

Section 3.3 Worksheet – Measures of Spread

MDM4U

David Chen

Refer to part 2 of the lesson for help with the following questions

1) Determine the range, median, Q_1 , Q_3 , and the interquartile range for the following sets of data. You may use technology.

- a) Number of home runs hit by players on the Statsville little league team:

6 4 3 8 9 11 6 5 15

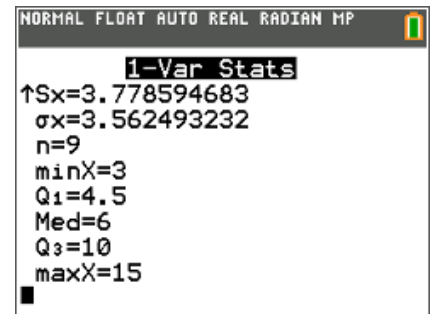
$$\text{range} = 15 - 3 = 12$$

$$Q_1 = 4.5$$

$$\text{median} = 6$$

$$Q_3 = 10$$

$$\text{IQR} = 10 - 4.5 = 5.5$$



- b) Final grades in a geography class:

88 56 72 67 59 48 81 62
90 75 75 43 71 64 78 84

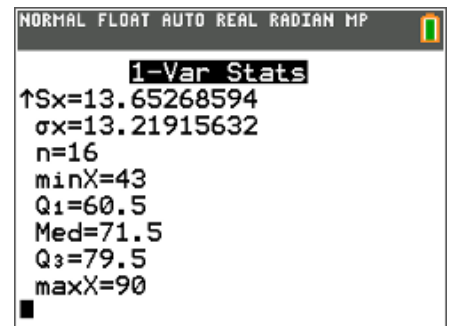
$$\text{range} = 90 - 43 = 47$$

$$Q_1 = 60.5$$

$$\text{median} = 71.5$$

$$Q_3 = 79.5$$

$$\text{IQR} = 79.5 - 60.5 = 19$$



2) For a recent standardized test, the median was 88, Q_1 was 67, Q_3 was 105. Describe the following scores in terms of quartiles

- a) 8 *first quartile*
b) 81 *second quartile*
c) 103 *third quartile*

Refer to part 3 of the lesson for help with the following questions

3) The number of calories in 12-ounce servings of five popular beers are {95, 152, 188, 205, 131}. Calculate the sample mean and standard deviation of calories by hand. Check your answer using your calculator.

$$\bar{x} = \frac{\sum x}{n} = \frac{95 + 152 + 188 + 205 + 131}{5} = \frac{771}{5} = 154.2$$

Solution using a table:

Calories, x	Deviation, $x - \bar{x}$	$(x - \bar{x})^2$
95	-59.2	3504.64
152	-2.2	4.84
188	33.8	1142.44
205	50.8	2580.64
131	-23.2	538.24
		$\sum(x - \bar{x})^2 = 7770.8$

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}} = \sqrt{\frac{7770.8}{5-1}} = 44.076$$

Solution without a table:

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}} = \sqrt{\frac{(95-154.2)^2 + (152-154.2)^2 + (188-154.2)^2 + (205-154.2)^2 + (131-154.2)^2}{5-1}} = \sqrt{\frac{7770.8}{4}} = 44.076$$

Check with Ti-84:

NORMAL FLOAT AUTO REAL Radian MP
1-Var Stats
$\bar{x}=154.2$
$\Sigma x=771$
$\Sigma x^2=126659$
$Sx=44.07607061$
$\sigma x=39.42283602$
$n=5$
$\min X=95$
$\downarrow Q_1=113$

4) Given the sample data x : {23, 17, 15, 30, 25}

a) Calculate the sample standard deviation by hand.

$$\bar{x} = \frac{\sum x}{n} = \frac{23 + 17 + 15 + 30 + 25}{5} = \frac{110}{5} = 22$$

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} = \sqrt{\frac{(23 - 22)^2 + (17 - 22)^2 + (15 - 22)^2 + (30 - 22)^2 + (25 - 22)^2}{5 - 1}} = \sqrt{\frac{148}{4}} = 6.08$$

b) Suppose the given data comprise the entire population of all x values. Compute the population standard deviation by hand.

$$\sigma = \sqrt{\frac{\sum (x - \mu)^2}{N}} = \sqrt{\frac{(23 - 22)^2 + (17 - 22)^2 + (15 - 22)^2 + (30 - 22)^2 + (25 - 22)^2}{5}} = \sqrt{\frac{148}{5}} = 5.44$$

5) The Points Per Game during the 2012-2013 season of all the New York Knicks players were {14.2, 28.7, 10.4, 1.8, 6.6, 13.9, 6.0, 18.1, 6.8, 7.0, 8.7, 3.5, 7.2}. Calculate the population mean and standard deviation using technology.

$$\mu = 10.22$$

$$\sigma = 6.87$$

NORMAL FLOAT AUTO REAL RADIAN MP														
1-Var Stats														
$\bar{x}=10.22307692$														
$\Sigma x=132.9$														
$\Sigma x^2=1972.13$														
$Sx=7.150076205$														
$\sigma x=6.869571014$														
$n=13$														
$\min X=1.8$														
$\downarrow Q1=6.3$														

Refer to part 4 of the lesson for help with the following question

6) Four classes recorded a sample of their pulse rates. Use the sample mean and standard deviation to determine which class has the lowest pulse rate and which class has the most consistent pulse rate using technology.

Class A	63	78	79	75	73	72	62	75	63	77	77	65	70	69	80
Class B	72	66	73	80	74	75	64	68	67	70	70	69	69	74	74
Class C	68	75	78	73	75	68	71	78	65	67	63	69	59	68	79
Class D	78	75	76	76	79	78	78	76	74	81	78	76	79	74	76

	Mean, \bar{x}	Standard Deviation, s
Class A	71.87	6.22
Class B	71	4.12
Class C	70.4	5.88
Class D	76.93	1.98

Class C has the lowest pulse rate. Class D has the most consistent pulse rate because it has the lowest standard deviation.

Refer to part 5 of the lesson for help with the following question

7) The nurses' union collects data on the hours worked by all of the operating-room nurses at the Statsville General Hospital. Calculate the population mean and standard deviation using technology.

Hours Per Week	Number of Employees
12	1
32	5
35	7
38	8
42	5

NORMAL FLOAT AUTO REAL RADIAN MP	NORMAL FLOAT AUTO REAL RADIAN MP
1-Var Stats List:L1 FreqList:L2 Calculate	1-Var Stats $\bar{x}=35.80769231$ $\Sigma x=931$ $\Sigma x^2=34211$ $Sx=5.912828296$ $\sigma x=5.798005166$ $n=26$ $\min X=12$ $\downarrow Q_1=35$

$$\mu = 35.8$$

$$\sigma = 5.8$$

8) The following table shows a sample of salaries for employees at a company. Calculate the sample mean and standard deviation using technology.

Salary (\$)	Frequency
28 000	4
30 000	6
32 000	7
34 000	4
36 000	2
38 000	1

$$\bar{x} = 31\,750$$

$$s = 2\,722.7$$

NORMAL FLOAT AUTO REAL RADIAN MP
1-Var Stats $\bar{x}=31750$ $\Sigma x=762000$ $\Sigma x^2=2.4364E10$ $Sx=2722.690485$ $\sigma x=2665.364265$ $n=24$ $\min X=28000$ $\downarrow Q_1=30000$ ■