

Appendix D: Review**5. Review****a. Grouped Data.**

Consider the following sample:

Class	f
0.5 - 1.5	1
1.5 - 2.5	0
2.5 - 3.5	1
3.5 - 4.5	2

- Calculate the mean
- Calculate the variance and standard deviation
- Calculate and interpret the skewness and relative skewness
- Calculate and interpret Pearson's measure of skewness
- Calculate the median
- Calculate the interquartile range

Solution:

You need the following:

Class	x (midpoint)	f	F	fx	fx^2	fx^3
0.5 - 1.5	1	1	1	1	1	1
1.5 - 2.5	2	0	1	0	0	0
2.5 - 3.5	3	1	2	3	9	27
3.5 - 4.5	4	2	4	8	32	128
		4		12	42	156

Note: $\sum f = n = 4$, $\sum fx = 12$, $\sum fx^2 = 42$, $\sum fx^3 = 156$.

a. Calculate the mean $\bar{x} = \frac{\sum fx}{n} = \frac{12}{4} = 3$

b. Calculate the variance and standard deviation $s^2 = \frac{\sum fx^2 - n\bar{x}^2}{n-1} = \frac{42 - 4(3)^2}{3} = \frac{6}{3} = 2$

$$s = \sqrt{\text{variance}} = \sqrt{2} = 1.414 \quad C = \frac{s}{\bar{x}} = \frac{\sqrt{2}}{3} = 0.471$$

- c. Calculate and interpret* the skewness and relative skewness

$$k_3 = \frac{n}{(n-1)(n-2)} \left[\sum fx^3 - 3\bar{x} \sum fx^2 + 2n\bar{x}^3 \right]$$

$$= \frac{4}{(3)(2)} \left[156 - 3(3)(42) + 2(4)(3)^3 \right] = \frac{2}{3} [-6] = -4$$

$$g_1 = \frac{k_3}{s^3} = \frac{-4}{(\sqrt{2})^3} = -1.414$$

- d. Calculate and interpret* Pearson's measure of skewness
The mode is 4, since that occurs most.

$$SK = \frac{3(\text{mean} - \text{mode})}{\text{std.deviation}} = \frac{3(3 - 4)}{\sqrt{2}} = -2.121$$

e. Calculate the median

First use $position = p(n+1)$, then use $x_{1-p} = L_p + \left[\frac{pN - F}{f_p} \right] w$ to find the value. Here

$p = .5$. So $p(n+1) = .5(5) = 2.5$. This location is above 2 and below 4, so use the class

3.5 to 4.5. Then $x_{.5} = 3.5 + \left[\frac{.5(4) - 2}{2} \right] 1 = 3.5$.

f. Calculate the interquartile range

For the first quartile $position = p(n+1) = .25(5) = 1.25$. This location is above 1 and below 2, so use the class 2.5 to 3.5. Then, using the second formula, we find

$x_{.25} = Q1 = 2.5 + \left[\frac{.25(4) - 1}{1} \right] 1 = 2.5$

For the third quartile $p(n+1) = .75(5) = 3.75$. This location is above 2 and below 4, so use

the class 3.5 to 4.5. Then, we find $x_{.75} = Q3 = 3.5 + \left[\frac{.75(4) - 2}{2} \right] 1 = 4.0$.

$IQR = Q3 - Q1 = 4.0 - 2.5 = 1.5$

b. Ungrouped Data.

Consider the following sample: 1, 3, 4, 4 -which can also be written as

	x
x_1	1
x_2	3
x_3	4
x_4	4

- Calculate the mean
- Calculate the variance, standard deviation and coefficient of variation.
- Calculate and interpret the skewness and relative skewness
- Calculate and interpret Pearson's measure of skewness
- Calculate the median
- Calculate the interquartile range

Solution:

You need the following:

	x	x^2	x^3
x_1	1	1	1
x_2	3	9	27
x_3	4	16	64
x_4	4	16	64
	12	42	156

Note: $n = 4$, $\sum x = 12$, $\sum x^2 = 42$, $\sum x^3 = 156$.

- Calculate the mean $\bar{x} = \frac{\sum x}{n} = \frac{12}{4} = 3$