

Seminar 10 (Suggested Solution)

1.

Class Mid-point (m_i)	Frequency (f_i)	$m_i f_i$
12.7	12	152.4
17.2	24	412.8
21.7	25	542.5
26.2	28	733.6
30.7	21	644.7
	110	2486

$$\text{Mean} = 2486 / 110 = \mathbf{22.6}$$

$$n = 110$$

$$\text{Median class} = (19.5 - 23.9)$$

$$\text{Median} = L_m + \frac{\frac{n}{2} - \text{Cum. Freq.}}{f} w$$

$$L_m = 19.45, \quad w = 4.5, \quad f = 25, \quad \text{Cum. Freq.} = 36$$

$$\text{Median} = 19.45 + \frac{110/2 - 36}{25}(4.5) = \mathbf{22.87}$$

$$\text{Modal class} = (24.0 - 28.4)$$

$$M_o = L_{mo} + \frac{d_1}{d_1 + d_2} w$$

$$L_{mo} = 23.95, \quad d_1 = 3, \quad d_2 = 7, \quad w = 4.5$$

$$\text{Mode} = 23.95 + \frac{3}{3+7} (4.5) = \mathbf{25.3}$$

$$\begin{aligned} 2) \quad & \sum(X_i - \mu) \\ &= \sum X_i - \sum \mu \\ &= n\mu - n\mu \\ &= 0 \end{aligned}$$

3)

X_i	3	5	24	17	9	15	10	18	21	8	130
μ	13	13	13	13	13	13	13	13	13	13	
$X-\mu$	-10	-8	11	4	-4	2	-3	5	8	-5	0
$ X-\mu $	10	8	11	4	4	2	3	5	8	5	60
$(X-\mu)^2$	100	64	121	16	16	4	9	25	64	25	444

- a. $MAD = 60/10 = 6$
- b. $Variance = 444/10 = 44$
- c. $Standard\ deviation = \sqrt{44} = 6.6333$
- 4) a. the interval 300 to 700
 $= 500 - 200$ to $500 + 200$
 $= 500 - (2) 100$ to $500 + (2) 100$
 According to the Empirical rule, there is 95% data within the interval.
- b. interval 200 to 800
 $= 500 - 300$ to $500 + 300$
 $= 500 - (3) 100$ to $500 + (3) 100$
 According to the Empirical rule, there is almost all (99.73%) data within the interval.
- c. for the interval 200 to 700,
 there is about $(95\%/2) + (99.73\%/2) = 97.365\%$ data within the interval.
 since it is a bell-shaped distribution, it means that the distribution is symmetrical about the mean..
- 5) a. Chebyshev's Theorem should be used. It is because that there is no information about the shape of the distribution, and Empirical rule is only applicable to bell-shaped distribution. Therefore, it is better to use Chebyshev's Theorem that is applicable to any shape of distribution.
- b. the interval 300 to 700
 $= 500 - 200$ to $500 + 200$
 $= 500 - (2) 100$ to $500 + (2) 100$
 According to the Chebyshev's theorem, we have $K = 2$,
 Therefore, there is at least $1 - 1/2^2 (= 1 - 1/4 = 75\%)$ data within the interval.
- c. the interval 200 to 800
 $= 500 - 300$ to $500 + 300$
 $= 500 - (3) 100$ to $500 + (3) 100$
 According to the Chebyshev's theorem, we have $K = 3$,
 Therefore, there is at least $1 - 1/3^2 (= 1 - 1/9 = 88.89\%)$ data within the interval.
- d. The percentage can't be determined.
 Since we have no knowledge about the distribution, and the shape may not be symmetric.