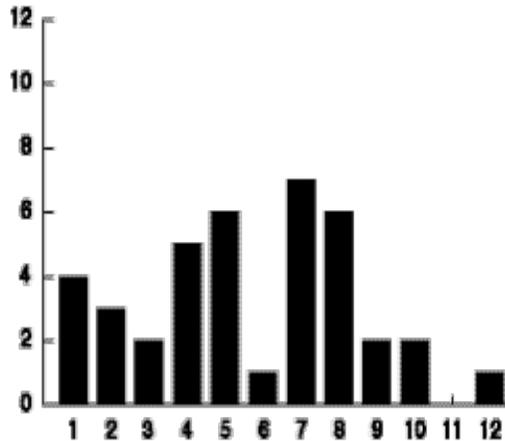


Homework Examples from ACE: *Data About Us*
Investigation 1: Questions 14 – 20, 22-25
Investigation 2: Questions 6, 7, 9
Investigation 3: Questions 6, 17

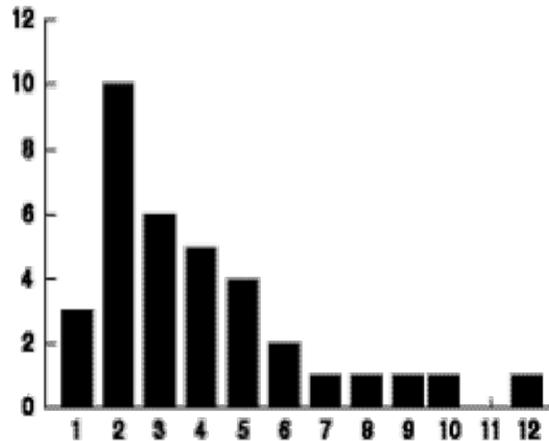
ACE Example	Possible Solutions
Investigation 1	
<p>For 14–20, tell whether the answers to the question are numerical or categorical data.</p> <p>14. What is your height in centimeters?</p> <p>15. What is your favorite musical group?</p> <p>16. What would you like to do when you graduate from high school?</p> <p>17. Are students in Mr. P’s class older than students in Ms. J’s class?</p> <p>18. What kind(s) of transportation do you use to get to school?</p> <p>19. How much time do you spend doing homework?</p> <p>20. On a scale of 1 to 7, with 7 being outstanding and 1 being poor, how would you rate the food served in the school cafeteria?</p>	<p>14. The answer will be a number, such as 150cm. Numerical data.</p> <p>15. The answer will be a name such as “Phish.” Categorical data.</p> <p>16. The answer will be a verb-word or phrase like “travel” or “take a vacation” or “go to college” or “join the army.” Categorical data.</p> <p>17. The answer will be “yes” or “no.” Categorical data.</p> <p>18. The answer will be a word like “bus.” Categorical data.</p> <p>19. The answer will be a number of hours. Numerical data.</p> <p>20. The answer will be a number, such as 7, if you think the food is outstanding. Numerical data.</p>

In 22 - 25, use the bar graphs below, which show information about a class of middle-school students.

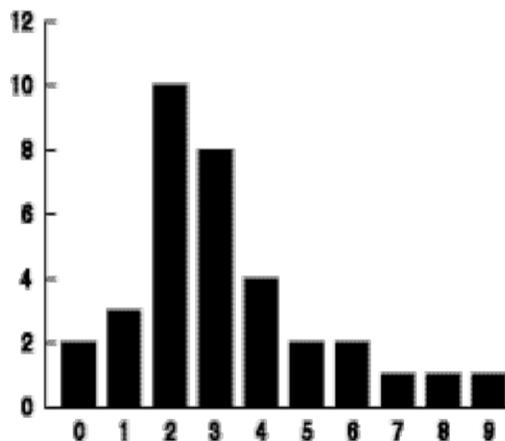
Graph A



Graph B



Graph C



22. Which graph might show the number of children

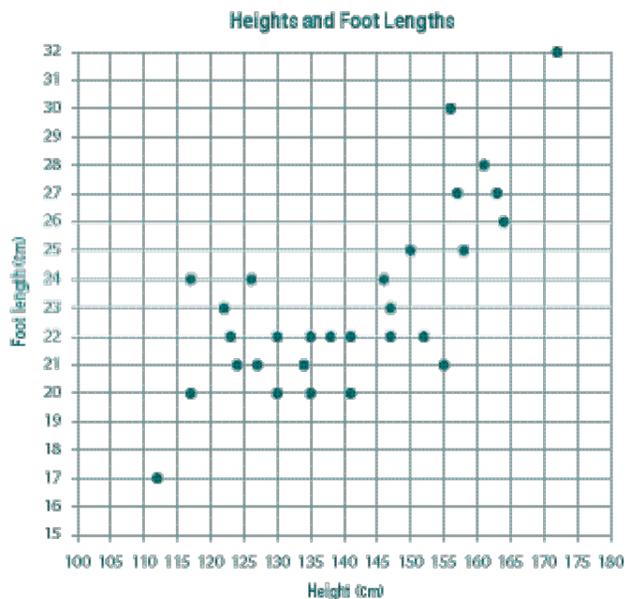
22. Since we are asking middle school children these questions we know there is at least 1 child in the family. This eliminates Graph C. Most families have 1 or 2 or 3 children. Families with 1 or 2 or 3 children are certainly more common than families with 7 or 8 children. Looking at the frequencies in Graphs A and B, **graph B** seems more likely.

23. There is no particular reason why a birth month of January should come up more or less often than May. There are 31 days in each, and so it seems they should occur equally frequently as birth months. Other months have almost the same number of days as January and May, so we would expect a graph showing all months occurring with about the same frequency. Graphs B and C have a definite pattern, with some values of the variable occurring more often than others. **Graph A** is closest to having the randomness that birth months should have. (Why is June so rare? Why was no one born in November? Probably a result of a small sample. If every month appeared with the same frequency each bar would be 3 high.)

24. This leaves Graph C. If this represents number of pizza toppings then we can deduce that a few students like 0 toppings, a few like as many as 7, 8, or 9 toppings, but most like 2 or 3 toppings. This seems reasonable.

<p>in the students' families? Explain your choice.</p> <p>23. Which graph might show the birth months of the students? (Hint: Months are often written using numbers instead of names. For example, 1 means January, 2 means February, and 3 means March.) Explain your choice.</p> <p>24. Which graph might show the number of toppings students like on their pizzas? Explain your choice.</p> <p>25. Give a possible title, a label for the vertical axis, and a label for the horizontal axis for each graph based on your answers to 19–21.</p>	<p>25. Graph A could be titled "Birth Months of Students." The horizontal axis would have to be labeled "Months of the Year, where "1" = January etc." The horizontal axis would have to be labeled, "# of students."</p>
Investigation 2	
<p>6. What ages, in years, does the interval of 80–89 months represent? Explain how you determined this information.</p> <p>7. What is the median age of these students? Explain how you determined this age.</p>	<p>6. 80 months is the same as $\frac{80}{12}$ years or 6 years and 8 months. 89 months is the same as $\frac{89}{12}$ years or 7 years and 5 months.</p> <p>7. If you arrange the ages in an ordered list you have 68, 73, 76, 78, 80, 81, 82, 90, 99, 101, 101, 103, 105, 108, 113, 114, 120, 120, 129, 132, 132, 132, 138, 140, 144, 145, 146, 148, 149, 152. There are 30 ages in this list. The median is the age in the middle of the list. In this case, with an even number of pieces of data, we have to locate the middle or median between the 15th and 16th pieces of data, so that 15 ages are above this number and 15 ages are below. The median is, therefore, between 113 and 114 months, or 113.5 months, 9 years 5 and half months.</p>

9. The coordinate graph below displays height and foot length for 29 students using the data from page 36. Study the scales used on the two axes. Notice that the x -axis is scaled in intervals of 5 centimeters and the y -axis is scaled in intervals of 1 centimeter.



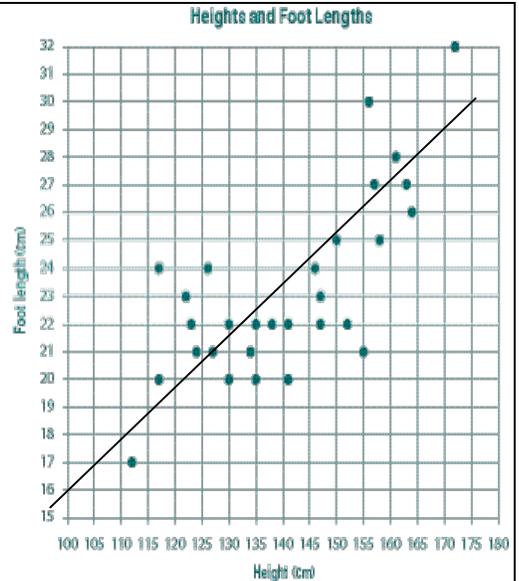
- One student said that if you know a person's foot length, you can tell that person's height. Looking at the graph, do you think she is right? Explain your reasoning.
- Determine the median height and the median foot length. Compare the median height with the median foot length. The median height is about how many times as large as the median foot length?
- Measure the length of your foot in centimeters. Compare this length to your height in centimeters. Your height is about how many times as large as your foot length?
- Look at your responses to parts b and c. How can you use this information to decide whether the student's comment in a is

- There does seem to be a rough pattern; as height increases so does foot length. We could make a prediction of the height by locating a given foot length on the y -axis and then scanning horizontally across the graph from there to locate a coordinate point that fits the general pattern shown by the "cloud" of data. The prediction will be an approximation, and some students will feel more comfortable giving the prediction as an interval. For example, if the foot length is known to be 19 cm. then the height is likely to be between 115 cm. and 145 cm. Or, if the foot length is known to be 26 cm then the height is likely to be between 125 cm and 165 cm.

Students might also superimpose a line on this data as shown below (position of the line will vary from student to student, but should lie in the middle of the data). They can use this line to make their prediction and give a single number instead of an interval of numbers. Students should still be wary of deciding with any certainty on a single height to associate with any particular foot length.

correct? Explain your reasoning.

- e. What would the graph look like if you started each axis at 0?



- c. Answers will vary but are likely to indicate that height is about 6 times foot length.

- d.
e.

Investigation 3

6. A group of nine students has a mean of 5 people per household, and the largest household in the group has 10 people. Make a line plot showing an example of data that fits this description.

6. The first clue tells us that there are a total of 45 people in all 9 households. If each household had exactly the mean number of people the list would be 5, 5, 5, 5, 5, 5, 5, 5, 5. However, the second clue tells us that the last entry in the list should be "10." If we just change the last entry then we have 5, 5, 5, 5, 5, 5, 5, 5, 10; BUT this does not have the correct mean. We have to balance this list so that the total is still 45 people. There are many ways to do this, for example: 4, 4, 4, 4, 4, 5, 5, 5, 10, or 3, 3, 4, 4, 4, 5, 6, 6, 10 etc. Students are to make a line plot of their list of data.

17. Three candidates are running for the mayor of Slugville. Each has determined the typical income for the people in Slugville and is using this information to help in the campaign.

Mayor Phillips is running for re-election. He says, "Slugville is doing great! The average income for each person is \$2,000 per week!"

Challenging candidate Lily Jackson says, "Slugville is nice, but it needs my help! The average income is only \$100 per week."

Radical Ronnie Ruis says, "No way! Slugville is in a lot of trouble. The average income is \$0 per week."

Some of the candidates are confused about the meaning of "average". Slugville has only 16 residents, and their weekly incomes are \$0, \$0, \$0, \$0, \$0, \$0, \$0, \$0, \$200, \$200, \$200, \$200, \$200, \$200, and \$30,600.

- a. Explain what measure of center each of the candidates actually used as an "average" income for the town. Check the computations to see whether you agree with the three candidates.
- b. Does any person in Slugville have the mean income? Explain.
- c. Does any person in Slugville have the median income? Explain.
- d. Does any person in Slugville have the mode income? Explain.
- e. What do you consider to be the typical income for a resident of Slugville? Explain.
- f. If four more people moved to Slugville, each

17.

a. The incomes are given by the list of values:

0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 200, 200, 200, 200, 200, 200, 200, 30600.

- The mean of these values is \$2000. This mean is unduly affected by the very unusual maximum value in the list. Mayor Phillips is using the mean in his statement.
- The median of the list is between 0 and 200, or 100. There are 8 incomes below \$100 and 8 incomes above \$100. Lily Jackson is using the median.
- The mode is the most frequently occurring piece of data and this is \$0. Ronnie Ruis is using the mode.

b. No one in Slugville actually has the mean \$2000. This often happens when we calculate a mean. We add all the data and divide by the number of pieces of data. The new value is constructed from the list of data values, but does not necessarily appear in the list.

c. No one in Slugville has the median income. When there are an odd number of pieces of data in the list the median will be the middle piece of data and will actually appear in the list. But in this case, with an even number of pieces of data, we have to construct a piece of data in the middle of the list, half way between 2 given pieces of data.

d. Many people in Slugville have the mode income. This will always be

with a weekly income of \$200, how would the mean, median, and mode change?

mode income. This will always be true about the mode, because it is the piece of data that occurs most frequently in the list.

e. Students may disagree about whether to use the median or the mode. However, they should see that the mean, \$2000, is like no one's income, so can not be considered typical at all.

f. The list would now be:
0, 0, 0, 0, 0, 0, 0, 0, 200, 200, 200, 200, 200, 200, 200, 200, 200, 200, 200, 30600. Now there are 20 incomes in the list and the total is \$32800. The mean is \$1640, the median is \$200, and the mode is \$200.