17.3 VARIABILITY

finitions

atistic: is a number that describes some characteristic of a set of data

ean, Median, Mode: describe the center of a set of data

nge & Interquartile Range: describe the spread of the data about the center

called **MEASURE OF DISPERSION** (how much data varies)

ample 1

ıe following 3 classes have the given test scores.

ass 1	Class 2	Class 3
, 50, 50, 50, 50	40, 50, 50, 50, 60	10, 40, 50, 60, 90
ean = 50	Mean = 50	Mean = 50
ınge = 50 - 50 = 0	Range = 60 - 40 = 20	Range = 90 - 10 = 80

- Data is more dispersed as we move from class 1 to class 3.

Other Measures of Dispersion: **VARIANCE** & **STANDARD DEVIATION**

Variance: Written as s^2 or σ^2 (sigma squared)

Data: $x_1, x_2, x_3, x_4, \ldots, x_n$ (# of items = n)
Mean = $\overline{x}$

$$s^2 = \frac{(x_1-\overline{x})^2+(x_2-\overline{x})^2+(x_3-\overline{x})^2+\ldots+(x_n-\overline{x})^2}{n}$$

Standard Deviation: Written as s or σ

*It is how much items are dispersed around the mean - NOT an average

$$s=\sqrt{\text{variance}}=\sqrt{\frac{(x_1-\overline{x})^2+(x_2-\overline{x})^2+\ldots+(x_n-\overline{x})^2}{n}}$$

Example 2

Five pairs of shoes cost \$10, \$20, \$30, \$40, and \$50. Find the standard deviation.

$\text{mean} = \frac{10 + 20 + 30 + 40 + 50}{5} = \frac{150}{5} = 30 = \bar{x}$

Variance ↓

$s^2 = (10 - 30)^2 + (20 - 30)^2 + (30 - 30)^2 + (40 - 30)^2 + (50 - 30)^2 = \frac{1000}{5} = 200$

standard deviation = $\sqrt{s^2} = \sqrt{200} =$ **\$14.14**

30 - 14.14 = 15.86
30 + 14.14 = 44.14
* Most shoes will cost \$15.86 to \$44.14

Example 3

Find the standard deviation for 1, 7, 9, 15

$\text{mean} = \frac{32}{4} = 8$

$s^2 = (1 - 8)^2 + (7 - 8)^2 + (9 - 8)^2 + (15 - 8)^2 = \frac{100}{4} = 25$

standard deviation = $\sqrt{25} = 5$

Example 4

Find the mean and standard deviation from the table of data.

Data	4	6	10
Frequency	2	5	3

# of distinct data items = 3

# of total data items = 2+5+3 = 10

$\bar{X} = \frac{4(2) + 6(5) + 10(3)}{10} = \frac{68}{10} = 6.8$

$S^2 = \frac{2(4-6.8)^2 + 5(6-6.8)^2 + 3(10-6.8)^2}{10} = \frac{49.6}{10} = 4.96$

st. dev = $\sigma = \sqrt{4.96} = 2.22$

Alg III 17.3 lesson

Standard Value (z) of a piece of data

* Standard Value = item of data - mean / standard deviation OR $z = \frac{x - \bar{x}}{\sigma}$

* Z gives you the number of standard deviations between an item of the data and the mean (also called "z score" or "relative score")

Example 5

Use data from example 3 to find the standard value if you had a score of…

1, 7, 9, 15 Mean = 8 $\sigma = 5$

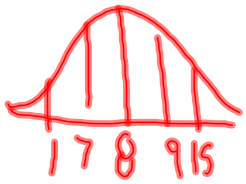
Score of 1 $z = \frac{1-8}{5} = -1.4$

Score of 7 $\frac{7-8}{5}$ $z = -.2$

Score of 9 $\frac{9-8}{5} = .2$

Score of 15 $\frac{15-8}{5} = 1.4$

Note: If z-score positive then above the mean, if z-score negative then below the mean.



Homework

p658 #3 - 10, 15