

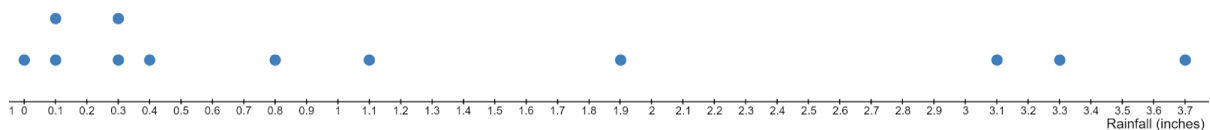
2.2.1: Exercises

- The table below lists the average monthly rainfall in California and Utah.

Month	CA (inches)	UT (inches)
Jan	3.3	1.4
Feb	3.7	1.3
Mar	3.1	1.9
Apr	0.8	2
May	0.3	2.1
Jun	0.1	0.8
Jul	0	0.7
Aug	0.1	0.8
Sept	0.3	1.3
Oct	0.4	1.6
Nov	1.1	1.4
Dec	1.9	1.2

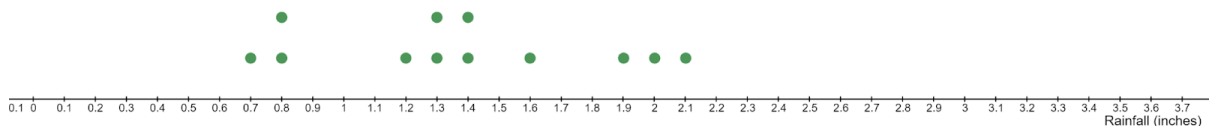
These data are summarized in dotplots below.

California Rainfall



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Utah Rainfall



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- Compute the sample mean of the typical monthly rainfall for both California and Utah. Use the symbols \bar{x} and \bar{y} for these sample means.
- Compute the sample medians of the monthly rainfall for both California and Utah.
- Compare and contrast the means and medians for the two states.

2. Students in a literature class took a test where the highest score was 100. Most of the students did quite well, with more than half of the students getting in the 80s and 90s on the test. Most of the rest of the students earned 70s, and only a few students earned scores in the 60s. Only two students got less than a 60, and their scores were very low in the 20s.
- If a grade of A is earned by getting a score in the 90s, B in the 80s, C in the 70s, D in the 60s, and F for scores below 60, what is the shape of the distribution of scores? Draw a sketch of the graph to show your thinking.
 - Is the mean or median likely to be larger? Explain your answer.
 - Students often want to know the average test score. Which of the values would be more representative of the typical grade on the test, the mean or median? Explain your reasoning.
3. Given below is a frequency distribution for the age of students in a statistics class. The frequency tells you how many students take on the given value of the variable (age). For example, $f_1 = 5$ and $x_1 = 18$, so there are 5 students in the class who are 18 years old.

Age (x_i)	Frequency (f_i)
18	5
19	6
20	4
21	1
22	3
23	2
27	1
32	1
36	1
40	1

Rather than finding the mean by adding every individual value and dividing by the total number of values

$\left(\frac{18 + 18 + 18 + 18 + 18 + 19 + \dots + 40}{25} \right)$, we can instead find the mean of this *grouped data* by using the frequencies

listed in the table. We can multiply each value of x by its associated frequency, find the sum, and divide by the total frequency

$\left(\frac{(18 \cdot 5) + \dots + (40 \cdot 1)}{5 + \dots + 1} \right)$. The formula for the sample mean can be written as

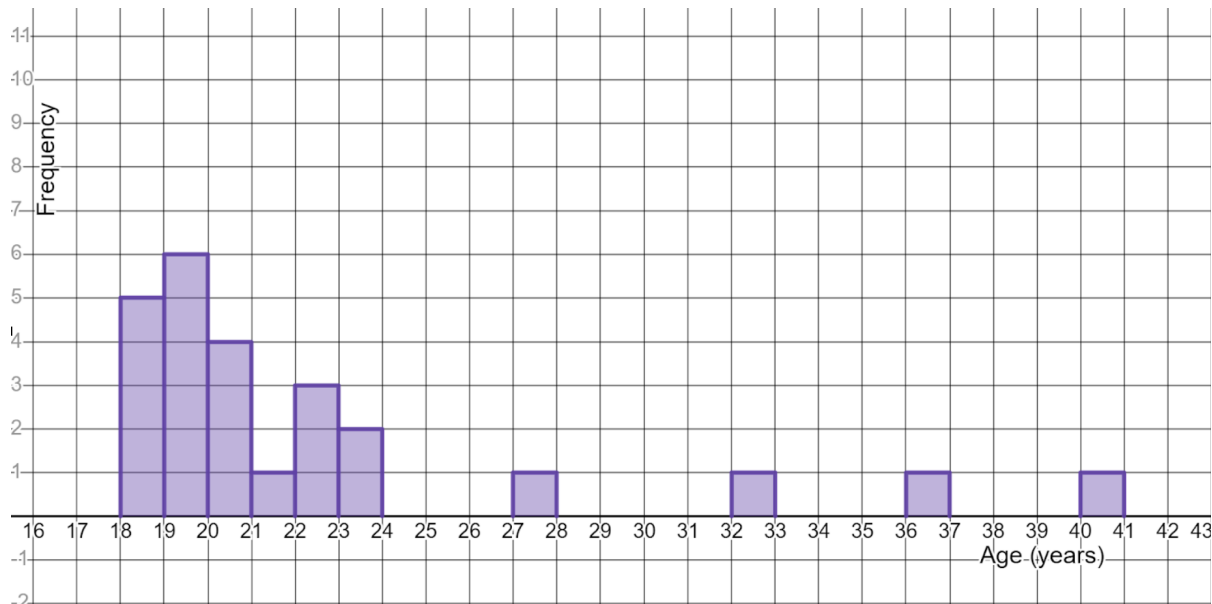
$$\bar{x} = \frac{\sum_i f_i \cdot x_i}{\sum_i f_i}$$

a. Fill in the missing values in the table below (including the totals)

Age (x_i)	Frequency (f_i)	$f_i \cdot x_i$
18	5	$f_1 \cdot x_1 = 5 \cdot 18 = 90$
19	6	
20	4	
21	1	$f_4 \cdot x_4 = 1 \cdot 21 = 21$
22	3	$f_5 \cdot x_5 = 3 \cdot 22 = 66$
23	2	
27	1	
32	1	$f_8 \cdot x_8 = 1 \cdot 32 = 32$
36	1	
40	1	$f_{10} \cdot x_{10} = 1 \cdot 40 = 40$
Totals	$\sum_i f_i = \underline{\hspace{2cm}}$	$\sum_i f_i \cdot x_i = \underline{\hspace{2cm}}$

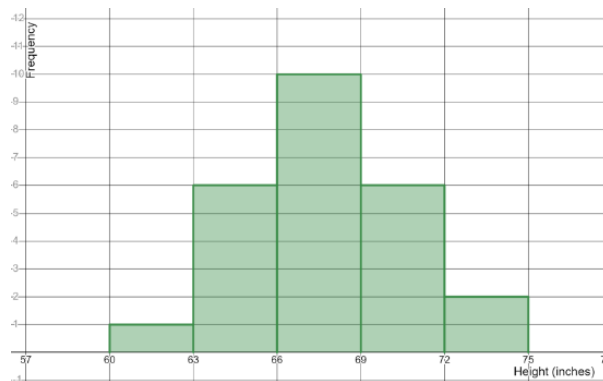
b. Compute the mean by dividing the appropriate values you computed in the totals row above.

c. Below is a frequency histogram. Is the mean likely to be greater than or less than the median? Explain your answer.



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4. Below is a frequency histogram for the heights students in a statistics class. Estimate the center, shape, and spread.



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5. Below is Samantha's calculation of the median for the heights of students in her statistics class. Explain any errors she made and write a sentence or two explaining to Samantha how to fix her mistake.

Samantha's work and solution:

$$H = [67, 67, 67, 67, 67, 62, 67, 64, 64, 64, 65, 65, 66, 68, 68, 69, 69, 69, 71, 71, 71, 73, 74, 67, 64]$$

Sort the list from smallest to greatest:

$$[62, 64, 64, 64, 64, 65, 65, 66, 67, 67, 67, 67, 67, 67, 67, 68, 68, 69, 69, 69, 71, 71, 71, 73, 74]$$

There are 25 students in the class, so to find the median, we divide by 2 and get 12.5 so the median is in between the 12th and 13th numbers on the list. Therefore, median = $\frac{67 + 67}{2} = 67$ inches

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