MATH 244 (L1) Applied Statistics

Quiz 1

Name _____ Student ID _____ Tutorial section ____

Time allowed : 45 minutes

1. (*8 marks*) The weights of 20 male students at State University are recorded to the nearest 0.1kg .

72.5	72.6	73.2	73.6	73.8	74.0	74.1	74.4	74.4	74.6
74.7	74.8	74.9	75.0	75.2	75.7	75.8	76.4	77.6	78.3

(a) Construct a stem-and-leaf display for the data. Is the distribution symmetric, positively skewed, or negatively skewed?

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72*|56
73 |268
74 |01446789            n = 20
75 |0278                leaf unit = 0.1 kg
76 |4
77 |6
78*|3
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The distribution of the data is slightly skewed to the right (positively skewed).

(b) Find the five number summary and hence sketch the boxplot for the data.

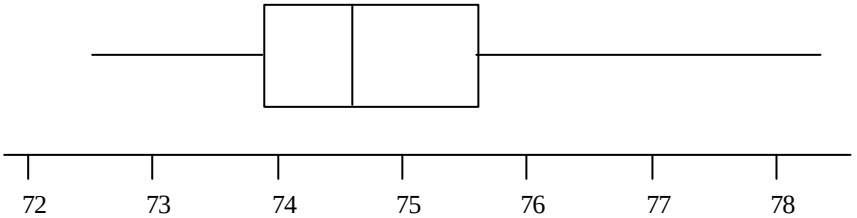
Min = 72.5

$$Q_L = X_{(5.25)} = X_{(5)} + 0.25\left(X_{(6)} - X_{(5)}\right) = 73.8 + 0.25(74.0 - 73.8) = 73.85$$

$$\text{Median} = \frac{1}{2}\left(X_{(10)} + X_{(11)}\right) = \frac{1}{2}(74.6 + 74.7) = 74.65$$

$$Q_U = X_{(15.75)} = X_{(15)} + 0.75\left(X_{(16)} - X_{(15)}\right) = 75.2 + 0.75(75.7 - 75.2) = 75.575$$

Max = 78.3



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2. (*7 marks*) Let A and B be two events such that

$$\Pr(A) = 0.7 \quad , \quad \Pr(B) = 0.6 \quad , \quad \Pr(A \cup B) = 0.8 \ .$$

(a) Find $\Pr(A \cap B)$.

$$\begin{aligned} \Pr(A \cap B) &= \Pr(A) + \Pr(B) - \Pr(A \cup B) \\ &= 0.7 + 0.6 - 0.8 = 0.5 \end{aligned}$$

(b) Are A and B disjoint? Why?

If A and B are disjoint, then $A \cap B = \boldsymbol{f}$ and hence $\Pr(A \cap B) = 0$. But now $\Pr(A \cap B) \neq 0$. Therefore A and B are not disjoint.

(c) Are A and B independent? Why?

$$\Pr(A)\Pr(B) = 0.7 \times 0.6 = 0.42 \neq \Pr(A \cap B)$$

By the definition of independence, A and B are not independent.

3. (*10 marks*) An economist believes that during periods of high economic growth, the U.S. dollar appreciates with probability 0.75; in periods of moderate economic growth, the dollar appreciates with probability 0.35; and during periods of low economic growth, the dollar appreciates with probability 0.15. During any period of time, the probability of high economic growth is 0.35, the probability of moderate growth is 0.50, and the probability of low economic growth is 0.15.

(a) What is the probability that the dollar is appreciating during the present period.

$$\Pr(appreciate \mid high) = 0.75$$
$$\Pr(appreciate \mid moderate) = 0.35$$
$$\Pr(appreciate \mid low) = 0.15$$
$$\Pr(high) = 0.35 \quad , \quad \Pr(moderate) = 0.5 \quad , \quad \Pr(low) = 0.15$$

$$\Pr(appreciate) = 0.75 \times 0.35 + 0.35 \times 0.5 + 0.15 \times 0.15 = 0.46$$

(b) Suppose the dollar has been appreciating during the present period. What is the probability that we are experiencing a period of high economic growth?

$$\Pr(high \mid appreciate) = \frac{\Pr(appreciate \mid high)\Pr(high)}{\Pr(appreciate)}$$
$$= \frac{0.75 \times 0.35}{0.46} = 0.5707$$

(c) If we know that we are **not** experiencing a period of low economic growth, what would be your answers to part (a) and part (b)?

$$\Pr(high \mid not\ \ low) = \frac{0.35}{0.35 + 0.5} = \frac{7}{17}$$
$$\Pr(moderate \mid not\ \ low) = \frac{0.5}{0.35 + 0.5} = \frac{10}{17}$$
$$\Pr(appreciate \mid not\ \ low) = 0.75 \times \frac{7}{17} + 0.35 \times \frac{10}{17} = 0.5147$$

$$\Pr(high \mid appreciate, not\ \ low) = \frac{\Pr(appreciate \mid high, not\ \ low)\Pr(high \mid not\ \ low)}{\Pr(appreciate \mid not\ \ low)}$$
$$= \frac{0.75 \times (7/17)}{0.5147} = 0.6$$

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