

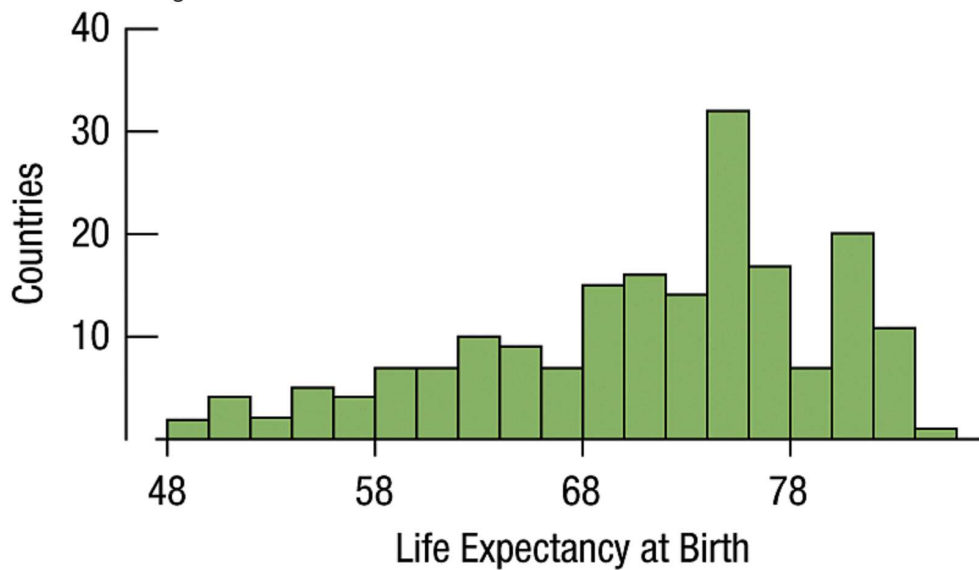
28/28 Questions Answered

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Problem Set 2


Q1**4 Points**

The World Health Organization collected data on 190 countries on life expectancy at birth.

**Q1.1****2 Points**

Describe whether this distribution is skewed to the left, skewed to the right, or symmetric. Also discuss its possible modes with an explanation.

This histogram is skewed to the left, since the tail extends towards the left. A possible mode would be a life expectancy at birth of 76.

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Q1.2**1 Point**

Do you expect the mean or the median to be larger? Explain.

Since the histogram is skewed left, the median would be larger. The mean in this case would be pulled more towards the lower tail.

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Q1.3**1 Point**

If you were to report either the mean or the median of the distribution, which one would you report, and why?

The median is resistant to the skewed shape of the distribution, so the median is best to report in this case.

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Q2**3 Points**

In a Statistics class at UCSD, 49 of the students took an exam and 1 student was absent. That student later took a make-up exam. The professor graded the first batch of the 49 exams and found an average score of 80 points with a standard deviation of 4 points. The student who took the make-up exam scored a grade of 75.

Q2.1**1 Point**

Will the new student's score increase or decrease the average score?

Decrease: The new student's score would decrease the average score since it is lower than the mean of the 49 other students.

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Q2.2**1 Point**

What is the new average?

Weighted mean = $[(\text{count}_1 \times \text{avg}_1) + (\text{count}_2 \times \text{avg}_2)] / (\text{count}_1 + \text{count}_2)$
Weighted mean = $[(49 \times 80) + (1 \times 75)] / 49 + 1$
Weighted mean = $3995 / 50$
Weighted mean = 79.9

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Q2.3**1 Point**

Does the new student's score increase or decrease the standard deviation of the scores?

Since the new score is 5 points away from the previous mean, and the previous standard deviation is 4 points, the new score is greater than 1 standard deviation from the previous mean. Hence, the new student's score increases the standard deviation.

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Q3**3 Points**

A class has 20 students who receive the following grades on an exam with 200 points:


194 71 31 42 175 10 100 68 11 125 156 106 90 186 95 89 142 26 89 89

Please find these statistics:

Q3.1**1 Point**


Mean

Mean: 94.75

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Median and quartiles


Median: 89.5 ,Q1: 61.5, Q3:129.25

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Q3.3**1 Point**

Range and IQR

Range: 184, IQR: 67.75

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Q4**5 Points**

The following are the statistics for the weekly salaries at a company:
lowest salary = \$300; mean = \$800; median = \$500; range = \$1200; IQR = \$600; first quartile = \$300; standard deviation = \$400.

Q4.1**1 Point**


Is this distribution skewed to the left, right, or symmetric?

Since the mean is greater than the median, this distribution is skewed right.

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Between what two values are the middle 50% found?

$IQR = Q3 - Q1$
 $600 = Q3 - 300$
 $Q3 = 900$
Hence, the middle 50% of data is found between \$300 and \$900

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Q4.3**1 Point**

Suppose the company gives every employee a \$50 raise. Write down the new values of each statistics.

lowest salary = \$350

mean = \$850

median = \$550


range = \$1200

IQR = \$600

first quartile = \$350

standard deviation = \$400

Note: Addition shifts the distribution to the right, but does not change the spread.

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Q4.4**2 Points**

Now suppose that the company gives every employee a 10% raise. Write down the new values of each statistics.

lowest salary = \$330

mean = \$880

median = \$550


range = \$1320

IQR = \$660

first quartile = \$330

standard deviation = \$440

Note: Multiplication changes the center and changes the spread.

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Q5**1 Point**

Below is a summary of the ZIP codes of 400 employees from a company. Discuss what these statistics can tell you.

Count	400
Mean	86384
Median	89756
Std. dev.	26476
Q1	45837
Q3	90473

Since ZIP codes are categorical, not quantitative, the statistics would not be useful or appropriate.

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Q6**3 Points**


The following summary statistics give some information on the acreage of some parcels of land in a region in California.

Count	36
Mean	46.50
Std. dev.	47.76
Median	33.50
Min	6
Q1	18.50
Q3	55
Max	250

Q6.1**1 Point**

Do you think this distribution is skewed or symmetric? Explain.

Since the mean is greater than the median, this distribution would be skewed right.

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Q6.2**1 Point**

Are there any outliers?


Q1: 18.5

Q3: 55

IQR: 36.5

 $1.5 \times \text{IQR} = 54.75$ lower outlier bound = $Q1 - 1.5 \times \text{IQR} = 18.5 - 54.75 = -36.25$ upper outlier bound = $Q3 + 1.5 \times \text{IQR} = 55 + 54.75 = 109.75$


Hence, the maximum is outside the outlier bounds and is an outlier.

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Draw a boxplot for this.

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Q7**4 Points**


A class of students take a quiz and the 5-number summaries are given for the 15 freshmen and 13 sophomores.

Summary	Min	Q1	Median	Q3	Max
Sophomores	2.0	4.5	6	7.8	10
Freshmen	3.5	5	6.5	8	9.5

Q7.1**1 Point**


Do the sophomores or freshmen have the highest score?

Sophomores have the highest score: since the max is greater than the freshmen.

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Do the sophomores or freshmen have a greater range?


range = max - min
range_soph = $10 - 2 = 8$
range_fresh = $9.5 - 3.5 = 6$
range_soph > range_fresh
Hence, sophomores have the greater range.

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Q7.3**1 Point**

Do the sophomores or freshmen have a greater IQR?

IQR = $Q3 - Q1$
IQR_soph = $7.8 - 4.5 = 3.3$
IQR_fresh = $8 - 5 = 3$
IQR_soph > IQR_fresh
Hence, sophomores have the greater IQR.

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Q7.4**1 Point**

If the mean of the scores of the sophomores is 5.5 and that of the freshmen is 6, then what is the overall mean for all 28 students?

Weighted mean = $[(\text{count}_1 \times \text{avg}_1) + (\text{count}_2 \times \text{avg}_2)] /$
 $\text{count}_1 + \text{count}_2$
Weighted mean = $[(15 \times 6) + (13 \times 5.5)] / 15 + 13$
Weighted mean = $161.5 / 28$
Weighted mean = 5.77

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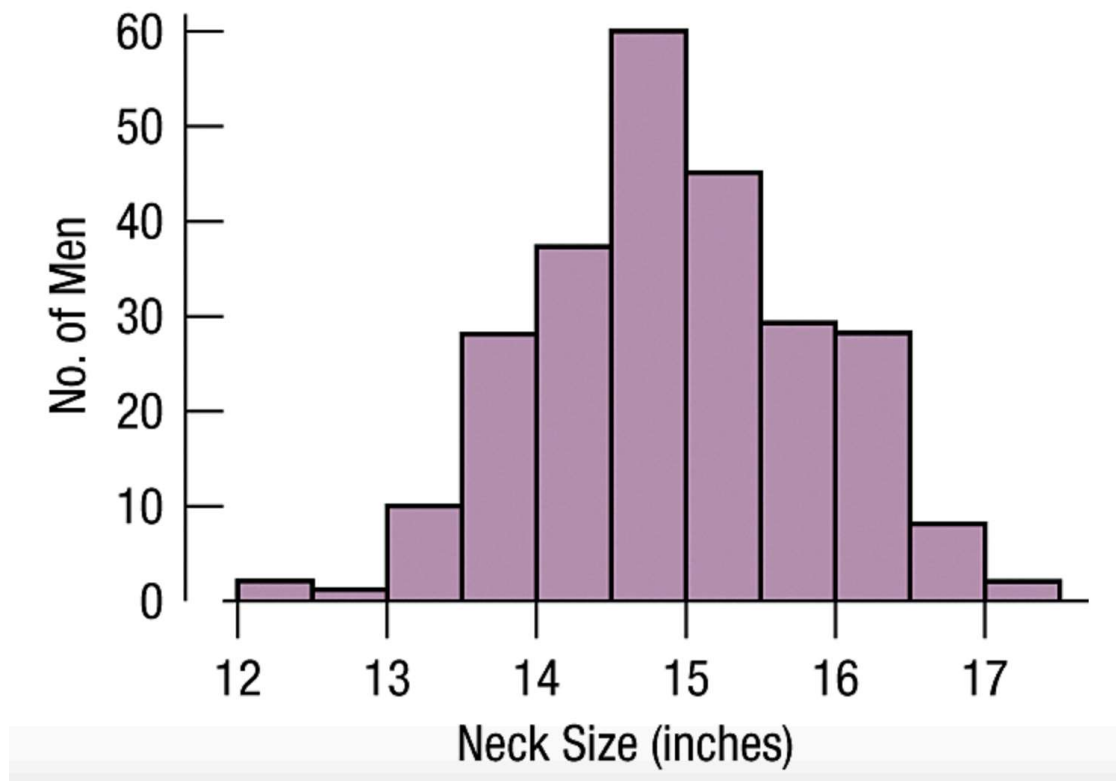
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Q8

3 Points

The following histogram shows the neck size of some men in California.



Q8.1

1 Point

Would it be appropriate to use the mean and standard deviation to summarize the distribution, and why?

Yes, because the distribution is symmetric and unimodal.

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Q8.2**1 Point**

Which is the mean closest to: 14, 15, or 16 inches?

15 inches since that is the balancing point of the histogram.

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Q8.3**1 Point**

Which do you think is a better estimate for the standard deviation: 1, 3, or 5 inches? Explain.

1 inch because that is a typical distance from the mean. There aren't a lot of points 3 inches away from the mean and there are no points 5 inches away from the mean.

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Q9**2 Points**

Alice, Bob, and Charlie are three employees in a small company. Charlie's salary is the highest among the three. If Charlie gets a raise, how would the following statistics of the salaries of these three employees be affected?

Q9.1**1 Point**

measures of center: Mean, Median;

The mean would increase and the median would not be affected.

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Q9.2**1 Point**

measures of spread: standard deviation, range, and IQR. Please provide some arguments to why the standard deviation increases/decreases.

The range, standard deviation, and IQR would all increase.

The standard deviation measures the spread of a dataset around its mean. When the maximum value is increased (while other values remain the same), the spread of the data increases since there is a larger gap between the maximum and the mean. This causes individual deviate more from the mean and consequently the standard deviation.

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Q10**2 Points**


Without doing any computations, identify which of the two distributions has a larger mean, and which of the two has a larger standard deviation. Justify your answer.

Q10.1**1 Point**

i) 2 3 5 6 7 8 9 10 11 13

(ii) 2 3 5 6 7 8 9 10 11 18


The second distribution has the larger mean since the last number 18 $>$ 13, and a higher standard deviation since 18 is farther away from the rest of the data when compared to 13.

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(i) 0 200 400 600 800

(ii) 50 100 400 700 750

Both distributions have the same mean since they are centered around 400. However, the first distribution has the larger standard deviation since the rest of the data is farther from the mean when compared to the data in the second.

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