

Sample Final Examination

Math 125, May 20, 2016 from 3 to 6 p.m.

on Chaps. 3,5,10,12,13–15,18,21,23,26,28 emphasizing: 3.1–3.3, 10.4–10.5, 14.4, 15.2, 18.4, 21.2, 23.2, 26.5, 28.1

Also see final review (with detailed solutions): problems 1,3,8a,14a,15a,22–25,29,30,34–36

No notes of any kind are allowed at the final exam; only the tables provided may be used.

To get full credit on the final examination you **must show your work**. No work, no credit.

Each regular question on the final exam will be worth about 9 points; the bonus: 5 points.

1.

Number of medals	0	1–2	3–5	6	7	8–11	12–15	16–20	21–30
Number of scouts	10	16	42	12	10	40	48	12	10

Consider the histogram for the above distribution of the number of medals for the scouts in a certain Boy Scout Council. *Be careful*. The number 42, for example, is the number of scouts with 3–5 medals. It is not the percentage of the population with 3–5 medals.

- (a) Draw the histogram, as defined in our text.
- (b)
 - i. The units on the horizontal scale are:
 - (A) number of medals (B) number of scouts (C) % of scouts (D) area
 - ii. The vertical scale is a _____ scale.
 - (A) measurement (B) percent (C) density (D) propensity (E) counting
 - iii. The area of the block for 8 to 11 medals (inclusive) represents:
 - (A) number of medals (B) percent of scouts (C) percent of scouts per medal
 - iv. The area of the block for 8 to 11 medals (inclusive) is:
 - (A) 40% (B) 20 scouts (C) 20 medals (D) 20% (E) 5% per medal (F) 5% per scout
 - v. The height of the block for 21–30 medals is:
 - (A) 5% (B) 5% per medal (C) 1/2% per medal (D) 5/9% per medal (E) 10 medals
 - vi. The endpoints of the base of the block for 1 or 2 medals are:
 - (A) 1 and 2 (B) 1.5 and 2.5 (C) 0 and 3 (D) 0.5 and 2.5 (E) 1 and 3 (F) 0 and 2
 - vii. Which block is the most dense?
 - (A) 1–2 (B) 3–5 (C) 8–11 (D) 12–15
2. On the Math SAT, men have a distinct edge. In 2005, for instance, the men averaged about 538, and the women averaged about 504.
 - (a) Estimate the percentage of men getting over 700 on this test in 2005.
 - (b) Estimate the percentage of women getting over 700 on this test in 2005.

You may assume (i) the histograms followed the normal curve, and (ii) both SDs were about 120.

3. For the 988 men age 18–24 in the HANES sample
 - average height $\approx$ 70 inches SD $\approx$ 3 inches
 - average weight $\approx$ 162 pounds SD $\approx$ 30 pounds
 - correlation $\approx$ 0.47

One man in the sample was 66 inches tall and weighed 140 pounds. In comparison with the other men in the sample of the same height, this man would be

- (i) a little light (ii) a little heavy

Circle one option and explain your choice.

4. Find the regression equation for predicting final score from midterm score, based on the following information:

$$\begin{aligned}\text{average midterm score} &\approx 70, & \text{SD} &\approx 10 \\ \text{average final score} &\approx 55, & \text{SD} &\approx 20, & r &\approx 0.60\end{aligned}$$

5. Find the regression equation for predicting weight from height for men age 18–24 in HANESS, based on the following information:

$$\begin{aligned}\text{average height} &\approx 70 \text{ inches}, & \text{SD} &\approx 3 \text{ inches} \\ \text{average weight} &\approx 180 \text{ pounds}, & \text{SD} &\approx 45 \text{ pounds}, & r &\approx 0.40\end{aligned}$$

6. A box has 10 tickets, numbered 1 to 10. A ticket is drawn at random. The player is a winner if the ticket has a number greater than 4 (event A) or if the ticket has an even number (event B).

- Find the chances each of A and B happening.
- Show that A and B are independent.
- Find the chance that a ticket selected at random falls into at least one of the 2 categories: over 4 or even.
 - Could you simply add the chances of A to the chances of B to get this answer?
 - Show how the correct answer is derived from the chances of A and the chances of B. Explain each of the logically correct steps.

7. A die will be rolled 9 times. What is the chance of obtaining exactly three 5's?

8. A fair coin is tossed 100 times. Estimate the chance of getting exactly 50 heads. (Show work.)

9. A simple random sample of 17-year-olds in high school was taken. Only 36.1% of the students in the sample knew that Chaucer wrote *The Canterbury Tales*.

If possible, find a 95%-confidence interval for the percentage of all 17-year-olds in high school who knew that Chaucer wrote *The Canterbury Tales*. If this is not possible, why not? Assume that there were 6,000 students in the sample.

10. A simple random sample of 1,440 persons is taken to estimate the percentage of Democrats among the 240,000 eligible voters in a large city. It turns out that 811 people in the sample are Democrats.

- Estimate the percentage of the eligible voters in the city who were Democrats, and attach a standard error to the estimate (that is: put a give-or-take number on the estimate.)
- The 811 is the _____ value for the number of Democrats in the sample. Options:
 - expected
 - observed
- The SD of the box is _____ $\sqrt{0.56319 \times 0.43681}$. Options:
 - exactly equal to
 - estimated from the data as
- Find a 95%-confidence interval for the percentage of Democrats among all 240,000 eligible voters.

11. A survey organization takes a simple random sample of 625 households from a city of 80,000 households. On the average, there are 2.30 persons per sample household, and the SD is 1.75. Say whether each of the following statements is true or false, and explain.
- (a) The 2.30 is 0.07 or so off the average number of persons per household in the whole city.
 - (b) A 95%-confidence interval for the average household size in the sample is 2.16 to 2.44.
 - (c) A 95%-confidence interval for the average household size in the city is 2.16 to 2.44.
 - (d) 95% of the households in the city contain between 2.16 and 2.44 persons.
 - (e) Household size in the city follows the normal curve.
 - (f) The 95%-confidence level is about right because household size follows the normal curve.
12. A die is rolled 6000 times, resulting in 963 $\square$'s.
- Does the result indicate that the die is fair? (Clearly describe the statistical test you decide to use, state the hypotheses, and justify your conclusion.)
13. Each time that the Daily Number[®] is drawn, its first digit is a number from 0 to 9, chosen at random. To decide if all ten possibilities for the first digit are equally likely, a series of 400 test draws is run on a particular device. The results were as follows:
(0) - 34, (1) - 41, (2) - 32, (3) - 40, (4) - 26, (5) - 43, (6) - 44, (7) - 46, (8) - 45, (9) - 49.

Is it reasonable to conclude from the above data that the random-number generator being tested is fair?

The next question is a bonus; it covers conceptual material.

14. The average grade on a precalculus final was 60 points with a standard deviation of 15 points, and the average grade on the midterm was also 60 points with a standard deviation of 15 points. The correlation between final-exam grades and midterm grades was 0.50, and the scatter diagram turned out to be football-shaped.

For all the students who got 96 on the midterm, their average grade on the final is estimated to be 78. And, furthermore, if one chose one of those students at random, it is reasonable to predict that his or her grade on the final is about 78.

This leads us to conclude that a grade of 96 on the midterm is associated by the regression method with a grade of 78 on the final.

Now decide if the following argument is valid or invalid and justify your conclusion.

It looks like students who did very well tended to have a higher grade on the midterm than on the final. So, if I were to look at, for example, students who got 92 on the final, it is obvious that these students tended to have done better on the midterm, meaning that as a group you would have to predict their average grade on the midterm to be greater than 92.