FM11 Lesson 5.3

Wednesday, April 26, 2017 9:17 AM

upper case "sigma"

$\sum$ means sum (add all terms together)

FOM 11 **5.3 Standard Deviation**

To describe data numerically, we often use two numbers:

1. **Mean**: the average

Let $x_1, x_2, x_3, \ldots, x_n$ represent any set of values.

sum

Mean: $\bar{x} = \mu = \dfrac{\sum x_i}{n} = \dfrac{x_1 + x_2 + x_3 + \ldots + x_n}{n}$

mu

2. **Standard Deviation:** a measure of the extent to which data cluster around the mean.

Let $x_1, x_2, x_3, \ldots, x_n$ represent any set of values.

Standard Deviation: $\sigma = \sqrt{\dfrac{\sum (x_i - \mu)^2}{n}} = \sqrt{\dfrac{(x_1-\mu)^2 + (x_2-\mu)^2 + \ldots + (x_n-\mu)^2}{n}}$

lower case "sigma"

* The smaller the standard deviation, the more consistent the results and the closer the data to the mean.

Example 1: Calculate the standard deviation from the following sets of values:

a. 7, 8, 9, 10, 11 mean $= \mu = (7+8+9+10+11) \div 5 = 9$

Standard Deviation

$$\sigma = \sqrt{\frac{(7-9)^2 + (8-9)^2 + (9-9)^2 + (10-9)^2 + (11-9)^2}{5}}$$

$$= \sqrt{\frac{(-2)^2 + (-1)^2 + (0)^2 + (1)^2 + (2)^2}{5}}$$

$$= \sqrt{\frac{4+1+0+1+4}{5}} = \sqrt{\frac{10}{5}} = \sqrt{2} = 1.41$$

b. 7, 9, 11, 13, 15

$$\mu = \frac{7+9+11+13+15}{5} = 11$$

$$\sigma = \sqrt{\frac{(7-11)^2+(9-11)^2+(11-11)^2+(13-11)^2+(15-11)^2}{5}}$$

$$= \sqrt{\frac{(-4)^2+(-2)^2+(0)^2+(2)^2+(4)^2}{5}} = \sqrt{\frac{16+4+0+4+16}{5}} = \sqrt{\frac{40}{5}} = \sqrt{8}$$

$$= 2.83$$

Example 2: Calculate the standard deviation for the following sets of data: $\boxed{\text{HW P.233 \#2,5}}$

a.

Midpoint	Daily Commute Time (min)	Number of Employees
5	0-~~10~~ 9	4
15	10-~~20~~ 19	9
25	20-~~30~~ 29	6
35	30-~~40~~ 39	4
45	40-~~50~~ 49	2

Total = 25

mean

$$\mu = \left[5(4) + 15(9) + 25(6) + 35(4) + 45(2)\right] \div 25$$

$$= 21.4$$

$$\sigma = \sqrt{\frac{4(5-21.4)^2 + 9(15-21.4)^2 + 6(25-21.4)^2 + 4(35-21.4)^2 + 2(45-21.4)^2}{25}}$$

$$=$$

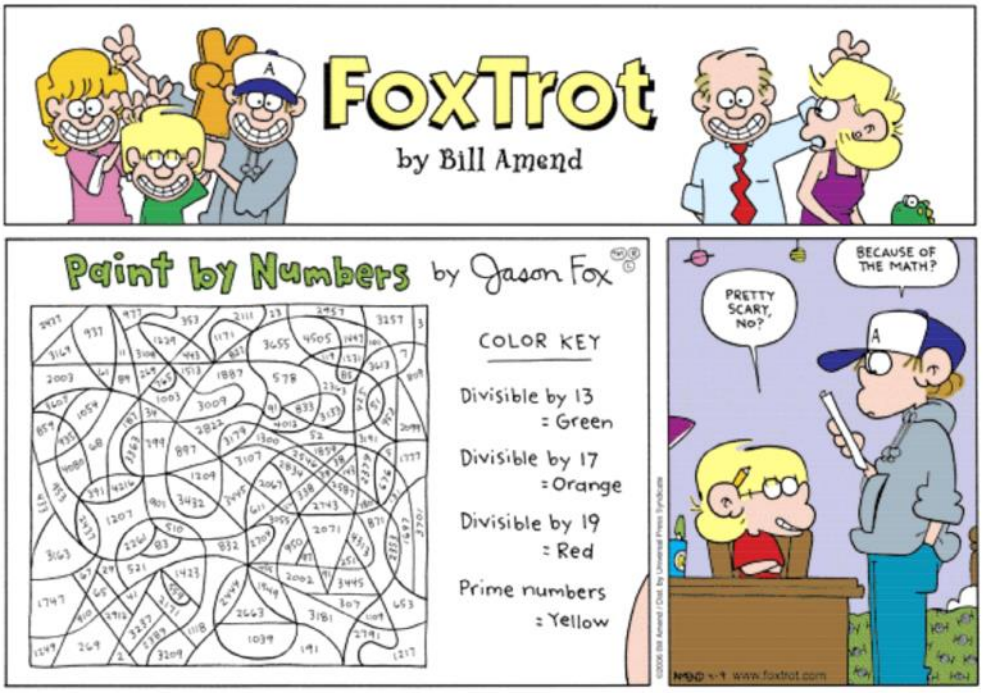
$$= 11.62$$

$\boxed{\text{P. 233 \# 3}}$

*HW 5.3 p.233 #2, 3, 5

b.

# of Orders	# of Days
10-12	4
13-15	12
16-18	20
19-21	14

omit

Assignment: Pg. 233 #1-3, 5, 6, 8, 11, 14