Practice Problems for the Midterm

WARNING: these questions are just intended to give you a *flavor* of the kind of questions you can expect on the exam. Do NOT expect that your exam questions will be identical to these. Please show ALL YOUR WORK AND REASONING for ALL the problems.

1. True or false, and explain. (You don't need to compute the average or the SD of the lists.)

   (a) The following two lists are the same, when converted to standard units:

i.	1	3	4	7	9	9	9	21	32
ii.	3	7	9	15	19	19	19	43	65

   (b) The following two lists are the same, when converted to standard units:

i.	1	3	4	7	9	9	9	21	32
ii.	−1	−5	−7	−13	−17	−17	−17	−41	−63

2. In a large class, the average score on the final was 50 out of 100, and the SD was 20. The scores followed the normal curve.

   (a) Two brothers took the final. One placed at the 70th percentile, and the other was at the 80th percentile. How many points separated them?

   (b) Two sisters took the final. One placed at the 80th percentile, and the other at the 90th percentile. How many points separated them?

3. Which of the following are true? false? Explain or give examples.

   (a) The median and the average of any list are always close together.

   (b) Half of a list is always below average.

   (c) With a large, representative sample, the histogram is bound to follow the normal curve quite closely.

   (d) If two lists of numbers have exactly the same average of 50 and the same SD of 10, then the percentage of entries between 40 and 60 must be exactly the same for both lists.

4. A distribution table is shown below. The table gives the distribution of cholesterol level for 6000 children, 4 to 19 years old. Cholesterol level is measured in milligrams. (More technically, it is the amount of cholesterol, in milligrams, per 100 milliliters of blood.) The class intervals include the left endpoint, but exclude the right one.

Cholesterol (in mg)	Percent
0-140	18
140-180	52
180-200	20
200-240	10

   (a) Plot the histogram carefully. Mark the horizontal and vertical scales, and label the axes.

   (b) Is the average bigger than 120 mg, smaller than 120 mg, or is there not enough information to decide?

   (c) Assuming that the data are uniformly spread within each bar, approximately where would the median lie?

5. For the first year students at a certain university, the average GPA was 2.7 and the SD was 0.6. The correlation between SD scores and first year GPA was 50%. The SAT scores and GPA followed the normal curve. Estimate the average first-year GPA for students whose percentile rank on the SAT was 80%.

6. A friend tells you about a recent study dealing with the number of years of teaching experience among current college professors. He remembers the average, but cannot recall whether the SD was 6 months, 6 years, or 16 years. Tell him which one it must have been, and why.

7. A distribution of heights follows the normal curve. The 60th percentile is 66 inches and the 90th percentile is 72 inches. Find the 20th percentile of the heights.

8. An incoming freshman took her college's placement exams in French and mathematics. In French, she scored 82, and in math 86. The overall results on the French exam had an average of 72 and an SD of 8. For the math exam, the average was 68, and the SD was 12. On which exam did she do better, compared with the other freshman?

9. The correlation between the weights and forearm lengths of a large population of men is 0.55 and the scatter diagram of the two variables is football shaped. The average forearm length is 17 inches with an SD of 0.75 inches. The average weight is 160 pounds with an SD of 24 pounds.

   (a) One of the men has a forearm length of 18 inches. Find the regression estimate of his weight.

   (b) One of the men is on the 40th percentile of forearm lengths. Find the regression estimate of his weight.

   (c) Fill in the blank: For about 10% of the men, the regression estimate of weight based on forearm length is off by more than _____ pounds.

   (d) About what percentage of the men had weights over 200 pounds?

   (e) Of the men with forearm length about 19 inches, about what percentage had weights over 170 pounds?

10. A statistician is doing a study on a group of undergraduates. On average, these students drink 4 beers a month, with an SD of 8. They eat 4 pizzas a month, with an SD of 4. There is some positive association between beer and pizza, and the regression equation is

$$\text{predicted number of beers} = \underline{\hspace{2cm}} \times \text{number of pizzas} + 2$$

   However, the statistician lost the data, and cannot remember the slope of the equation. Can you help him find the slope?

11. A box contains 6 tickets, numbered 1 through 6. Three tickets are drawn at random, without replacement, from the box. Find the chance that the three tickets left in the box are 4, 5, and 6.

12. I have two boxes. Box A contains 2 gold coins and 3 silver coins. Box B contains 4 gold coins and 1 silver coin. I pick a box at random, then a coin at random from that box. What is the chance that I get a gold coin?

13. A lake contains 100 fish, 20 of which have been tagged as part of a study. Four fish are chosen at random (without replacement) from the lake.

   (a) Find the chance that no tagged fish is chosen.

   (b) Find the chance that at most three of the chosen fish are tagged.

14. A die is rolled 10 times. What are the chances of:

   (a) getting 10 sixes

   (b) not getting 10 sixes

   (c) all the rolls having 5 dots or less.