

Answer all questions using complete sentences.

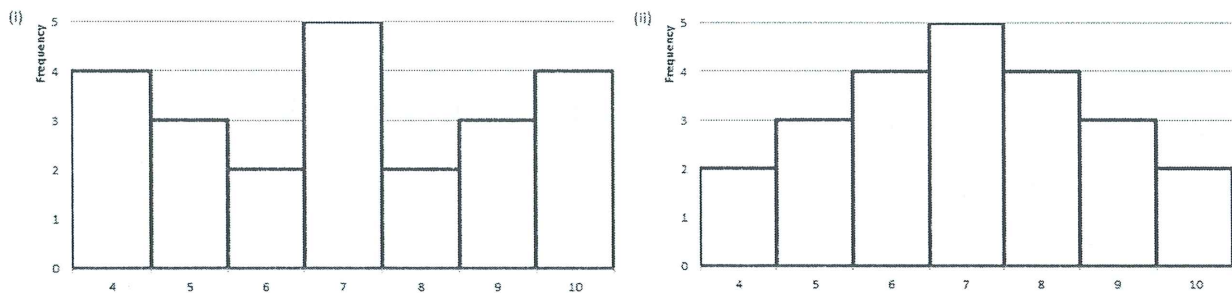
1. What measures of variation indicate spread about the mean?

Variance, Standard deviation

2. Which graphic display shows the median and data spread about the median?

Box-and-Whisker plot

3. Look at the two histograms below. Each involves the same number of data. The data are all whole numbers, so the height of each bar represents the number of values equal to the corresponding midpoint shown on the horizontal axis. Notice that both distributions are symmetric.



- a. Estimate the mode, median, and mean for each histogram.

(i) mode: 7  
 median: 7  
 mean: 7

(ii) mode: 7  
 median: 7  
 mean: 7

- b. Which distribution has the larger standard deviation? Why?

(i)  $s = 2.13$       (ii)  $s = 1.76$

Distribution (i) has the larger standard deviation because the end data have a higher frequency.

4. Consider the following display of two data sets.

Variable	N	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
C1	20	20.00	1.62	7.26	7.00	15.00	20.00	25.00	31.00
C2	20	20.00	1.3	5.79	7.00	20.00	22.00	22.00	31.00

a. What are the respective means? the respective ranges?

$\bar{x}$  for both is 20  
range for both is 24

b. Which data set seems more symmetric? Why?

C1 because the  $Q_1$ , median, and  $Q_3$  are all equally spaced out.

c. Compare the interquartile ranges of the two sets. How do the middle halves of the data sets compare?

$C_1$ : IQR = 10

$C_1$  has more spread than  $C_2$

$C_2$ : IQR = 2

5. "Radon: The Problem No One Wants to Face" is the title of an article appearing in *Consumer Reports*. Radon is a gas emitted from the ground that can collect in houses and buildings. At certain levels it can cause lung cancer. Radon concentrations are measured in picocuries per liter (pCi/L). A radon level of 4 pCi/L is considered "acceptable." Radon levels in a house vary from week to week. In one house, a sample of 8 weeks had the following readings for radon levels (in pCi/L):

<del>1.9</del>	<del>2.8</del>	<del>5.1</del>	<del>4.2</del>	<del>1.9</del>	<del>8.6</del>	<del>3.9</del>	<del>7.2</del>
1.9	1.9	2.8	3.9	4.2	5.7	7.2	8.6

a. Find the mean, median, and mode.

$$\bar{x} = 4.525 = 4.5$$

median: 4.05

mode: 1.9

b. Find the sample standard deviation, coefficient of variation, and range.

range: 6.7

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{6.76 + 6.76 + 2.89 + 0.36 + 0.09 + 1.44 + 7.29 + 16.81}{7}}$$

$$= 2.461 = \boxed{2.5}$$

$$C.V. = \frac{2.5}{4.5} \times 100\% = 55.5\%$$

$$= \boxed{56\%}$$

6. How Democratic is Georgia? County-by-county results are shown for a recent election. For your convenience, the data have been sorted in increasing order.

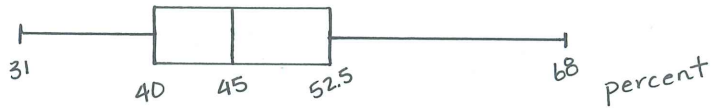
**Percentage of Democratic Vote by Counties in Georgia**

31	33	34	34	35	35	35	36	38	38	38	39	40	40	40	40	40
41	41	41	41	41	41	41	42	42	43	44	44	44	45	45	46	46
46	46	46	47	48	49	49	49	49	50	51	52	52	53	53	53	53
53	53	55	56	56	57	57	59	62	66	66	68					

MEDIAN  
Q<sub>1</sub>  
Q<sub>3</sub>

- a. Make a box-and-whisker plot of the data. Find the interquartile range.

low: 31  
Q<sub>1</sub>: 40  
Median: 45  
Q<sub>3</sub>: 52.5  
high: 68  
IQR = 12.5



- b. Make a frequency table using five classes. Then estimate the mean and sample standard deviation using the frequency table. Compute a 75% Chebyshev interval centered about the mean.

$$c.w. = \frac{68-31}{5} = 7.4 = 8$$

$$\bar{x} = 46$$

$$s = 8.64$$

Class	frequency
31-38	11
39-46	24
47-54	15
55-62	7
63-70	3

75% Chebyshev Int.

$$\bar{x} \pm 2s$$

$$28.82 \text{ to } 63.38$$

$$29 \text{ to } 63$$

- c. Use the values  $\sum x = 2769$  and  $\sum x^2 = 132,179$  to compute the sample mean and sample standard deviation.

$$\bar{x} = \frac{2769}{60} = 41.65 = 42$$

$$s = \sqrt{\frac{\sum x^2 - (\sum x)^2/n}{n-1}} = \sqrt{\frac{132179 - (2769)^2/60}{59}} = 8.63$$

7. Professor Cramer determines a final grade based on attendance, two papers, three major tests, and a final exam. Each of these activities has a total of 100 possible points. However, the activities carry different weights. Attendance is worth 5%, each paper is worth 8%, each test is worth 15%, and the final is worth 34%.

a. What is the average for a student with 92 on attendance, 73 on the first paper, 81 on the second paper, 85 on test 1, 87 on test 2, 83 on test 3, and 90 on the final exam?

$$= \frac{92(.05) + 73(.08) + 85(.15) + 87(.15) + 83(.15) + 90(.34)}{.05 + .08 + 3(.15) + .34}$$

$$= 85.77\% = \boxed{86\%}$$

b. Compute the average for a student with the above scores on the papers, tests, and final exam, but with a score of only 20 on attendance.

$$= \frac{20(.05) + 73(.08) + 85(.15) + 87(.15) + 83(.15) + 90(.34)}{.05 + .08 + 3(.15) + .34}$$

$$= 82.17\% = \boxed{82\%}$$

8. The following data represent weights in kilograms of maize (corn) harvest from a random sample of 72 experimental plots on St. Vincent, an island in the Caribbean. For convenience, the data are presented in increasing order.

7.8	9.1	9.5	10.0	10.2	10.5	11.1	11.5	11.7	11.8
12.2	12.2	12.5	13.1	13.5	13.7	13.7	14.0	14.4	14.5
14.6	15.2	15.5	16.0	16.0	16.1	16.5	17.2	17.8	18.2
19.0	19.1	19.3	19.8	20.0	20.2	20.3	20.5	20.9	21.1
21.4	21.8	22.0	22.0	22.4	22.5	22.5	22.8	22.8	23.1
23.1	23.2	23.7	23.8	23.8	23.8	23.8	24.0	24.1	24.1
24.5	24.5	24.9	25.1	25.2	25.5	26.1	26.4	26.5	26.7
27.1	29.5								

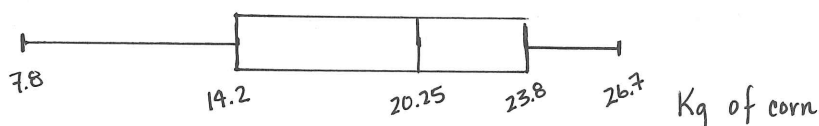
a. Compute the five-number summary.

low: 7.8                       $Q_3$ : 23.8  
 $Q_1$ : 14.2                    high: 26.7  
 Median: 20.25

b. Compute the interquartile range.

$$IQR = 9.6$$

c. Make a box-and-whisker plot.



d. Discuss the distribution. Does the lower half of the distribution show more data spread than the upper half?

The lower half has about twice the spread of the upper half.

9. A performance evaluation for new sales representatives at Office Automation Incorporated involves several ratings done on a scale of 1 to 10, with 10 the highest rating. The activities rated include new contacts, successful contacts, total contacts, dollar volume of sales, and reports. Then an overall rating is determined by using a weighted average. The weights are 2 for new contacts, 3 for successful contacts, 3 for total contacts, 5 for dollar value of sales, and 3 for reports. What would the overall rating be for a sales representative with ratings of 5 for new contacts, 8 for successful contacts, 7 for total contacts, 9 for dollar volume of sales, and 7 for reports?

$$= \frac{5(2) + 8(3) + 7(3) + 9(5) + 7(3)}{2 + 3(3) + 5}$$

$$= 7.5625$$

$$= 8$$

An overall rating of 8.