1. Students taking an intro stats course reported the number of credit hours that they were taking that quarter. Summary statistics are shown in the table.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{x}$</td>
<td>16.65</td>
</tr>
<tr>
<td>$s$</td>
<td>2.96</td>
</tr>
<tr>
<td>Min</td>
<td>5</td>
</tr>
<tr>
<td>$Q_1$</td>
<td>15</td>
</tr>
<tr>
<td>Median</td>
<td>16</td>
</tr>
<tr>
<td>$Q_3$</td>
<td>19</td>
</tr>
<tr>
<td>Max</td>
<td>28</td>
</tr>
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</table>

a. Suppose that the college charges $73 per credit hour plus a flat student fee of $35 per quarter. For example, a student taking 12 credit hours would pay $35 + 12($73) = $911 for that quarter.

i. What is the mean fee paid?

The mean is a center statistics. Because of this, we use the formula above to find the mean fee paid.

$$35 + (mean)(73) = 35 + (16.65 \times 73) = 1250.45$$

ii. What is the standard deviation for the fees paid?

The standard deviation is a spread statistics. For the spread, we only want to see the difference in the change in units. Therefore the standard deviation would only consider the standard deviation of this problem multiplied by the cost per unit.

$$73 \times 2.96 = 216.08$$

iii. What is the median fee paid?

Since this is also a center statistics, we would use the formula to find the median fee paid.

$$35 + (median)(73) = 35 + (16 \times 73) = 1203$$

iv. What is the IQR for the fees paid?

Since this is also a spread statistics, we are only looking for the IQR distance multiplied by the cost per unit.

$$73 \times 4 = 292$$

You can also get this same answer by finding the exact fee for $Q_3$ and $Q_1$ and subtracting the two.

$$35 + 19 \times 73 = 1422$$

$$35 + 15 \times 73 = 1130$$

$$1422 - 1130 = 292$$

2. Adult female Dalmatians weigh an average of 50 pounds with a standard deviation of 3.3 pounds. Adult female Boxers weigh an average of 57.5 pounds with a standard deviation of 1.7 pounds. One statistics teacher owns an underweight Dalmatian and an underweight Boxer. The Dalmatian weighs 45 pounds, and the Boxer weighs 52 pounds. Which dog is more underweight? Explain.

In order to find out which dog is more underweight, you would need to compute the z-score for both the Dalmatian and the Boxer so that we can compare the dogs on the same distribution.
\[ Z_D = \frac{45 - 50}{3.3} = -1.52 \]

\[ Z_B = \frac{52 - 57.5}{1.7} = -3.24 \]

Since we look at the absolute value of the z-scores when we are comparing two different z-scores, the Boxer would be more underweight because it is farther from the mean than the Dalmatian.

3. At a large business, employees must report to work at 7:30 am. The arrival times of employees can be described by a normal model with mean of 7:22 am and a standard deviation of four minutes.
   a. What percent of employees are late on a typical work day?
      We need to find the percentage of employees that arrive after 7:30. Therefore, we are looking for the area to the right of 30 (since our unit is minutes - not hours and minutes).
      \[ P(time > 7:30) = z = \frac{30 - 22}{4} = 2.00 \]
      \[ P(z > 2.00) = 1 - .9772 = .0228 \]
      Thus, the percentage of employees that are late is 2.28%.
   
   b. A psychological study determined that the typical worker needs five minutes to adjust to their surroundings before beginning their duties. What percent of this business’ employees arrive early enough to make this adjustment?
      Now, we are looking for the percentage of employees that arrive before 7:25. Therefore, we are looking for area to the left of 25.
      \[ P(time > 7:25) = z = \frac{25 - 22}{4} = .75 \]
      \[ P(z \leq .75) = .7734 \]
      Therefore, the percentage of employees that arrive by 7:25 is 77.34%.

4. Some IQ tests are standardized to a Normal model, with a mean of 100 and a standard deviation of 16.
   a. Draw the model for these IQ scores. Clearly label it, showing what the 68-95-99.7 Rule predicts about the scores.
      To draw this model, we would draw a normal curve, record the mean in the middle of the chart, and then find the standard deviations. Recall that the 68-95-99.7 Rule states that 68% of your data is between 1 standard deviation of the mean, 95% of your data is between 2 standard deviations of the mean, and 99.7% of your data will be between the 3 standard deviation of the mean. This is similar to the IQR when relating it to the median. You would want to record the standard deviations and then show the percentage of data that’s between the two numbers.
b. In what interval would you expect the central 95% of IQ scores to be found?

Since we know 95% of our data lies between the 2nd SD away from the mean, the interval would be (68,132).

c. About what percent of people should have IQ scores above 116?

Since we are looking for the percentage of people who should have IQ scores above 116, we are looking for the z-score of 116 and finding the area to the right.

\[ z = \frac{116 - 100}{16} = 1 \]

Therefore, we find that the area under the curve is .8413. So our percentage would be 1-.8413=.1582. Thus, our percentage is 15.82%

d. About what percent of people should have IQ scores between 68 and 84?

Since we are looking for a percentage of a range of scores, we would need to find the z-score for both numbers, and subtract the area under the curve for both.

\[ Z = \frac{68 - 100}{16} = -2 \]
\[ Z = \frac{84 - 100}{16} = -1 \]

.1582(area for -1) -.0228(area for -2) = 1.354

Therefore, our percentage is 13.5%

e. About what percent of people should have IQ scores above 132?

Again, we are looking for the percent of people who should have an IQ score above 132. We need to find the z-score of 116 and find the area to the right.

\[ z = \frac{132 - 100}{16} = 2 \]

Thus, our area to the left is .9772. Therefore, to find the area to the right, we would subtract that from 1. So, our percentage is 2.28%

5. A tire manufacturer believes that the treadlife of its snow tires can be described by a Normal model with a mean of 32,000 miles and standard deviation of 2500 miles.

a. If you buy a set of these tires, would it be reasonable for you to hope they’ll last 40,000 miles? Explain.

No, if we find the z-score for this problem, the z-score is 3.2. That means that almost 99.7% of the tires have worn out by 40,000 miles. Therefore, you have a .07% chance they would last longer.

b. Approximately what fraction of these tires can be expected to last less than 30,000 miles?

Fraction and percent is the same thing. Therefore, we would find our z-score for 30,000. Since we are being asked to find the tires that last less than 30,000 we are finding area to the left.
Therefore, our percentage of tires that last less than 30,000 miles is 21.2%.

c. Approximately what fraction of these tires can be expected to last between 30,000 and 35,000 miles?

Since we just calculated the percentage of tires less than 30,000 we don’t need to find the z-score for this problem. We do need to find the z-score for 35,000 miles so that we can find the area between these two numbers.

\[ z = \frac{35000 - 32000}{2500} = 1.2 \]

When we find the area under the curve for the z-score of 1.2, we get .8849. Therefore, when we subtract the area under the curve for 30,000 we get:

\[ .8849 - .2119 = .673 \]

Thus, the percentage of scores between 30,000 and 35,000 is 67.3%.

d. Estimate the IQR of the treadlives.

Since we know the IQR holds 50% of our data, we need to find the z-score that has 25% of the data to the left. Since the normal curve is symmetric, the z-score we find for the lower 25%, will be the opposite of the z-score for the upper 25%. When we look at the chart, we find that .2500 is between -.68 and -.67. The closer number is -.68, therefore, this is our z-score. For the upper tail, we have a z-score of +.68. To find the actual tirelive, to calculate the range of the IQR, we need to multiply the z-score by the standard deviation and add it to the mean.

\[ Q_1 = (-.68 \times 2500) + 32000 = 30,314 \]
\[ Q_3 = (.68 \times 2500) + 32000 = 33,686 \]

The IQR is 33,686 - 30,314 = 3372.

e. In planning a marketing strategy, a local tire dealer wants to offer a refund to any customer whose tires fail to last a certain number of miles. However, the dealer does not want to take too big a risk. If the dealer is willing to give refunds to no more than 1 of every 25 customers, for what mileage can he guarantee these tires to last?

Since we know the dealer wants to be wrong 1/25, this is the area under the curve. So our area is .04. When we look for the z-score for the area of .04, we get -1.75. To find the mileage he can use for his guarantee, we would multiply the z-score by the standard deviation and add it to the mean.

\[ (-1.75 \times 2500) + 32000 = 27,623 \text{ miles} \]