

Sample Test Problems for Chapter 11

1. In a statistical study, what is the purpose of picking a random sample?
2. At a factory that produces light bulbs, a batch of 1200 light bulbs has just been produced. To check the quality of the light bulbs, a random sample of 75 light bulbs are selected to test for defects. Out of these 75 light bulbs, 4 were found to be defective. Based on these results, what is the best estimate you can give for the number of defective light bulbs in the batch of 1200? Explain your reasoning.
3. There is a large bin filled with ping pong balls, but we don't know how many. There are 30 orange ping pong balls in the bin; the rest are white. Yoon-He reaches into the bin and randomly picks out 20 ping pong balls. Out of the 20 Yoon-He picked, 7 are orange. Based on Yoon-He's sample, what is the best estimate we can give for the number of ping pong balls in the bin? Explain your reasoning.
4. A researcher wants to estimate the number of fish in a small pond. She throws a net in the water, and when she pulls it out, she finds 30 fish in the net. The researcher marks these 30 fish and throws them back in the pond, unharmed. The next day, the researcher uses her net to catch some fish again. This time she catches 40 fish and finds that 2 of the fish are marked (so these two fish are two of the fish she had caught on the previous day). Assuming that the fish mix freely in the pond, give the best estimate you can for the number of fish in the pond based on the researcher's experiment. Explain your reasoning.
5. Briefly discuss the use of line graphs: when is it appropriate to use a line graph and when is it not appropriate to use a line graph? Give two examples to illustrate.
6. (a) What are pie graphs used for?
(b) What is a mathematical idea that children can learn about by using pie graphs? Briefly describe a pie graph activity that would help children develop this mathematical idea.
7. The table below gives information about some of the activities that the children at Franklin Elementary say they enjoy.

Activity	Percent of children saying they enjoy the activity
Jumping rope	20%
Playing in sandbox	15%
Climbing on the play structure	35%
Playing catch	30%

- (a) Would it be appropriate to use a single pie graph to display this information? Explain your answer.

- (b) Roughly sketch a way to display the data above in a graph other than a pie graph.
8. The students in Mrs. Brown’s class rolled a pair of dice 30 times. They added the number of dots on both dice and made a line plot of the data, as shown in Figure 1.

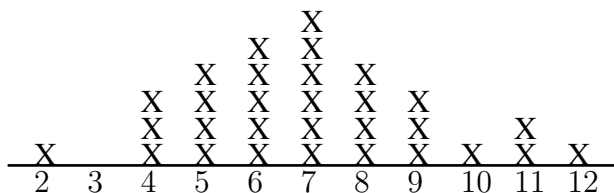


Figure 1: A Line Plot of the Number Rolled with 2 Dice

- (a) Write two “read the data” questions for the line plot. Answer your questions.
- (b) Write two “read between the data” questions for the line plot. Answer your questions.
- (c) Write two “read beyond the data” questions for the line plot. Answer your questions (if possible).
9. Ms. Smith has a bag containing 200 paper squares. Some squares are red and some are white. The students in Ms. Smith’s class each picked 10 paper squares out of the bag (replacing the squares after picking them). Each child wrote the number of red squares he or she picked on a sticky note. The class then made a line plot on the chalkboard that looked like the one in Figure 2 (each X represents a sticky note).

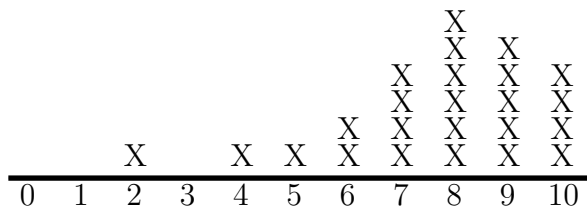


Figure 2: A Line Plot of Number of Red Squares Picked out of 10 Squares

- (a) Write two “read the data” questions for the line plot. Answer your questions.
- (b) Write two “read between the data” questions for the line plot. Answer your questions.
- (c) Write two “read beyond the data” questions for the line plot. Answer your questions (if possible).
10. At a math center in a class, there is a bag filled with 30 red blocks and 20 blue blocks. Each child in the class of 25 will do the following activity at the math center: randomly pick 10 blocks out of the bag without looking and write on one index card the number of red blocks picked and the number of blue blocks picked.

- (a) Describe a good way to display the *whole class's data* using one of the types of graphical displays we have discussed.
- (b) Show roughly what you expect the display you suggest in part (a) to look like, and say why.
11. (a) Why do we have the mathematical concept of *average*? Why is it a useful concept?
- (b) Describe how we calculate an average.
- (c) Describe how to view an average concretely as “leveling out” or “making even.”
- (d) We can calculate an average numerically or we can determine an average concretely by “leveling out” or “making even.” Explain *why* we must get the same answer either way.
12. (a) Explain what the mathematical term *average* or *mean* means.
- (b) Describe a way that you could use concrete objects to help 4th or 5th graders learn about the mathematical concept of average.
13. Explain how to use physical objects to describe the average of a list of numbers in terms of “leveling out.” Explain why this way of thinking about averages agrees with the way we calculate averages. Use the example
- 1, 1, 4, 6
- to illustrate.
14. Juanita read an average of 2 books a day for 4 days. How many books will Juanita need to read on the 5th day so that she will have read an average of 3 books a day over 5 days? Solve this problem in two different ways and explain both of your solutions.
15. Explain how you can quickly calculate the average of the following test scores without adding the numbers.
- 76, 73, 78, 75
16. Frank's average score on his math tests in the first quarter is 70. Frank's average score on his math tests in the second quarter is 90. Frank's semester score in math is the average of all the tests Frank took in the first and second quarters. Can Frank necessarily calculate his semester score by averaging 70 and 90? If so, explain why; if not, explain why not, say what other information you would need to calculate Frank's semester average, and show how to calculate this average.
17. Ten children take a 10 point test. The average score is 7.
- (a) Is it possible for the median score to be 10, given that the average score is 7? If so, give an example of how this could occur; if not, explain why not.
- (b) Is it possible for the median score to be 6 or less, given that the average score is 7? If so, give an example of how this could occur; if not, explain why not.
- (c) Is it possible for the median score to be 3 or less, given that the average score is 7? If so, give an example of how this could occur; if not, explain why not.

18. Suppose that all 4th graders in a state take a writing competency test that is scored on a 5 point scale. Is it possible for 80% of the 4th graders to score below average? If so, show how that could occur; if not, explain why not.
19. Figure 3 shows bar graphs of hypothetical scores on a 400 point test given at two different schools.

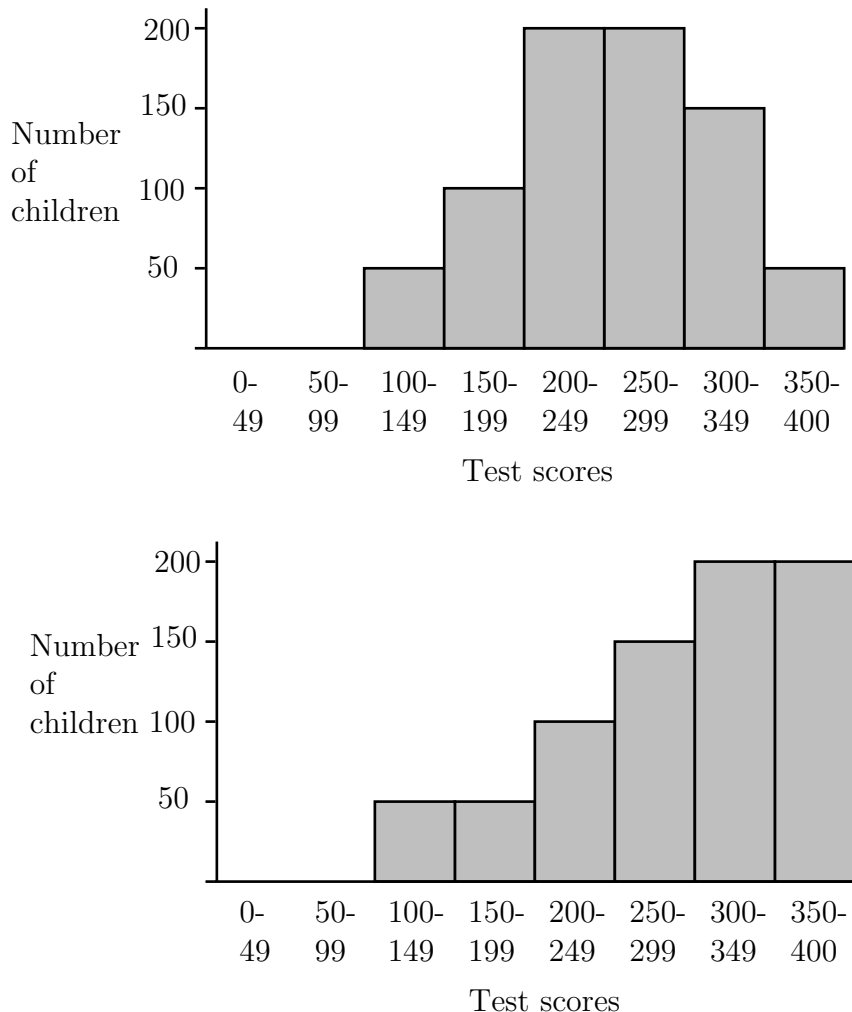


Figure 3: Hypothetical Test Results at Two Schools

- (a) At both of the schools, consider a student who scored at the 20th percentile. In each case, approximately what score did such a student get? Did such a student get 20% correct, more than 20% correct, or less than 20% correct on the test?
- (b) At both of the schools, consider a student who scored at the 80th percentile. In each case, approximately what score did such a student get? Did such a student get 80% correct, more than 80% correct, or less than 80% correct on the test?
20. The bar graph in Figure 4 shows hypothetical scores on a 100 point test taken by 2000 students.

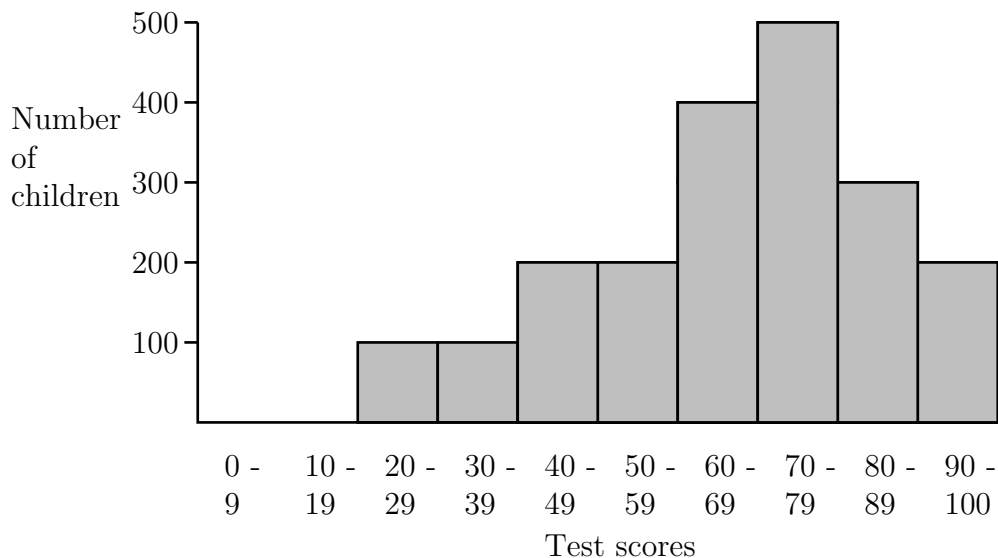


Figure 4: A Bar Graph Showing Test Performance of 2000 Students

- (a) Approximately what score is the 75th percentile? Explain briefly.
 - (b) Approximately what score is the 50th percentile? Explain briefly.
 - (c) What is another way to say “50th percentile”?
 - (d) Approximately what score is the 25th percentile? Explain briefly.
 - (e) Discuss briefly: what is the difference between “percentile” and “percent correct”?
21. What is the difference between getting 90% correct on a test and being in the 90th percentile on a test. Give some specific examples to illustrate.
 22. Suppose that all 4th graders in a state take a writing competency test that is scored on a 5 point scale. Is it possible for 80% of the 4th graders to score below average? If so, show how that could occur; if not, explain why not.
 23. (a) Determine the 25th, 50th, and 75th percentiles for the hypothetical test scores shown in the line plots of Figure 5.

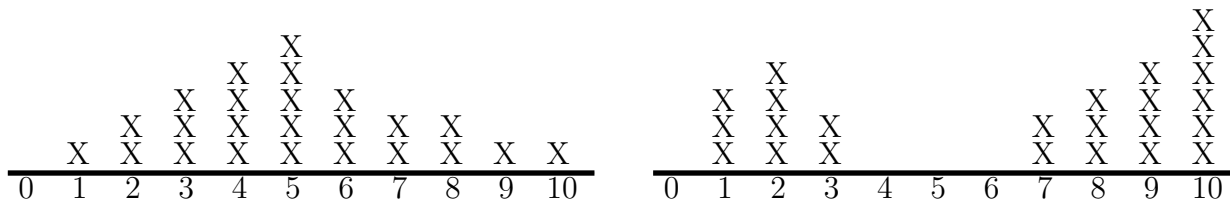


Figure 5: Hypothetical Test Results

- (b) Discuss how these percentiles you determined in part (a) are related to the way the data is spread in the two line plots.