PRACTICE 8

1. Kathy and her brother Clay recently ran in a local marathon. The distribution of finishing time for women was approximately normal with mean 259 minutes and standard deviation 32 minutes. The distribution of finishing time for men was approximately normal with mean 242 minutes and standard deviation 29 minutes.

   (a) The finishing time for Clay was 289 minutes. Calculate and interpret the standardized score for Clay's marathon time. Show your work.

   Clay's finishing time was 289 minutes and the distribution of finishing time for men was normal with $\mu = 242$ and $\sigma = 29$.

   $$z = \frac{289 - 242}{29} \approx 1.62$$

   Clay's finishing time is 1.62 standard deviations greater than the men's finishing times.

   (b) The finishing time for Kathy was 272 minutes. What proportion of women who ran the marathon had a finishing time less than Kathy's? Show your work.

   The women's finishing times are normally distributed with $\mu = 259$ minutes and $\sigma = 32$ minutes.

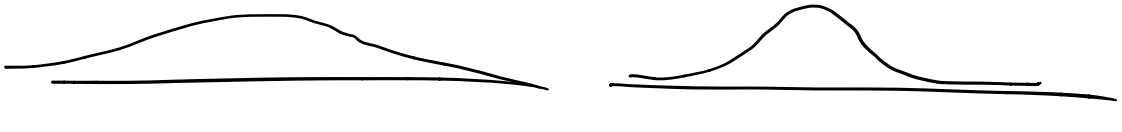
   $$z = \frac{272 - 259}{32} \approx 0.41$$

   $$P(Z < 0.41) = \text{normalCDF}(x = 0.41, \mu = 0, \sigma = 1) = \boxed{0.66}$$

   (c) The standard deviation of finishing time is greater for women than for men. What does this indicate about the finishing times of the women who ran the marathon compared to the finishing times of the men who ran the marathon?

   Since the standard deviation of women's times is greater than the standard deviation for men's times, there is more variability in the women's times than in the men's times.

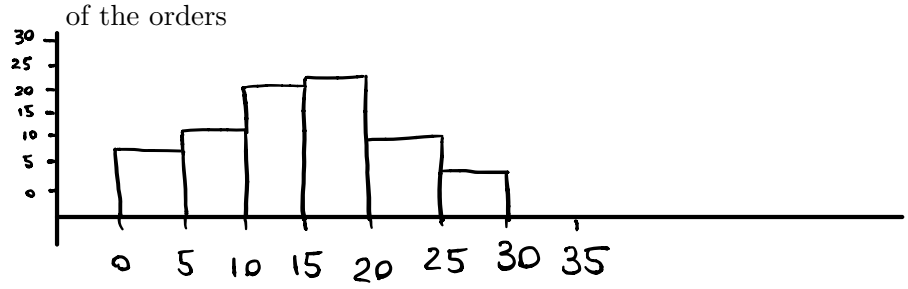
   The women's times are more widely dispersed about the women's times mean than men's times are dispersed about the men's times mean.



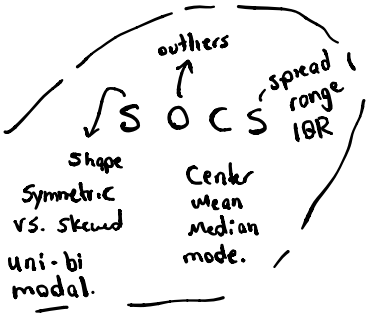
2. The following frequency table summarizes the total amounts, in dollars, for 91 orders from a food truck during a certain day.

Amount	Frequency
\$0 up to but not including \$5	8
\$5 up to but not including \$10	14
\$10 up to but not including \$15	25
\$15 up to but not including \$20	27
\$20 up to but not including \$25	12
\$25 up to but not including \$30	5

(a) Use the data in the table to create a histogram showing the distribution of the amounts of the orders



(b) Describe the shape of the distribution of amounts.



• The distribution appears to be symmetric and approximately normal, with a mean and median of approximately \$15, a range of \$0-\$30.

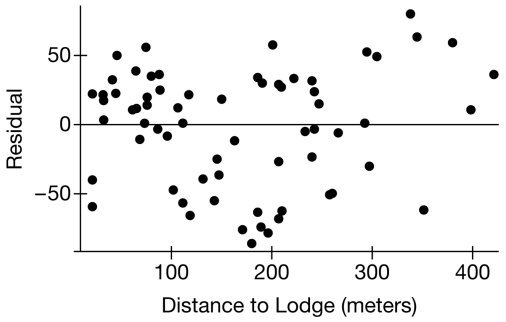
There does not appear to be any outliers.

(c) Identify a possible amount for the median of the distribution. Justify your answer.

The median of the distribution appears to be ~\$15, ~50% of the data points fall above and below \$15.

The true median will lie somewhere between \$10 and \$15.

3. American beavers are foragers with a central home location that make foraging trips from their lodge and then return. To test the optimal foraging theory, researchers trapped and radio-tagged a random sample of 67 American beavers from the population in a certain region and recorded their movements over the course of about a year. The researchers fit a least-squares regression line to the data, where the explanatory variable was distance to lodge, in meters, and the response variable was speed, in meters per hour. The resulting residual plot of the regression analysis is shown.

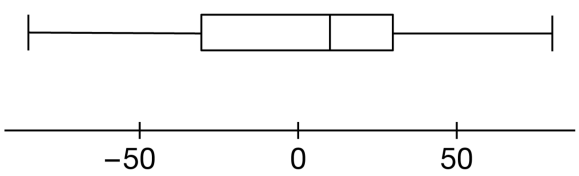


(a) Is a linear model appropriate to use for these data? Justify your response by referencing the residual plot.

Yes, the residual plot appears to be randomly scattered about 0, with no curvature or apparent pattern, this suggests a linear model may be appropriate.

The computer output from the regression analysis and the box-plot of the residuals are shown.

	Estimate	Error	T	p
Intercept	-16.462	9.726	-1.693	0.0953
Distance	0.849	0.049	17.177	0.0000



(b) Identify the intercept of the least-squares regression line and interpret it in the context of the data.

- The intercept is -16.462, this is the predicted speed for a beaver that is 0 meters from the lodge (at or in the lodge).
- Note that this value falls out of the range of the data and may be extrapolation.

(c) Identify the slope of the least-squares regression line and interpret it in the context of the data.

The slope is 0.849, this indicates that, on average, for every meter increase in the distance to the lodge there is a 0.849 m/s increase in the speed of a beaver.