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Midterm1 for Statistics 1 Fall 2020

ANSWERS TO MULTIPLE CHOICE QUESTIONS

1. B
2. A
3. C
4. A
5. D
6. D

ANSWERS TO FILL-IN-THE-BLANK QUESTIONS

7. 68%
8. $\frac{16}{36} = \frac{4}{9} = 0.44 = 44\%$

Question 1 – Part A

$0.25 * 10 = 2.5$ so round up to 3rd then 0th percentile is 398

$0.50 * 10 = 5$ so average 5th and 6th then 50th percentile is $\frac{502+555}{2} = 528.5$

$0.75 * 10 = 7.5$ so round up to 8th then 75th percentile is 796

Five-number summary:

0th percentile = Min = 238

25th percentile = Q_L = 398

50th percentile = Q_M = Median = $\frac{502+555}{2} = 528.5$

75th percentile = Q_U = 796

100th percentile = Max = 1245

Interquartile range = 3rd quartile – 1st quartile = $796 - 398 = \mathbf{398}$

Question 1 – Part B

Interquartile range = upper quartile – lower quartile = $18.5 - 12.5 = 6$

Upper Inner fence: Upper quartile + $1.5(\text{IQR}) = 18.5 + 1.5(6) = 27.5$

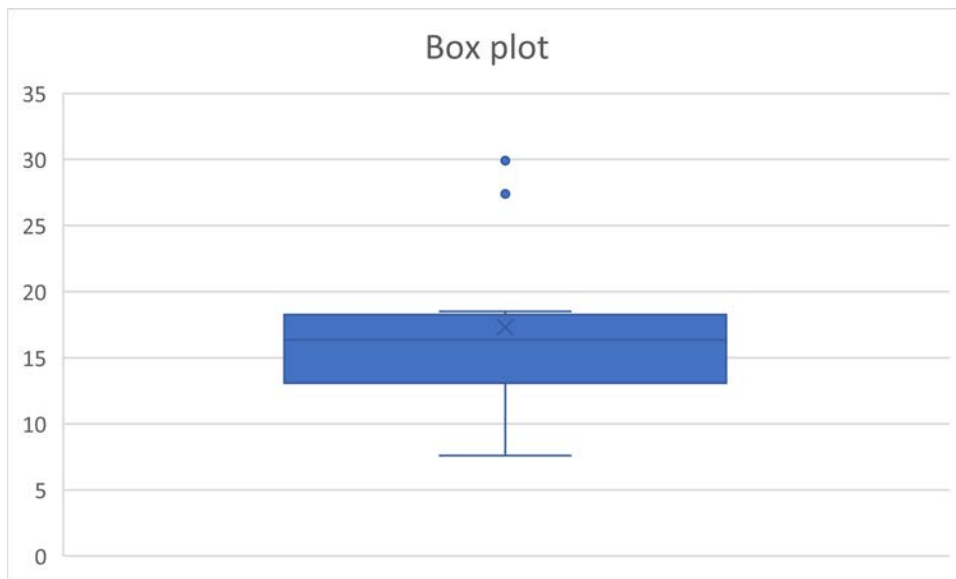
Upper outer fence: Upper quartile + $3(\text{IQR}) = 18.5 + 3(6) = 36.5$

Lower Inner fence: Lower quartile – $1.5(\text{IQR}) = 12.5 - 1.5(6) = 3.5$

Lower outer fence: Lower quartile – $3(\text{IQR}) = 12.5 - 3(6) = -5.5$

We have two values greater than the upper inner fence: **27.4** and **29.9** so they are possible outlier.

We do not have any values less than the lower inner fence so no lower outlier.



Question 2

A)

Of the 6 males 4 are above 30 years old.

Pick 4 from 6 males then 3 from 5

$$P(\text{males both over 30}) = \frac{4}{6} * \frac{3}{5} = \frac{2}{5} = \mathbf{0.4}$$

B)

Of the 5 females 3 are below 30 years old.

Pick 3 from 5 females then 2 from 4

$$P(\text{females both below 30}) = \frac{3}{5} * \frac{2}{4} = \frac{3}{10} = \mathbf{0.3}$$

C)

$P(A \text{ and } B) = P(A) * P(B)$, since they are independent

$$P(A \text{ and } B) = 0.3 * 0.4 = \mathbf{0.12}$$

D)

11 subjects 6 above 30 years old

Choose 2 from over 30 subject, then 2 from rest

exactly two above 30 = 6 choose 2 * 5 choose 2

$$= 15 * 10 = 150 \text{ choices}$$

Total choices = 11 choose 4 = 330

$$P(\text{exactly two above 30}) = \frac{150}{330} = \frac{5}{11} = \mathbf{0.45}$$

Question 3

35% have high blood pressure,

42% have an infection

12% have both problems

a)

$$BloodPressure \cap Infection = 12\% = 0.12$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$P(Infection \text{ given } BloodPressure) = \frac{0.12}{0.35} = 0.34 = \mathbf{34\%}$$

b)

$$P(BloodPressure \text{ given } Infection) = \frac{0.12}{0.42} = \frac{2}{7} = 0.29 = \mathbf{29\%}$$

c)

$$P(BloodPressure \cup Infection) = P(BloodPressure) + P(Infection) - P(Both) = 0.35 + 0.42 - 0.12 = 0.65 = \mathbf{65\%}$$

d)

$$P(none) = 1 - P(\text{either } BloodPressure \text{ or } Infection) = 1 - P(BloodPressure \cup Infection) = 1 - 0.65 = 0.35 = \mathbf{35\%}$$

Question 4

Machine 1: 2% defective

Machine 2: 1% defective

Machine 3: 3% defective

Total production: machine 1 produces 35%, machine 2 produces 25% and machine 3 produces 40%

A)

$$P(\text{defective of total}) = 0.02 * 0.35 + 0.01 * 0.25 + 0.03 * 0.40 = \frac{43}{2000} = 0.0215 = \mathbf{2.15\%}$$

B)

Using Bayes rule,

$$P(\text{from machine 3 given defective}) = \frac{0.03*0.40}{0.02*0.35+0.01*0.25+0.03*0.40} = \frac{24}{43} = 0.56 = \mathbf{56\%}$$