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The final exam in a third year communication skills course requires students to write several essay-style answers. The number of pages for a sample of 25 exams were recorded. These data are shown here.

5 8 9 3 12 8 5 7 3 8 9
5 2 7 12 9 6 3 8 7 10 9
12 7 3

- a. Range
- b. Quartile Deviation
- c. Mean Absolute Deviation
- d. Variance
- e. Standard Deviation

Solution:

* Sorted List: 2, 3, 3, 3, 3, 5, 5, 5, 6, 7, 7, 7, 7, 8, 8, 8, 8, 9, 9, 9, 9, 10, 12, 12, 12

a. Range:

$$R = \text{Max} - \text{Min}$$

$$R = 12 - 2$$

$$\boxed{R = 10}$$

b. Quartile Deviation:

$$QD = \frac{(Q_3 - Q_1)}{2}$$

$$Q_1 = \frac{i(n+1)}{4} = \frac{1(25+1)}{4} = \frac{26}{4} = 6.5$$

$$Q_3 = \frac{i(n+1)}{4} = \frac{3(25+1)}{4}$$

$$QD = \frac{(9-5)}{2}$$

$$\boxed{Q_1 = 5}$$

$$= \frac{3(26)}{4} = 19.5$$

$$\boxed{QD = 2}$$

$$\boxed{Q_3 = 9}$$

c. Mean Absolute Deviation

$$\bar{x} = \frac{2+3+3+3+3+5+5+5+6+7+7+7+7+8+8+8+8+9+9+9+9+10+12+12+12}{25}$$

$$\bar{x} = 7.08$$

x_i	$ x_i - \bar{x} $	$(x_i - \bar{x})^2$
2	$(2 - 7.08) = 5.08$	25.8064
3	$(3 - 7.08) = 4.08$	16.6464
3	$(3 - 7.08) = 4.08$	16.6464
3	$(3 - 7.08) = 4.08$	16.6464
3	$(3 - 7.08) = 4.08$	16.6464
5	$(5 - 7.08) = 2.08$	4.3264
5	$(5 - 7.08) = 2.08$	4.3264
5	$(5 - 7.08) = 2.08$	4.3264
6	$(6 - 7.08) = 1.08$	1.1664
7	$(7 - 7.08) = 0.08$	0.0064
7	$(7 - 7.08) = 0.08$	0.0064
7	$(7 - 7.08) = 0.08$	0.0064
7	$(7 - 7.08) = 0.08$	0.0064
8	$(8 - 7.08) = 0.92$	0.8464
8	$(8 - 7.08) = 0.92$	0.8464
8	$(8 - 7.08) = 0.92$	0.8464
8	$(8 - 7.08) = 0.92$	0.8464
9	$(9 - 7.08) = 1.92$	3.6864
9	$(9 - 7.08) = 1.92$	3.6864
9	$(9 - 7.08) = 1.92$	3.6864
9	$(9 - 7.08) = 1.92$	3.6864
10	$(10 - 7.08) = 2.92$	8.5264
12	$(12 - 7.08) = 4.92$	24.2064
12	$(12 - 7.08) = 4.92$	24.2064
12	$(12 - 7.08) = 4.92$	24.2064
$\sum x_i - \bar{x} = 58.08$		$\sum (x_i - \bar{x})^2 = 205.84$

$$MAD = \frac{\sum |x_i - \bar{x}|}{n} \quad \boxed{MAD = \frac{58.08}{25} = 2.32}$$

d. Variance:

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$$

$$s^2 = \frac{205.84}{24}$$

$$\boxed{s^2 = 8.57}$$

e. Standard Deviation

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$s = \sqrt{\frac{205.84}{25-1}}$$

$$s = \sqrt{\frac{205.84}{24}}$$

$$s = \sqrt{8.57}$$

$$s = 2.92$$

GROUPED DATA

- a. Range - 10
- b. Quartile Deviation - 2
- c. Mean Absolute Deviation - 2.32
- d. Variance - 8.5767
- e. Standard Deviation - 2.92

a. Range:

$$R = \text{Max} - \text{Min}$$

$$= 12 - 2$$

$$\boxed{= 10}$$

b. Quartile Deviation:

$$QD = \frac{Q_3 - Q_1}{2}$$

$$= \frac{9 - 5}{2} \boxed{= 2}$$

c. Mean absolute deviation:

$$\sum \frac{|x - \bar{x}|}{n} = \frac{58.08}{25} \boxed{= 2.32}$$

d. Variance:

$$s^2 = \sum (x_i - \bar{x})^2$$

$$\cdot \frac{n-1}{24} \boxed{= 8.5767}$$

e. Standard Deviation:

$$s = \sqrt{s^2}$$
$$\boxed{= 2.92}$$