Mean and Standard Deviation of Grouped Data

- Make a frequency table
- Compute the midpoint (x) for each class.
- Count the number of entries in each class (f).
- Sum the f values to find n, the total number of entries in the distribution.
- Treat each entry of a class as if it falls at the class midpoint.

Sample Mean for a Frequency Distribution

$$\overline{x} = \frac{\sum xf}{n}$$

x = class midpoint

Sample Standard Deviation for a Frequency Distribution

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

Computation Formula for Standard Deviation for a Frequency Distribution

$$s = \sqrt{\frac{SS_x}{n-1}}$$

where $SS_x = \sum x^2 f - \frac{\left(\sum xf\right)^2}{n}$

Calculation of the mean of grouped data

Ages:	f	x	xf
30 - 34	4	32	128
35 - 39	5	37	185
40 - 44	2	42	84
45 - 49	9	47	423
	$\Sigma f = 20$		$\Sigma xf = 820$

Mean of Grouped Data

$$\bar{x} = \frac{\sum xf}{n} = \frac{\sum xf}{\sum f}$$

$$= \frac{820}{20} = 41.0$$

Calculation of the standard deviation of grouped data

Ages:	f	x	x – mean	$(x - \text{mean})^2$	$(x - \text{mean})^2 f$
30 – 34	4	32	– 9	81	324
35 – 39	5	37	– 4	16	80
40 – 44	2	42	1	1	2
45 - 49	9	47	6	36	324

$\Sigma f = 20$

$\Sigma (x - \text{mean})^2 f = 730$

Mean = 41.0

Calculation of the standard deviation of grouped data

$\sum (x - \bar{x})^2 = 730$ $\quad$ $\Sigma\, f = n = 20$

$$s = \sqrt{\frac{\sum (x - \bar{x})^2 f}{n - 1}} = \sqrt{\frac{730}{20 - 1}}$$

$$= \sqrt{38.42} \approx 6.20$$

Computation Formula for Standard Deviation for a Frequency Distribution

$$s = \sqrt{\frac{SS_x}{n-1}}$$

where $SS_x = \sum x^2 f - \frac{\left(\sum xf\right)^2}{n}$

Computation Formula for Standard Deviation

x	f	xf	x^2f
32	4	128	4096
37	5	185	6845
42	2	84	3528
47	9	423	19881

$\Sigma f = 20 \quad \Sigma xf = 820 \quad \Sigma x^2f = 34350$

Computation Formula for Standard Deviation for a Frequency Distribution

$$\text{where} \quad SS_x = \sum x^2 f - \frac{\left(\sum xf\right)^2}{n} =$$

$$34350 - \frac{820^2}{20} = 730$$

$$s = \sqrt{\frac{SS_x}{n-1}} = \sqrt{\frac{730}{20-1}} \approx 6.20$$

Weighted Average

Average calculated where some of the numbers are assigned more importance or weight

Weighted Average

$$\textbf{Weighted Average} = \frac{\sum xw}{\sum w}$$

where **w = the weight of the data value x.**

Compute the Weighted Average:

- Midterm grade = 92
- Term Paper grade = 80
- Final exam grade = 88
- Midterm weight = 25%
- Term paper weight = 25%
- Final exam weight = 50%

Compute the Weighted Average:

	x	w	xw
• **Midterm**	**92**	**.25**	**23**
• **Term Paper**	**80**	**.25**	**20**
• **Final exam**	**88**	**.50**	**44**
		1.00	**87**

$$\frac{\sum xw}{\sum w} = \frac{87}{1.00} = 87 = \textbf{Weighted Average}$$