

Probability and Statistics— 410147

Assignment 2

Instructure: Maryam Fafous

Deadline 09/04/2025

Student: Mohammed Jamel (22110219)

- Eighty adults were asked to watch a 30-minute infomercial until the presentation ended or until boredom became intolerable. The following table lists the frequency distribution of the times that these adults were able to watch the infomercial

Time (minutes)	Number of Adults
0 to less than 6	16
6 to less than 12	21
12 to less than 18	18
18 to less than 24	11
24 to less than 30	14

Find the mean, variance, and standard deviation. Are the values of these summary measures population parameters or sample statistics?

Interval	Frequency (f)	Midpoint (x)	f·x	f·x ²
0 – <6	16	3	48	144
6 – <12	21	9	189	1701
12 – <18	18	15	270	4050
18 – <24	11	21	231	4851
24 – <30	14	27	378	10206
Total	80		1116	20952

- 1- Midpoint = $\frac{Lower - Upper}{2}$
- 2- The Mean: $\mu = \frac{\sum f \cdot x}{\sum f} = \frac{1116}{80} = 13.95$ minutes
- 3- The Variance $\sigma^2 = \frac{\sum f \cdot (x^2)}{\sum f} - \mu^2 = \frac{20952}{80} - (13.95)^2 = 67.2975$
- 4- Standard Deviation $\sigma = \sqrt{67.2975} \approx 8.2$ minutes
- 5- only 80 adults then is a Sample Not Population

2. These data give the times (in minutes) taken to commute from home to work for 10 workers

10	50	65	33	48
26	32	17	7	15

1. Construct a stem-and-leaf display for these data.

```

0 | 7
1 | 0 5 7
2 | 6
3 | 2 3
4 | 8
5 | 0
6 | 5
  
```

2. Find the central tendency and dispersion measures.

a. Mean = $\frac{(7+10+15+17+26+32+33+48+50+65)}{10} = \left(\frac{303}{10}\right) = 30.3$ minutes

b. Median = $\frac{\left(\frac{n}{2}\right)^{th} Value + \left(\frac{n}{2} + 1\right)^{th} Value}{2} = \frac{5^{th} + 6^{th}}{2} = 26 + 32 = 29$

c. Mode = No repeated values = No mode

d. Range = Highest – Lowest = 65 – 7 = 58

e. Variance And Standard Deviation in short

$$\sum (x_i - \bar{x})^2 = (7 - 30.3)^2 + \dots + (65 - 30.3)^2 = 3706.10$$

$$s^2 = \frac{3706.1}{9} \approx 411.79 \Rightarrow s \approx 411.79 \approx 20 \cdot 29$$

3. Calculate the values of the three quartiles and the interquartile range. Where does the value of 32 lie in these quartiles?

Sorted data again:

7, 10, 15, 17, 26, 32, 33, 48, 50, 65

Q1 (25th percentile): Median of first half

Q1 = median of (7, 10, 15, 17, 26) = 15 minutes

Q2 (Median) = 29 (already found)

Q3 (75th percentile): Median of second half

Q3 = median of (32, 33, 48, 50, 65) = 48 minutes

IQR = Q3 – Q1 = 48 – 15 = 33 minutes

32 Its between Q2 (29) and Q3 (48) So 32 lies in Q3 (the third quartile)

4. Find the (approximate) value of the 30th percentile. Give a brief interpretation of this percentile.

$$P_k = \left(\frac{k}{100} \right) (n + 1) \Rightarrow P_{30} \left(\frac{30}{100} \right) (11) = 3 \cdot 3^{rd}$$

interpolate between the 3rd (15) and 4th (17) values:

$$P_{30} \approx 15 + 0.3(17 - 15) = 15 + 0.6 = 15.6 \text{ minutes}$$

About 30% of workers have commute times less than or equal to 15.6 minutes

Hope you all the best!