Sample of Final Examination Questions

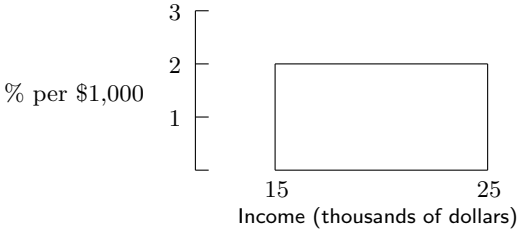
Math 125, December 16, 2022 from 3 to 6 p.m.

on Chaps. 3,4,5,8,10,13,14,15,17,20,21,23,26 emphasizing: 10.4, 13, 14, 23, 26.5

Also see final review (with detailed solutions): problems 1,4cde,5a,6c,8a,9a,14,19abd,20,22,23,27ab,29,30,35

To get full credit on the final examination, you **must show your work**. No work, no credit. Each question is worth about 9 points.

1. The sketch below shows one block of the family-income histogram for a certain city. About what percent of the families in the city had incomes between \$19,000 and \$25,000?



2. (a) Find the average and SD of the list 4, 11, 13, 13, 14, 17.
   (b) Which members of the list are within 1.5 SDs of average? within 2.5 SDs of average?

3. The heights of the women in a recent survey average 63.5 inches; the SD was 3 inches. Use the normal curve to estimate the percentage with heights above 70 inches.

4. Find the correlation coefficient for the data set shown below.

x	y
1	1
1	3
1	1
1	5
2	1
2	7
2	1
3	3
3	3
4	5

5. In a study of the stability of IQ scores, a large group of individuals is tested once at age 18 and again at age 35. The following results are obtained.

$$\begin{array}{lll} \text{age 18:} & \text{average score} \approx 100, & \text{SD} \approx 15 \\ \text{age 35:} & \text{average score} \approx 100, & \text{SD} \approx 15, \quad r \approx 0.80 \end{array}$$

   (a) Predict the score at age 35 of an individual who scored 175 at age 18.
   (b) Predict the score at age 18 of an individual who scored 160 at age 35.
   (c) Apparently, geniuses who score high at age 18 score lower at age 35. But geniuses who score high at age 35 scored lower at age 18. How is this possible? (It seems like a contradiction.)

6. Forty draws are made with replacement from a standard deck or playing cardss.

   Find the chance (to nearest 0.1%) of—

   (a) getting all non-aces.
   (b) not getting all non-aces.
   (c) getting at least one ace.
   (d) getting no red ace.
   (e) the number of hearts among the 40 draws coming out to 9 or 10.

7. Three cards are drawn from a standard deck of cards, with replacement.

   True or false, and explain:

   (a) The chance of getting all hearts is 1.5625%.
   (b) The chance of getting at least one heart is $25\% + 25\% + 25\% = 75\%$.

8. A die will be rolled 2880 times.

   (a) The number of aces (⚀) should end up around _____, give or take _____ or so.
   (b) The percentage of aces (⚀) should end up around ___%, give or take ___% or so.

9. A simple random sample of 17-year-olds in high school was taken. 94.1% of the students in the sample knew that Edison invented the light bulb. The sample size was 6,000.

   If possible, find a 95%-confidence interval for the percentage of all 17-year-olds in high school who knew that Edison invented the light bulb. If this is not possible, why not?

10. A researcher takes a simple random sample of 900 students from the 13,000 students at UMass. On the average, there are 0.52 cats per sample student, and the SD is 0.152. Say whether each of the following statements is true or false, and explain.

    (a) The 0.52 is 0.152 or so off the average number of cats per student in the whole school.
    (b) A 95%-confidence interval for the average number of cats per student in the sample is 0.216 to 0.824.
    (c) A 95%-confidence interval for the average number of cats per student in the whole school is 0.51 to 0.53.
    (d) 95% of the students at UMass have between 0.216 and 0.824 cats.
    (e) The 95%-confidence level is about right because the number of cats follows the normal curve.
    (f) The 95%-confidence level is about right because, with 900 draws from the box, the probability histogram for the average number of cats in the sample follows the normal curve.

11. A programmer is working on a new program, COIN, to simulate tossing a coin. As a preliminary test, he sets up the program to do one million tosses. The program returns with a count of 502,015 heads. The programmer looks at this and thinks:

    > Hmmm. Two thousand and fifteen off. That's a lot. No, wait. Compare it to the million. Two thousand—forget the fifteen—out of a million is two out of a thousand. That's one in five hundred. One fifth of a percent. Very small. Good. COIN passes.

    Do you agree? Answer yes or no, and explain.