

Chapter 2 - Describing Distributions with Numbers

2.1 Mean *E. coli* level is $\bar{x} = \frac{291.0 + 10.9 + \dots + 9.6}{16} = 56.28$ per ml. The mean is greater than most of the observations because of the two outliers (291.0 and 190.4).

2.3 The mean travel time is $\bar{x} = 31.25$ minutes. The median travel time is 22.5 minutes. The mean is significantly larger than the median due to the right-skew in the distribution of times.

2.4 The mean is larger than the median; surely the distribution of home prices is right-skewed. This means that the mean is \$340,300 and the median is \$270,900.

2.6 (a) and (b) A back-to-back stemplot is provided. The five-number summaries are given below. **(c)** The offensive line players are heavier; the distribution of weights for the offensive linemen is symmetric, whereas the distribution for the defensive players is not symmetric and has two distinct clusters. Neither group appears to have outliers.

Pos	Minimum	Q1	Median	Q3	Maximum
DL	242.00	253.50	285.50	305.00	323.00
OL	298.00	303.00	315.00	320.50	332.00

Offense	Defense
24	2
25	24
26	0
27	4
28	
8	29
51	30
850	31
10	32
2	33

2.8 For these data, $Q_1 = 10$, $Q_3 = 30$, and so $IQR = 30 - 10 = 20$ minutes; $Q_1 - 1.5 \times IQR = 10 - 1.5 \times 20 = -20$ minutes. Obviously, no times can be negative, so no outliers are in the left tail. $Q_3 + 1.5 \times IQR = 30 + 1.5 \times 20 = 60$ minutes. The "60" would not be considered an outlier, but it's close.

2.10 (a) $\bar{x} = (6.2 + 12.8 + 7.6 + 15.4)/4 = 42/4 = 10.5$ picocuries. **(b)** The standard deviation can be computed in steps:

x	6.2	12.8	7.6	15.4	Sum
$x - \bar{x}$	-4.3	2.3	-2.9	4.9	0
$(x - \bar{x})^2$	18.49	5.29	8.41	24.01	56.2

$$s^2 = \frac{1}{n-1} \sum (x - \bar{x})^2 = \frac{1}{4-1} (56.2) = 18.7333.$$

$$\text{So, } s = \sqrt{s^2} = \sqrt{18.7333} = 4.33 \text{ picocuries.}$$

2.12 (a) No. The distribution isn't symmetric. **(b)** Yes. The distribution is symmetric and mound-shaped with no severe outliers. **(c)** No. The distribution is strongly right-skewed.

2.15 (b) 167.48

2.16 (b) 168.25

2.17 (b) 151.6, 163.5, 168.25, 174.3, 177.6

2.18 (a) The mean is pulled toward the longer end of the distribution.

2.19 (a) 25%. Q_3 has 75% of observations equal to or less than its value.

2.20 (c) the five-number summary

2.21 (c) 8.2.

2.22 (a) $0 \leq s$.

2.23 (b) seconds

2.24 (a) the median

2.25 The distribution of incomes in this group is almost certainly right-skewed, so the mean is \$62,597 and the median is \$50,281.

2.28 (a) Min = 23.0 thousand pounds (23,000 as rounded), Q_1 = 30.35 thousand pounds (30,350 pounds), Median = 31.95 thousand pounds, Q_3 = 32.7 thousand pounds, Max = 33.7 thousand pounds. **(b)** Notice that the minimum is much farther from Q_1 (7.35 thousand pounds) than the maximum is from Q_3 (1 thousand pounds). This suggests a long left tail, consistent with a left-skewed distribution.

2.39 Answers will vary, but a raise in the minimum wage will probably have a greater impact on the median income. Most Americans earn "middle income" or less; a few people earn huge amounts each year. The few large amounts will still pull the mean toward that end of the distribution.

