# 6. APPENDIX

ARTIST Scale and CAOS Test Items Measuring Distribution Literacy and Reasoning

Tabled values represent percent of students who selected a particular response.

ITEM 1

Here is a histogram for a set of test scores from a 10-item makeup quiz given to a group of students who were absent on the day the quiz was given. How many people received scores higher than 4?
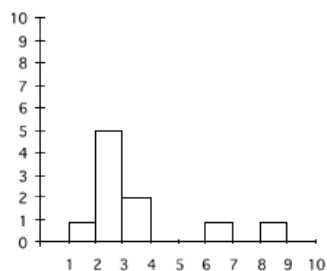
Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. 1	5.1	11.9	9.4
b. 2	**90.4**	**78.8**	**83.0**
c. 3	2.5	2.9	2.8
d. 4	2.0	6.4	4.8

ITEM 2

How many people took the test and have scores represented in the graph?

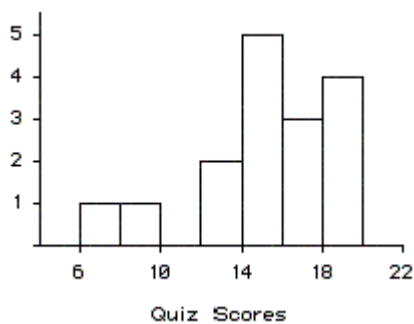| Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. 5	3.0	20.9	14.4
b. 10	**93.4**	**74.5**	**81.4**
c. 20	2.0	3.5	3.0
d. 30	1.5	0.6	0.9

ITEM 3

What do the numbers on the vertical axis represent?

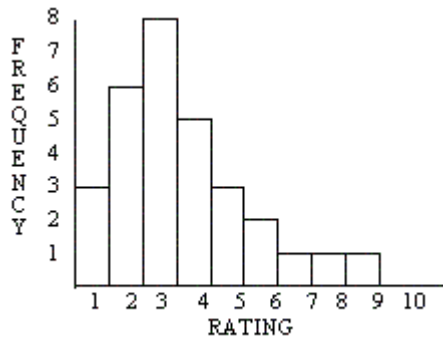| Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. Independent variable	5.1	8.4	7.2
b. Scores on the test	20.8	33.6	29.0
c. Dependent variable	15.7	8.4	11.1
d. Number of Students	**58.4**	**49.6**	**52.8**

ITEM 4

Scores for a quiz were calculated as the number of correct responses. Below is a graphical display of the quiz scores. How many of the scores are above 15? (Note: all scores are integers and bars begin at left endpoints)

Quiz Scores

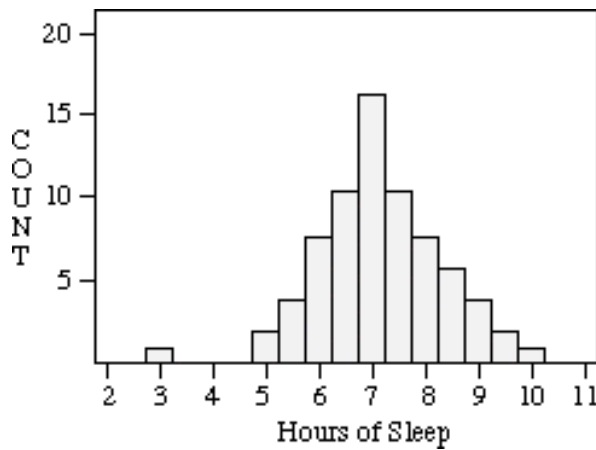| Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. 6	0.5	4.1	2.8
b. 7	**32.5**	**23.8**	**26.9**
c. 12	21.3	30.4	27.1
d. 13	1.0	1.4	1.3
e. Can't be determined	44.7	40.0	41.7

ITEM 5

One of the items on the student survey for an introductory statistics course was "Rate your aptitude to succeed in this class on a scale of 1 to 10" where 1 = Lowest Aptitude and 10 = Highest Aptitude. The instructor examined the data for men and women separately. Below is the distribution of this variable for the 30 women in the class. How should the instructor interpret the women's perceptions regarding their success in the class?

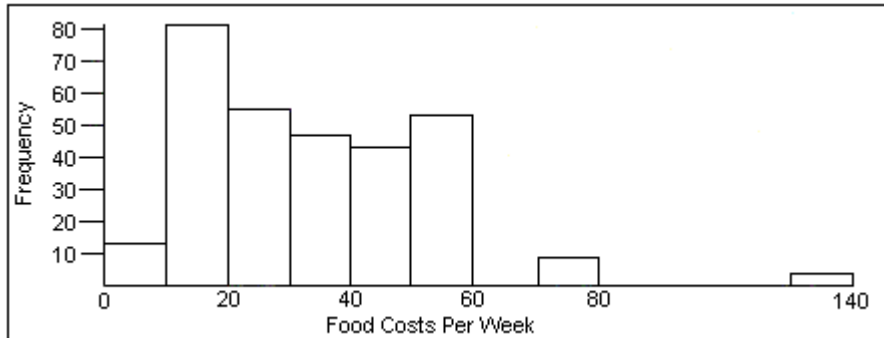| Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. A majority of women in the class do not feel that they will succeed in statistics although a few feel confident about succeeding.	**86.8**	**75.4**	**79.5**
b. The women in the class see themselves as having lower aptitude for statistics than the men in the class.	3.6	10.7	8.1
c. If you remove the three women with the highest ratings, then the result will show an approximately normal distribution.	9.6	13.9	12.4

ITEM 6

The following graph shows a distribution of hours slept last night by a group of college students. Select the statement below that gives the most complete description of the graph in a way that demonstrates an understanding of how to statistically describe and interpret the distribution of a variable.

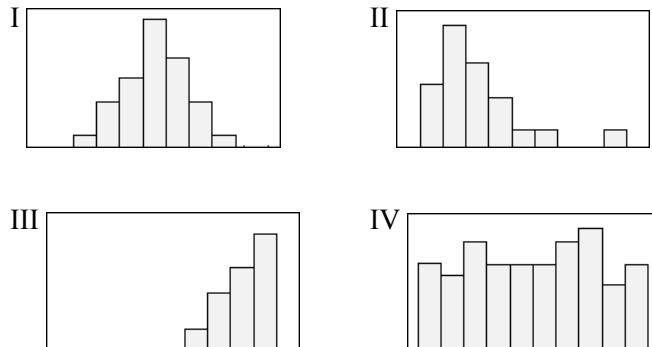|		High School (N = 97)	College-Level (N = 796)	All (N = 893)
Response				
a.	The bars go from 3 to 10, increasing in height to 7, then decreasing to 10. The tallest bar is at 7. There is a gap between three and five.	5.2	4.5	4.6
b.	The distribution is normal, with a mean of about 7 and a standard deviation of about 1.	15.5	19.5	19.0
c.	Most students seem to be getting enough sleep at night, but some students slept more and some slept less. However, one student must have stayed up very late and got very few hours of sleep.	1.0	3.1	2.9
d.	**The distribution of hours of sleep is somewhat symmetric and bell-shaped, with an outlier at 3. The typical amount of sleep is about 7 hours and overall range is 7 hours.**	**78.4**	**72.9**	**73.5**

ITEM 7

A college statistics class conducted a survey. They gathered data from a large random sample of students who estimated how much money they typically spent each week in different categories (e.g., food, entertainment, etc.). A distribution of the survey results is presented below. One student claims the distribution of food costs basically looks bell-shaped, with one outlier. How would you respond?

Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. Agree, it looks pretty symmetric if you ignore the outlier.	8.1	6.7	7.2
b. Agree, most distributions are bell-shaped.	0.0	6.7	4.2
c. Disagree, it looks more skewed to the left.	4.1	19.4	13.8
d. Disagree, it looks more skewed to the right.	**81.2**	**55.7**	**64.9**
e. Disagree, it looks more bimodal.	6.6	11.0	9.4

ITEMS 8, 9, AND 10

Match each description to the appropriate histogram below.

Item 8: A set of quiz scores where the quiz was very easy.

Response	High School (N = 97)	College-Level (N = 797)	All (N = 894)
I	2.1	5.4	5.0
II	3.1	7.2	6.7
III	**86.6**	**69.4**	**71.3**
IV	8.2	18.1	17.0

Item 9: The last digits of phone numbers sampled from a phone book. Match this description to the appropriate histogram below.
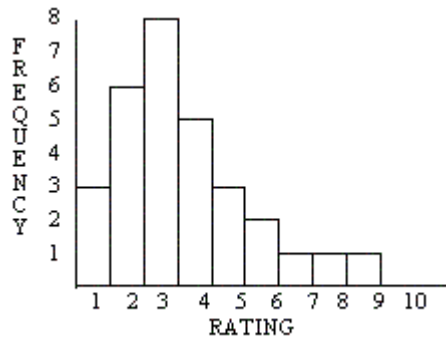
Response	High School (N = 97)	College-Level (N = 797)	All (N = 894)
I	15.5	26.2	25.1
II	20.6	21.8	21.7
III	2.1	7.2	6.6
IV	**61.9**	**44.8**	**46.6**

Item 10: A set of average weights (measured in pounds) compiled monthly over the course of two years, of one healthy adult. Match this description to the appropriate histogram below.

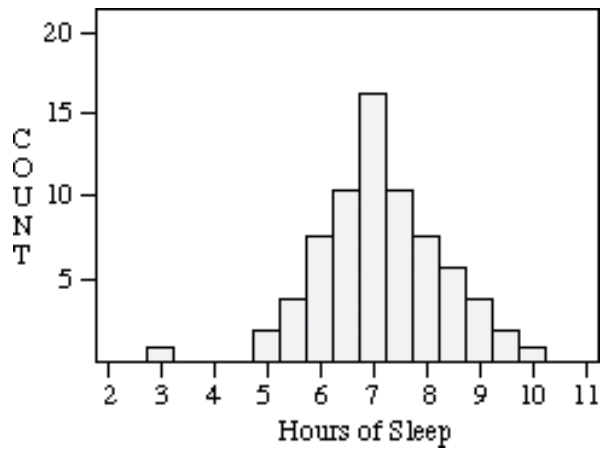| Response	High School (N = 97)	College-Level (N = 797)	All (N = 894)
I	**30.9**	**24.7**	**25.4**
II	5.2	8.3	7.9
III	8.2	7.3	7.4
IV	55.7	59.7	59.3

ITEM 11

One of the items on the student survey for an introductory statistics course was "Rate your aptitude to succeed in this class on a scale of 1 to 10" where 1 = Lowest Aptitude and 10 = Highest Aptitude. The instructor examined the data for men and women separately. Below is the distribution of this variable for the 30 women in the class. Which of the following boxplots represents the same data set as the histogram shown above?

Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
A	2.5	12.8	9.0
B	**76.6**	**67.0**	**70.5**
C	20.8	18.6	19.4

ITEM 12

The following graph shows a distribution of hours slept last night by a group of college students. Which box plot seems to be graphing the same data as this histogram?
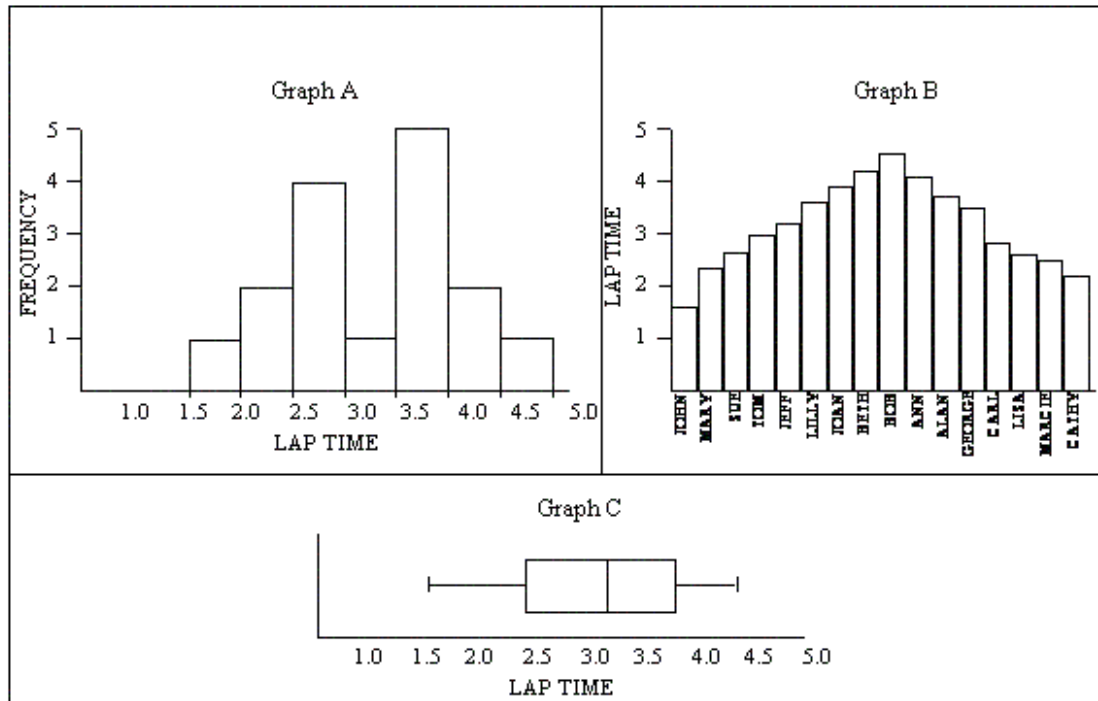

Response				High School (N = 97)	College-Level (N = 796)	All (N = 893))
A				22.7	30.0	29.2
B				**69.1**	**55.8**	**57.2**
C				8.2	14.2	13.5

ITEM 13

A local running club has its own track and keeps accurate records of each member's individual best lap time around the track, so members can make comparisons with their peers. Here are graphs of these data. Which of the above graphs allows you to most easily see the shape of the distribution of running times?

Response	High School (N = 197)	College-Level (N = 345)	All (N = 542)
a. Graph A	**54.3**	**35.9**	**42.6**
b. Graph B	40.6	55.9	50.4
c. Graph C	2.5	4.1	3.5
d. All of the above	2.0	2.3	2.2

ITEM 14

A baseball coach wanted to get an idea of how well his team did during the past baseball season. He recorded the proportion of hits obtained by each player based on their number of times at bat as shown in the table below.

Player	Proportion of hits	Player	Proportion of hits	Player	Proportion of hits
BH	0.305	SU	0.270	BC	0.301
HA	0.229	DH	0.136	AA	0.143
JS	0.281	TO	0.218	HK	0.341
TC	0.097	RL	0.267	RS	0.261
MM	0.167	JB	0.270	CR	0.115
GV	0.333	WG	0.054	MD	0.125
RC	0.085	MH	0.108		

Which of the following graphs gives the best display of the distribution of proportion of hits in that it allows the coach to describe the shape, center and spread of the data?

Response	High School (N = 97)	College-Level (N = 794)	All (N = 891)
A.	3.1	11.8	10.9
B.	47.4	55.9	55.0
C.	**39.2**	**20.9**	**22.9**
D.	10.3	11.3	11.2