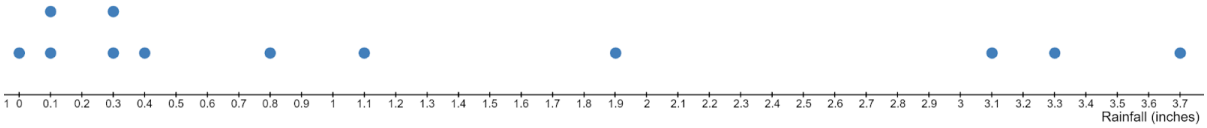
2.3.1: Exercises

1. The dotplots below summarize the average monthly rainfall in California and Utah.

California Rainfall



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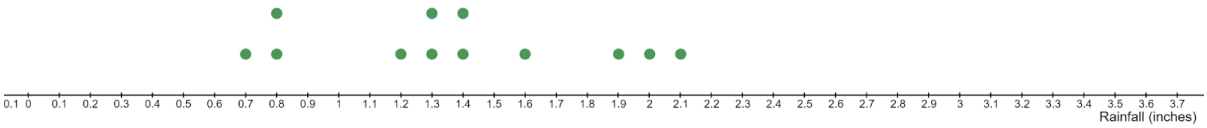
Utah Rainfall



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a. Compare the center, shape, and spread of the two distributions.

b. In how many months was the average rainfall less than 1 inch in California? In what proportion of a year was average rainfall less than 1 inch in California?

c. Decide which measure of spread (range or IQR) would be best to use to compare the variation in the rainfall of CA and UT. Explain.

d. Select the value that best represents the IQR for California rainfall: 1 inch or 2 inches? Justify your answer.

2. Given below are the heights (in feet) of 30 randomly selected pro football and basketball players.

Heights of 30 Pro Football Players

6.5	6.3	6.8	6.1	5.8
6.4	6.3	6.7	6.5	5.8
6.6	6.3	6	5.8	6.6
6.3	5.9	6	6	6.3
5.8	6.5	6.3	6.2	5.8
5.8	6.5	6.2	6.2	6.1

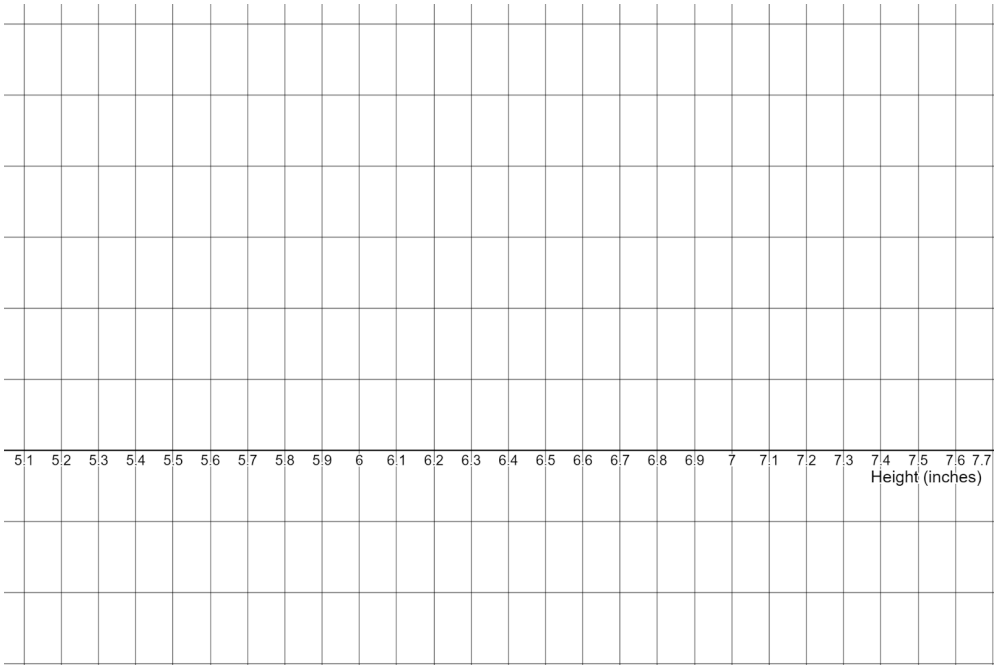
Heights of 30 Pro Basketball Players

6.1	6	6.6	6.5	6.6
7	6.5	6.6	6.5	6.6
6.3	6.8	6.4	6.7	6.3
6.9	6.3	6.6	6.1	6.4
6.3	6.9	6.8	6.5	6.6
5.8	6.3	6.9	6.7	6.8

a. Calculate the five-number summary for the data values from the Football and Basketball samples by hand.

Five Number Summary	**Football Sample**	**Basketball Sample**
Minimum		
Q1 (first quartile)		
Median		
Q3 (third quartile)		
Maximum		

b. Graph the boxplots (stacked) for the heights of football players and the heights of basketball players by hand. Use the graphs to compare the distributions.



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c. Calculate the range of heights for the football and basketball samples. Write the calculations. How is the range represented graphically in the boxplot?

d. Calculate the IQR for the heights of football and basketball players. Write the calculations.How is the IQR represented graphically in the boxplot?

3. Below is Nate's calculation of the five number summary and graph of the corresponding boxplot. Explain any errors they made and write a sentence or two explaining to Nate how to fix their mistakes.

   Nate's work and solution:

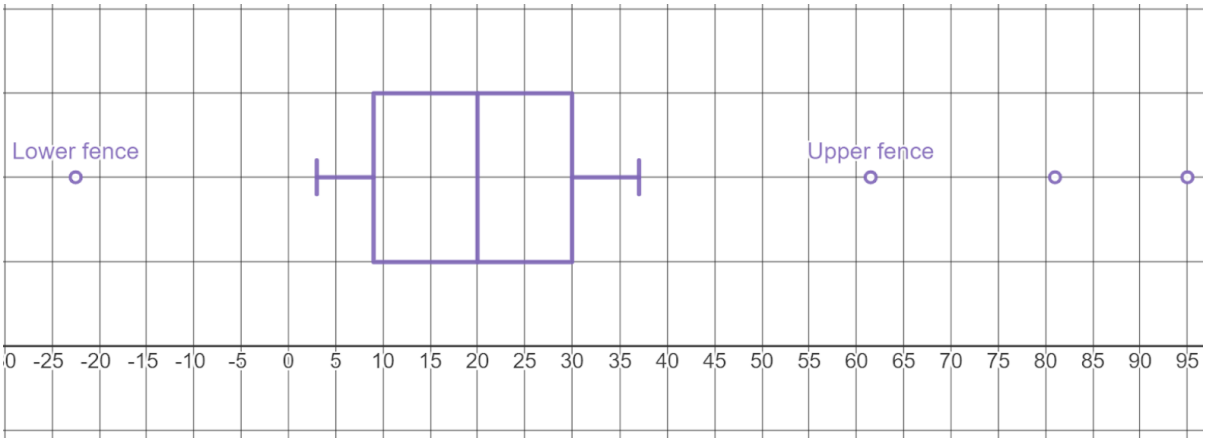
   The following data represent the observed number of native plant species from random samples of study plots on different islands in the Galapagos Island chain:

   $$P = [23, 26, 33, 21, 35, 30, 16, 3, 17, 9, 8, 9, 19, 12, 11, 7, 23, 95, 81, 4, 37, 28]$$

   Sort the data from smallest to largest:

   $$[3, 4, 7, 8, 9, 11, 12, 16, 17, 19, 21, 23, 23, 26, 28, 30, 33, 35, 37, 81, 95]$$

   There are 22 values in the data set, so the median will be between the 11th and 12th value in the set. Therefore median $= (19+21)/2 = 20$. The median separates the set into two sets each of size 11. Half of 11 is 5.5, so Q1 and Q3 will be the 6th value in their respective sets. $Q1 = 11$, and $Q3 = 30$. The minimum is 3 and the maximum is 95. The lower fence is $9 - (1.5 \cdot 21) = -22.5$ and the upper fence is $30 + (1.5 \cdot 21) = 61.5$ so the outliers are -22.5, 61.5, 81, 95.



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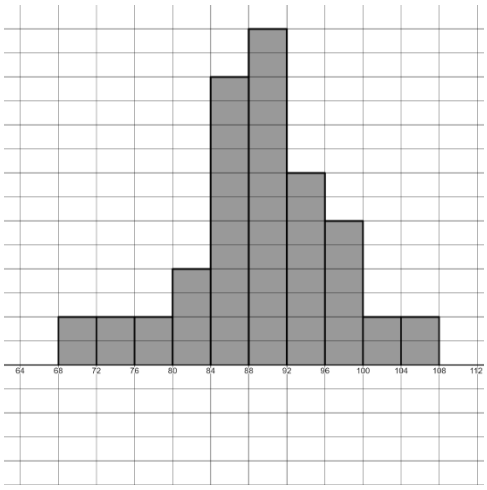
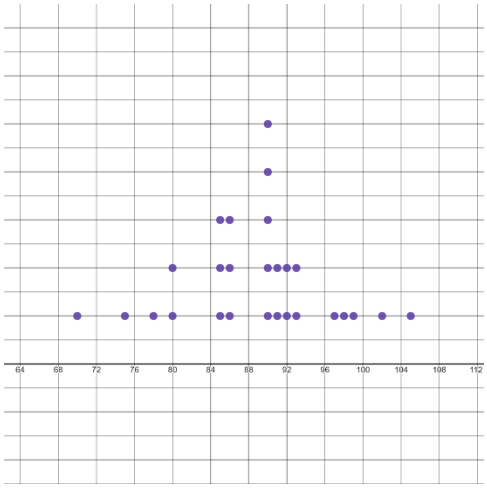
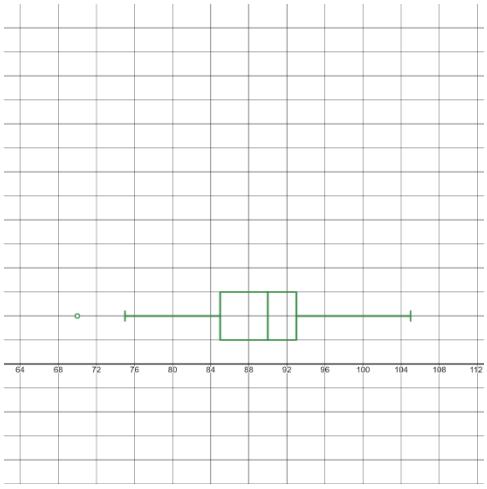
4. The following graphs represent glucose levels (mg/100ml) in the blood for a random sample of 27 non-obese adults. Use the graphs to estimate the center, shape, and spread of the distribution. Identify some benefits/challenges with using each of the graphs to describe this distribution.







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5. Below is Danny's calculation of the five number summary and graph of the corresponding boxplot. The following data represent glucose levels (mg/100ml) in the blood for a random sample of 27 non-obese adults.

   Danny's work and solution:

   $$G = [80, 85, 75, 90, 70, 97, 91, 85, 90, 85, 105, 86, 78, 92, 93, 90, 80, 102, 90, 90, 99, 93, 91, 86, 98, 86, 92]$$

   Sort the list from smallest to greatest:

   $$[70, 75, 78, 80, 80, 85, 85, 85, 86, 86, 86, 90, 90, 90, 90, 90, 91, 91, 92, 92, 93, 93, 97, 98, 99, 102, 105]$$

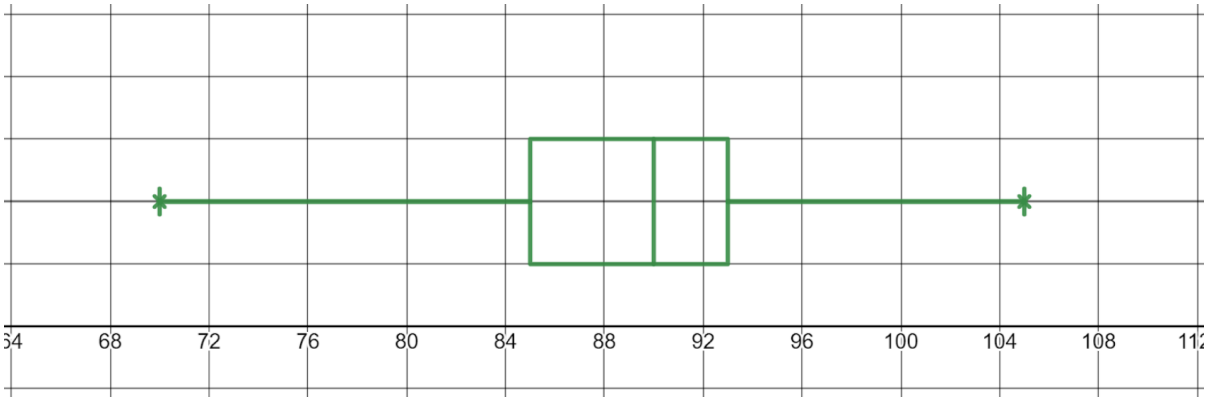
   The median is the 14th number on the list which is 90. Then we get two sets each with 14 numbers in them:

   Lower $= [70, 75, 78, 80, 80, 85, 85, 85, 86, 86, 86, 90, 90, 90]$ so $\text{Q1} = 85 + 85/2 = 85$

   Upper $= [90, 90, 90, 91, 91, 92, 92, 93, 93, 97, 98, 99, 102, 105]$ so $\text{Q3} = 92 + 93/2 = 92.5$

   Minimum is 70, Q1 is 85, Median is 90, Q3 is 92.5, and maximum is 105. $\text{IQR} = 92.5 - 85 = 7.5$.

   Lower fence $= 85 - (1.5 \cdot 7.5) = 73.75$ and upper fence $= 92.5 + (1.5 \cdot 7.5) = 103.75$.



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