell phone radiation for four hours a day, five days a week, for two years. One third of the rats were randomized to be exposed to analog cell phone frequency, one third to digital cell phone frequency, and one third served as controls and received no radiation. At the end of two years, their brains were examined for cancerous tumors. No statistically significant difference in the percentage of brain cancer was found among the groups.

a) True or false? Study 1 shows that cell phone use causes brain cancer. [2 marks]
___True ___False

b) Identify the following elements for Study 2:

i. the experimental unit [2 marks]: _____
ii. the factor [2 marks]: _____
iii. the treatments [3 marks]:

_____

3. A city council was planning to turn a major street in the city from a primary traffic artery to a secondary traffic artery. It sent out a questionnaire to all the 36,589 households living in the city requesting for their input concerning the plan. Thirty four percent of the 10,375 households who returned the questionnaires opposed the plan.

   For the following statements, check all that are correct. [3 marks]

   ___ This survey conducted by the city council is likely to suffer from nonresponse bias.

   ___ The 10,375 households that returned the questionnaires formed a random sample of the population.

   ___ The percentage of the 10,375 households that opposed the plan, 34%, is a parameter.

4. You need to drive past two traffic lights on the way from your house to the nearest grocery store. The probability that you hit a red light is 0.5 at the first intersection and 0.4 at the second intersection. The probability that you run into a red light at both intersections is 0.25. On a random day you drive from home to that grocery store.

   Define the following events:

   E_1 = you run into a red light at the first intersection
   E_2 = you run into a red light at the second intersection
   E_3 = you run into a green light at both intersections
   E_4 = you run into a red light at both intersections

   Which of the following statements is (are) true about the above events? Check all that are correct. [6 marks]

   ___ E_1 and E_2 are independent events.

   ___ E_1 and E_2 are disjoint events.

   ___ E_3 and E_4 are disjoint events.

   ___ E_3 is the complement of E_4.

5. You draw two cards without replacement from a deck of 52 cards. If the first card is not a spade, find the probability that the two cards drawn are both diamonds. [6 marks]

6. The length of trout in a lake is normally distributed with mean $\mu = 0.95$ feet and an unknown standard deviation σ. If 60% of all trout are longer than 0.8 feet, what is the value of σ? [6 marks]

7. In a university parking database with 5600 registered vehicles, records show that 43% of the registered vehicles are Asian makes, 23% are European makes and the remaining are American makes. Among all the 5600 cars, 20% once received a parking ticket.

   a) You randomly pick three vehicles with replacement from the database. What is the probability that at most two of the three are American makes? [6 marks]

   b) Consider a random sample of 100 vehicles selected from the database.
   The sample proportion of the 100 selected vehicles that <u>had never received</u> a parking ticket has an approximate 95% chance of falling between
   _____ and _____.
   Fill in the blanks and show your calculation below. [4 marks]

8. Two stores sell watermelons. At the first store the melons weigh an average of 20 pounds with a standard deviation of 2.2 pounds. The melons are sold for 36 cents a pound. At the second store the melons are smaller, with a mean of 17 pounds and a standard deviation of 2 pounds. The store is having a sale on watermelons – only 25 cents a pound. Assume that the weights are normally distributed. Jenny selects a melon at random at each store. Find the mean and the variance of the difference in the prices Jenny pays for the two melons. [6 marks]

9. Each day the value of a particular stock goes up one unit with probability 0.3, stays the same with probability 0.5 or else goes down one unit with probability 0.2. Taking changes over consecutive days to be independent of each other, estimate the probability that the stock will have increased by a value of at least five units over 500 days. [10 marks]