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 Objective:

- Distinguish between categorical and quantitative variables;
- Identify graphs that represent the distribution of a quantitative variable;
- Analyze the distribution of a quantitative variable using a histogram. Describe shape, give a general estimate of center and the overall range, and calculate relevant percentages.

Overview:
In this activity you will again practice analyzing the distributions of quantitative variables using descriptions of shape, center and spread. This is the same type of thinking you did earlier with dot plots, but this time the data will be summarized in a histogram.

1) Match the following descriptions to the histograms I-III.

A. Scores on an easy exam for a class of students

B. Scores on a hard exam for a class of students

C. Number of siblings for a large sample of U.S. adults

D. Exact volume of soda in a one-liter bottle for a case of 24 bottles

E. Dates on the pennies I have in my car ashtray

F. Weights for a large sample of newborn babies

2) For each research question, (1) identify the individuals of interest (the group or groups being studied), (2) identify the variable(s) (the characteristic that we would gather data about), and (3) determine whether each variable is categorical or quantitative.

  A. What is the average number of hours that community college students work each week?

  B. What proportion of all U.S. college students are enrolled at a community college?

  C. In community colleges, do female students have a higher GPA than male students?

  D. Are college athletes more likely than non-athletes to receive academic advising?

3) If we gathered data to answer the previous research questions, which data could be analyzed using a histogram? How do you know?

4) Which of the graphs below is a histogram? How do you know?
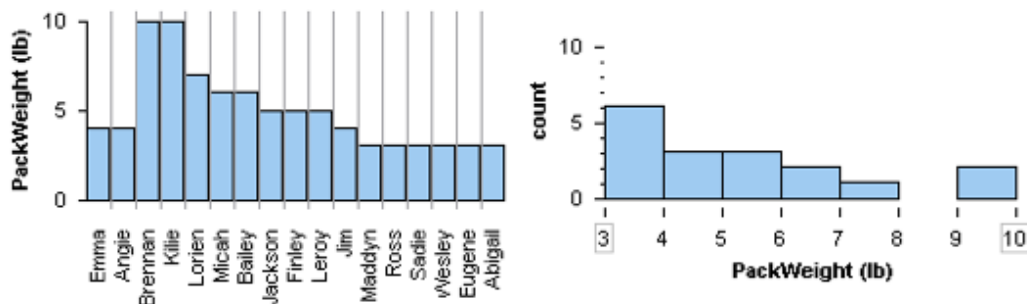
5) This histogram shows the distribution of exam scores for 15 students in a Biology class.
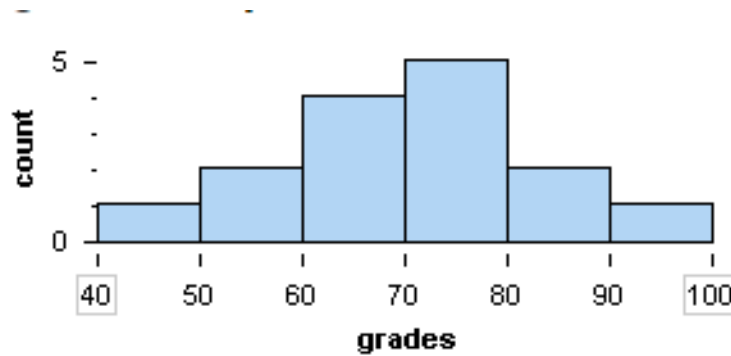
a) How would you describe the shape of this distribution of exam scores? (Use course vocabulary.)

b) Give an interval that describes typical grades on this exam.

c) Estimate the overall range of grades on this exam. (Range = Max – Min)

d) What percentage of the students made a D on the exam (a grade of 60-69%)?

e) What percentage of the students passed the exam with a 70 or better?

f) What percentage of the students made an A or a B?

g) What percentage of the students who passed the exam made an A or a B?

h) What percentage of the students who failed the exam (grades lower than 70) made a D (a grade of 60-69%)?

6) The following is a histogram indicating the distribution of scores on the Spring 2012 Module 1 Checkpoint for 82 students in Math 27 classes.
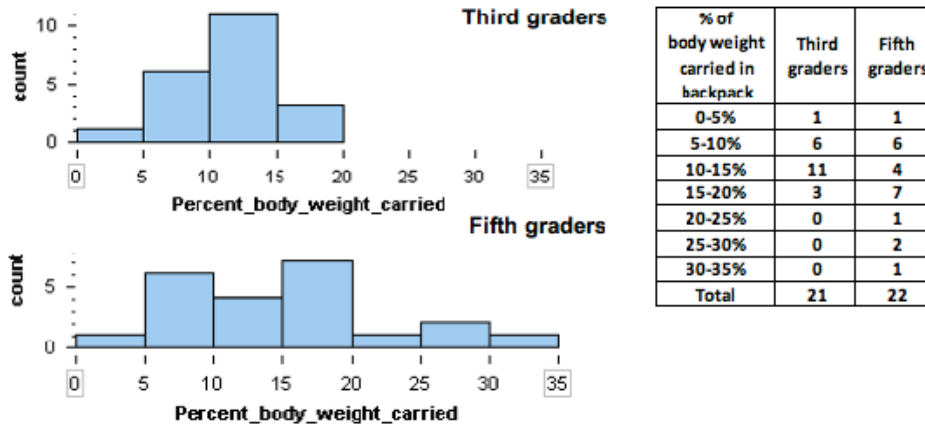

Spring 2012 Module 1 Checkpoint Scores (two classes)
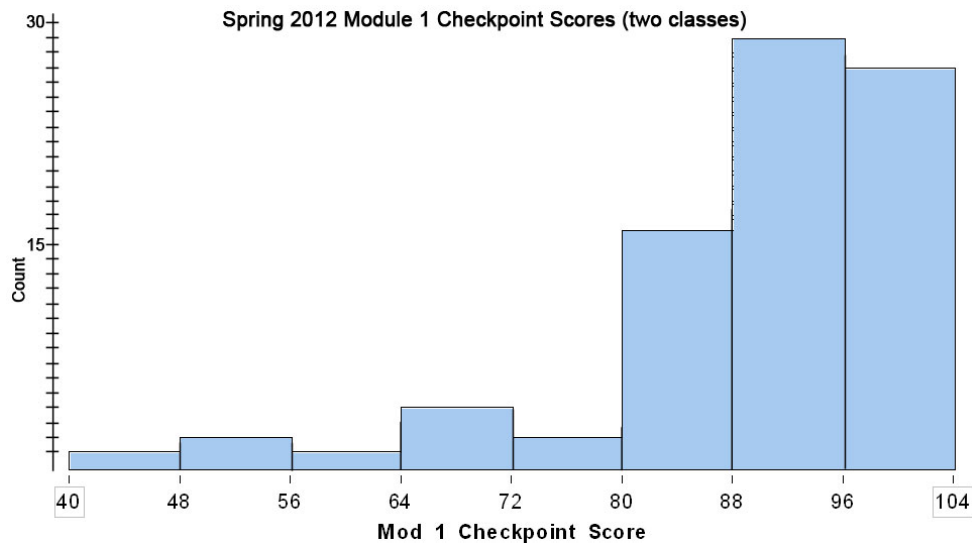
a) How would you describe the shape of this distribution of quiz scores? (Use course vocabulary.)

b) Give an interval that describes typical performance on this quiz.

c) Estimate the overall range of grades on this quiz. (Range = Max – Min)

For each of the following questions, answer the question if the histogram provides enough information to answer it. If not, write "not enough information".

d) What percentage of students scored below 80%?

e) How many students made an A (scored a 90% or higher)?

f) What is the lowest grade on the Module 1 Checkpoint?

g) What percentage of the students aced the quiz (a score of 100%)?

h) What is the average (mean) quiz score?

i) Did the majority of students pass the quiz (70% or better)?

7) The data graphed in these histograms describes 43 elementary school children. The variable is "percent of body weight carried in the school backpack." A child who weighs 60 pounds and carries 9 pounds has a variable value of 15% since 9÷60=0.15=15%. The American Chiropractic Association (ACA) recommends that children carry no more than 10% of their body weight.

Third graders

Fifth graders

% of body weight carried in backpack	Third graders	Fifth graders
0-5%	1	1
5-10%	6	6
10-15%	11	4
15-20%	3	7
20-25%	0	1
25-30%	0	2
30-35%	0	1
Total	21	22

Percent_body_weight_carried

Percent_body_weight_carried

a) Of the 3rd graders, how many are following the ACA recommendation?

b) Of the 3rd graders what percentage is following the ACA recommendation?

c) Of the 5th graders, what percentage is following the ACA recommendation?

d) Of all the children in this study, what percentage is NOT following the ACA recommendation?

e) Of the 5th graders who are NOT following the ACA recommendation, what percentage are carrying more than 25% of their body weight?

8) This data comes from a survey of 218 students enrolled at Carnegie Mellon University in Pennsylvania. Students were asked if they preferred to sit in the back (B), front (F), or middle (M) of the classroom. 51 reported a preference for sitting at the front; 131 prefer to sit in the middle of the classroom; 46 prefer the back. They also reported their college GPA.
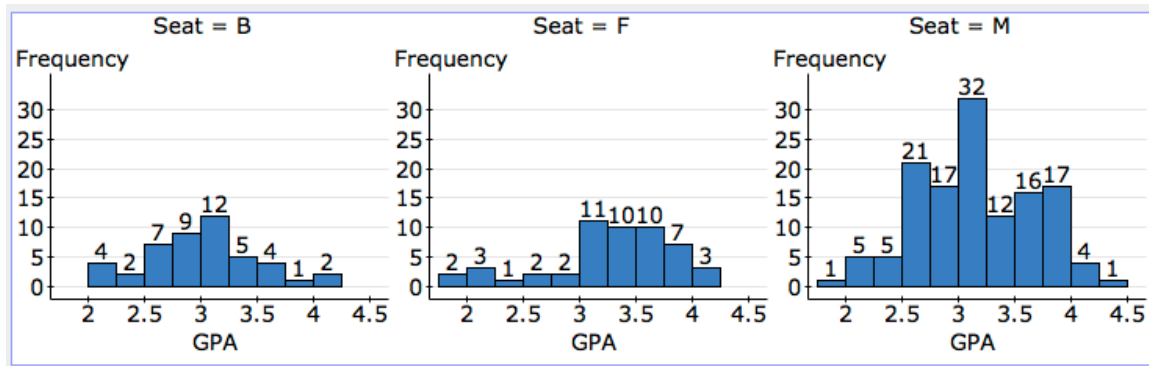
a) Do students who sit at the front of the class tend to have higher GPAs compared to students who sit at the back of class? Calculate percentages to support your answer.

b) Do the students who sit at the back of the class tend to have lower GPAs compared to students who sit at the front or in the middle?

c) To answer the questions in (a) and (b), it is better to use percentages than counts. Why is this?