

Unit 02 Practice Problems

2.1

stem	leaf
0	9
1	5
2	0
3	26
4	136
5	3468
6	14679
7	0024677
8	012334688

2.2

stem	leaf
71	27
72	66
73	05
74	19
75	23
76	46

2.3

left-skewed

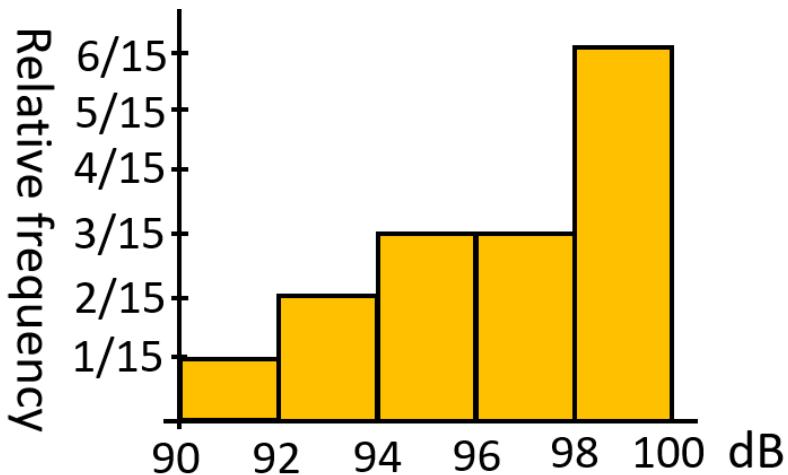
2.4

uniform

2.5

class	frequency	relative frequency
[90, 92)	1	1/15
[92, 94)	2	2/15
[94, 96)	3	3/15
[96, 98)	3	3/15
[98, 100)	6	6/15
total	15	15/15 = 1

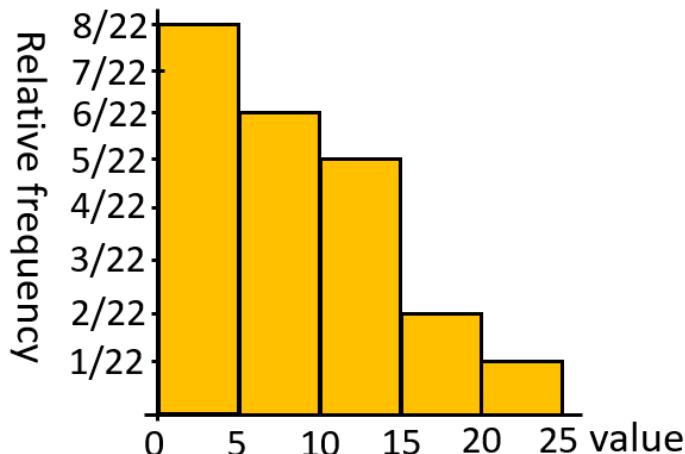
left-skewed



2.6

class	frequency	relative frequency
[0, 5)	8	8/22
[5, 10)	6	6/22
[10, 15)	5	5/22
[15, 20)	2	2/22
[20, 25)	1	1/22
total	22	22/22 = 1

right-skewed



2.7

a

The mean is greater than the median.

b

The mean and median are approximately equal.

c

The mean is less than the median.

2.8

$$\bar{X} = \frac{\sum x}{n} = \frac{887.1}{12} = 73.925 \text{ inches}$$

$$\text{median} = \text{mean of the } 6^{\text{th}} \text{ and } 7^{\text{th}} \text{ ordered values} = \frac{73.5 + 74.1}{2} = 73.8 \text{ inches}$$

2.9

$$\bar{X} = \frac{\sum x}{n} = \frac{1446.8}{15} \approx 96.4533 \text{ dB}$$

$$\text{median} = 8^{\text{th}} \text{ ordered value} = 97.6 \text{ dB}$$

Notice the data must be ordered first before finding the median.

2.10

$$\frac{n+1}{2} \rightarrow \frac{13643}{2} = 6821.5$$

If $n = 13,642$ then the median would be the mean of the 6821st and 6822nd ordered values.

$$\frac{n+1}{2} \rightarrow \frac{173210}{2} = 86605$$

If $n = 173,209$ then the median would be the 86,605th ordered value.

2.11

x	$x - \bar{X}$	$(x - \bar{X})^2$	x^2
0	-8	64	0
3	-5	25	9
3	-5	25	9
9	1	1	81
10	2	4	100
13	5	25	169
18	10	100	324
sum = 56 mean = 8	sum = 0	sum = 244	sum = 692

$$s^2 = \frac{\sum(x - \bar{x})^2}{n - 1} = \frac{244}{6} \approx 40.667$$

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1} = \frac{692 - \frac{56^2}{7}}{6} = \frac{244}{6} \approx 40.667$$

$$s = \sqrt{\frac{244}{6}} \approx 6.377$$

2.12

x	$x - \bar{X}$	$(x - \bar{X})^2$	x^2
5	-10.5	110.25	25
8	-7.5	56.25	64
9	-6.5	42.25	81
10	-5.5	30.25	100
17	1.5	2.25	289
21	5.5	30.25	441
24	8.5	72.25	576
30	14.5	210.25	900
sum = 124 mean = 15.5	sum = 0	sum = 554	sum = 2476

$$s^2 = \frac{\sum(x - \bar{x})^2}{n - 1} = \frac{554}{7} \approx 79.143$$

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n - 1} = \frac{2476 - \frac{124^2}{8}}{7} = \frac{554}{7} \approx 79.143$$

$$s = \sqrt{\frac{554}{7}} \approx 8.896$$

2.13

A data set made up of 100 observations of "11" and 100 observations of "12" would have a sample mean of 11.5 and a standard deviation close to 0.5. (The exact value of s would be $\sqrt{\frac{50}{199}} \approx .50125$.

2.14

Five years from today, the members of the book club will have a sample mean age of $\bar{X} = 34.1 + 5 = 39.1$ and the standard deviation will still be $s = 7.2$.

If you add a constant k to a data set, then:

$$\bar{X}_{new} = \bar{X}_{old} + k$$

$$s_{new}^2 = s_{old}^2$$

$$s_{new} = s_{old}$$

2.15

The dollar amount of these amounts of quarters would have $\bar{X} = 512.4(0.25) = 128.1$ and $s = 83.5(0.25) = 20.875$

If you multiply a data set by a constant k , then:

$$\bar{X}_{\text{new}} = (\bar{X}_{\text{old}})k$$

$$s_{\text{new}}^2 = (s_{\text{old}}^2)k^2$$

$$s_{\text{new}} = (s_{\text{old}}) \cdot |k|$$

2.16

a

Many correct answers exist.

$$\{8, 9, 10, 11, 12\}$$

b

impossible

c

Many correct answers exist.

$$\{0, 0, 0, 0, 1\}$$

d

Many correct answers exist.

$$\{-100, -50, 1, 2, 3\}$$

2.17

	Locator numbers (n is even)	$n = 12$
Q_1	$\frac{n+2}{4}$	$\frac{n+2}{4} = \frac{14}{4} = 3.5$
Q_2	$\frac{n+1}{2}$	$\frac{n+1}{2} = \frac{13}{2} = 6.5$
Q_3	$\frac{3n+2}{4}$	$\frac{3n+2}{4} = \frac{38}{4} = 9.5$

$$\min = 71.2$$

$$Q_1 = \frac{72.6 + 72.6}{2} = 72.6$$

$$Q_2 = \frac{73.5 + 74.1}{2} = 73.8$$

$$Q_3 = \frac{75.2 + 75.3}{2} = 75.25$$

$$\max = 76.6$$

2.18

Notice the data must be ordered first before finding the quartiles.

90.2 92.4 93.8 94.3 94.7
 95.9 96.2 97.6 97.9 98.1
 98.3 98.7 99.3 99.5 99.9

	Locator numbers (n is odd)	$n = 15$
Q_1	$\frac{n+3}{4}$	$\frac{n+3}{4} = \frac{18}{4} = 4.5$
Q_2	$\frac{n+1}{2}$	$\frac{n+1}{2} = \frac{16}{2} = 8$
Q_3	$\frac{3n+1}{4}$	$\frac{3n+1}{4} = \frac{46}{4} = 11.5$

$$\min = 90.2$$

$$Q_1 = \frac{94.3 + 94.7}{2} = 94.5$$

$$Q_2 = 97.6$$

$$Q_3 = \frac{98.3 + 98.7}{2} = 98.5$$

$$\max = 99.9$$

2.19

	Locator numbers (n is even)	$n = 13642$
Q_1	$\frac{n+2}{4}$	$\frac{n+2}{4} = \frac{13644}{4} = 3411$
Q_2	$\frac{n+1}{2}$	$\frac{n+1}{2} = \frac{13643}{2} = 6821.5$
Q_3	$\frac{3n+2}{4}$	$\frac{3n+2}{4} = \frac{40928}{4} = 10232$

$Q_1 = 3411^{\text{st}}$ ordered value

$Q_2 = \text{mean of } 6821^{\text{st}} \text{ and } 6822^{\text{nd}}$ ordered value

$Q_3 = 10232^{\text{nd}}$ ordered value

	Locator numbers (n is odd)	$n = 173209$
Q_1	$\frac{n+3}{4}$	$\frac{n+3}{4} = \frac{173212}{4} = 43303$
Q_2	$\frac{n+1}{2}$	$\frac{n+1}{2} = \frac{173210}{2} = 86605$
Q_3	$\frac{3n+1}{4}$	$\frac{3n+1}{4} = \frac{519628}{4} = 129907$

$Q_1 = 43303^{\text{rd}}$ ordered value

$Q_2 = 86605^{\text{th}}$ ordered value

$Q_3 = 129907^{\text{th}}$ ordered value

2.20

	Locator numbers (n is even)	$n = 16$
Q_1	$\frac{n+2}{4}$	$\frac{n+2}{4} = \frac{18}{4} = 4.5$
Q_2	$\frac{n+1}{2}$	$\frac{n+1}{2} = \frac{19}{2} = 9.5$
Q_3	$\frac{3n+2}{4}$	$\frac{3n+2}{4} = \frac{50}{4} = 12.5$

{ 0, 0, 1, 2, 3, 3, 6, 7, 9, 10, 10, 10, 11, 13, 19, 26 }

$$Q_1 = \text{mean of } 4^{\text{th}} \text{ and } 5^{\text{th}} \text{ ordered value} = \frac{2+3}{2} = 2.5$$

$$Q_2 = \text{mean of } 9^{\text{th}} \text{ and } 10^{\text{th}} \text{ ordered value} = \frac{7+9}{2} = 8$$

$$Q_3 = \text{mean of } 12^{\text{th}} \text{ and } 13^{\text{th}} \text{ ordered value} = \frac{10+11}{2} = 10.5$$

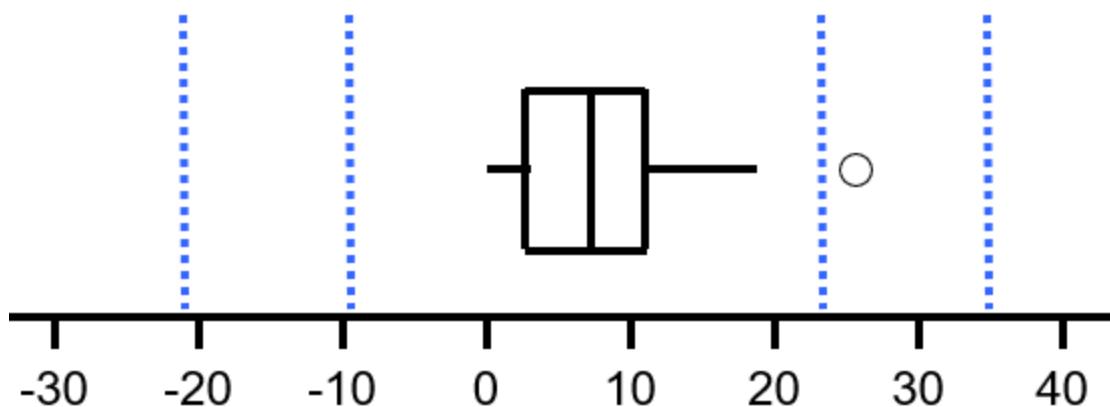
$$\text{IQR} = Q_3 - Q_1 = 10.5 - 2.5 = 8$$

$$\text{LIF} = Q_1 - 1.5(\text{IQR}) = 2.5 - 1.5(8) = -9.5$$

$$\text{UIF} = Q_3 + 1.5(\text{IQR}) = 10.5 + 1.5(8) = 22.5$$

$$\text{LOF} = Q_1 - 3(\text{IQR}) = 2.5 - 3(8) = -21.5$$

$$\text{UOF} = Q_3 + 3(\text{IQR}) = 10.5 + 3(8) = 34.5$$



2.21

$$\text{range} = 100 - 10 = 90$$

$$\text{IQR} = Q_3 - Q_1 = 60 - 50 = 10$$

$$\text{LIF} = Q_1 - 1.5(\text{IQR}) = 50 - 1.5(10) = 35$$

$$\text{UIF} = Q_3 + 1.5(\text{IQR}) = 60 + 1.5(10) = 75$$

$$\text{LOF} = Q_1 - 3(\text{IQR}) = 50 - 3(10) = 20$$

$$\text{UOF} = Q_3 + 3(\text{IQR}) = 60 + 3(10) = 90$$