

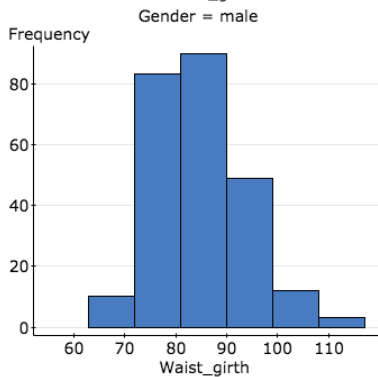
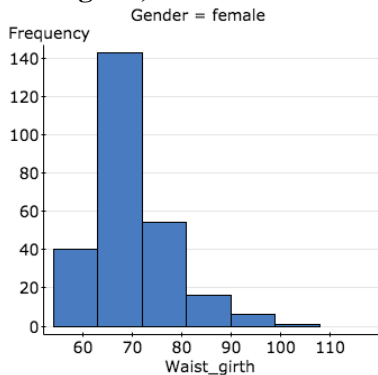
**Module 4.4 Module 4 Lab**

Name: Solutions v 2

**Learning Goal:** For the distribution of a quantitative variable, describe the overall pattern (shape, center, and spread) and striking deviations from the pattern.

**Specific Learning Objectives:** Compare and contrast the distributions of a quantitative variable for two groups using histograms. Describe shape, give a general estimate of center and the overall range, and calculate relevant percentages.

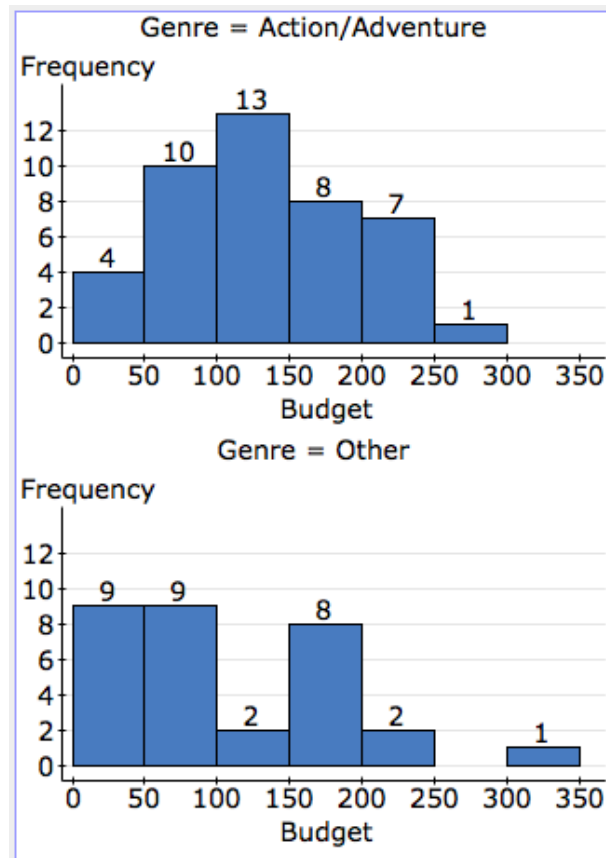
**1. Here are data from adults (247 men and 260 women) who exercise regularly. The variable is waist girth, measured in centimeters.**



**Are the following statements valid (true) or invalid (false)? Explain how the histograms support your answer.**

- (a) In this dataset, typical females have a smaller waist girth than typical males.  
*Valid. Typical females have a waist girth between about 63 and 72 cm. Typical males have a waist girth between about 72 and 90 cm.*
- (b) There is less variability in waist girth for females.  
*Valid. The waist girth for typical females varies by about 9 cm (from 63 to 72 cm). The waist girth for typical males varies by about 18 cm (from 72 to 90 cm).*
- (c) Here the distributions of waist girth measurement are skewed to the right for both males and females, with only a small percentage of each group having waist girths exceeding 99 cm.  
*Valid. Both distributions have tails on the right. I estimate that the percentage of women whose waist girths exceed 99 cm is  $(7 + 2)/260 \approx 0.035 \approx 3.5\%$ . I estimate that the percentage of men whose waist girths exceed 99 cm is  $(12 + 3)/247 \approx 0.061 \approx 6.1\%$ .*

2. These histograms show the budget in millions of dollars for a sample of 74 movies listed in the top 100 USA box offices sales of all time. The movies are divided into two genres: Action/Adventure (with 43 movies) and Other (with 31 movies).



- (a) Describe the shape of each distribution. What does the shape tell us about where most of the data fall?

*The shape for Action/Adventure is roughly symmetric, with a slight skew to the right. Most of the data fall in the middle between \$50 M and \$200 M. The shape for Other is right-skewed, with an extra peak between \$150 M and \$200 M. Most of the data fall between \$0 M and \$100 M.*

- (b) Which genre (Action/Adventure or Other) has the movie with largest budget?

*Other has the movie with the largest budget (between \$300 M and \$350 M).*

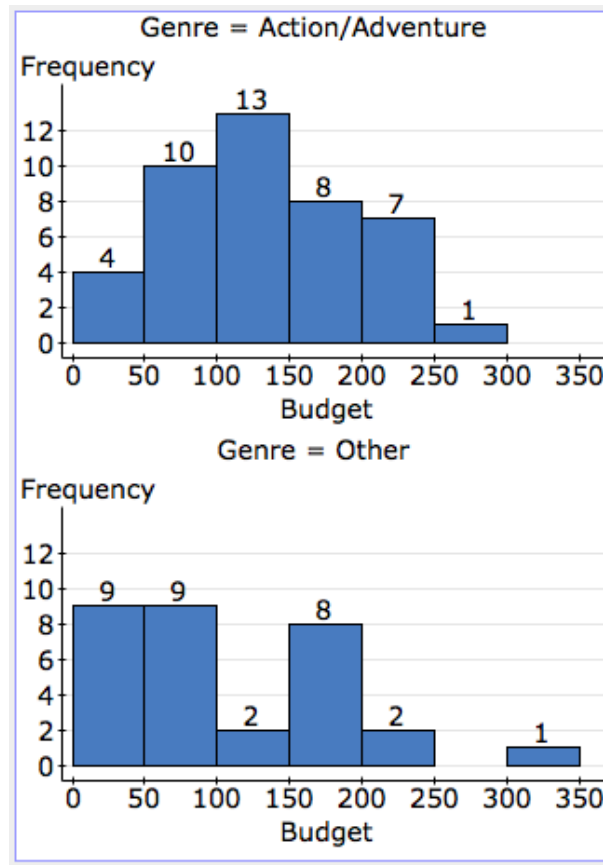
- (c) When we take all of the data into account, which genre tends to have larger budgets? (To answer this question, give an interval that represents typical budget amounts for each genre. Use these intervals to support your answer.)

*For Action/Adventure budgets, a typical interval is \$50 M to \$200 M. For Other budgets, a typical interval is \$0 M to \$100 M. So Action/Adventure movies tend to have larger budgets than Other movies.*

- (d) Which genre has more variability in budget amounts? (To answer this question, estimate the overall range of budget amounts for each genre. Use your estimates to support your answer.

*I estimate that the overall range for Action/Adventure budgets is  $275 - 25 = \$250 M$ , and the overall range for Other budgets is  $325 - 25 = \$300 M$*

- (e) Pick the statement that you think is more strongly supported by the data:



- ➡ • Action/Adventure movies tend to have larger budgets than other movies.
- Budget amounts are similar for Action/Adventure movies and Other movies.

For the statement you picked, support it with *at least three* precise observations from the histograms. Explain how your observations support the statement you chose.

- 1) *The median budget for Action/Adventure movies is between \$100 M and \$150 M, while the median budget for Other movies is between \$50 M and \$100 M*
- 2) *The typical interval for Action/Adventure budgets is \$50 M to \$200 M, while the typical interval for Other budgets is \$0 M to \$100 M. So Action/Adventure movies tend to have larger budgets than Other movies.*
- 3) *The distribution of Action/Adventure budgets is roughly symmetric, so most of the budgets are mid-range, while the distribution of Other budgets is skewed right, so most of the budgets are low.*