

Sample Final Examination

Math 125, Exam Time: December 14, 2012 from 3 to 6 p.m.

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. In a tabulation of the age distribution of people in the U.S. in 2004, 15 percent of the population were in the category of age 35–45 (meaning that they were 35 years or older but had not yet turned 45).

Draw the block of the histogram over the class interval from 35 to 45 years. How tall must it be? Show the exact endpoints and label the horizontal and vertical scales.

2. (a) For each list below, work out the average, the deviations from average, and the SD.
 - i. 1, 3, 4, 5, 7
 - ii. 3, 9, 12, 15, 21(b) How is list (ii) related to list (i)? How does this relationship carry over to the average? the deviations from average? the SD?

3. In a study of Danish draftees, T. W. Teasdale and associates found a positive correlation between near-sightedness and intelligence. True or false, and explain:

- (a) Draftees who were more near-sighted were also more intelligent, on average.
- (b) Draftees who were more intelligent were also more near-sighted, on average.
- (c) The data show that near-sightedness causes intelligence.
- (d) The data show that intelligence causes near-sightedness.

4. In a large statistics class, the correlation between midterm scores and final scores is found to be nearly 0.50, every term. The scatter diagrams are football-shaped. Predict the percentile rank on the final for a student whose percentile rank on the midterm is

- (a) 5% (b) 80% (c) 50% (d) unknown

(Show work).

5. A die is rolled three times. Find the chance of getting:

- (a) all aces.
- (b) at least one ace.
- (c) no aces.
- (d) not all aces.
- (e) at least one roll that is not an ace.

6. One hundred draws will be made at random with replacement from the box

1	3	3	9
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- (a) How large can the sum be? How small?
- (b) How likely is the sum to be in the range from 370 to 430?
7. A coin is tossed 1225 times. Estimate, to the nearest tenth of a percent, the chance of getting 626 heads. Show all calculations.
8. A coin is tossed 1225 times. True or false, and explain:
Although the expected value for the number of heads is known with certainty to be 612.5, the actual number of heads will not be 612.5 for sure, only around 612.5, give or take 17.5. Chance error is in play here, and will show up in the result of the tosses.
9. The speed of light is measured 25 times by a new procedure. The 25 measurements are recorded, and show no trend or pattern. The investigators work out the average and SD of the 25 numbers; the average is 299,789.2 kilometers per second and the SD is 12 kilometers per second.
- (a) Find an approximate 95%-confidence interval for the speed of light, showing your work. (You may assume the Gauss model, with no bias.)
- (b) Now the investigators measure the speed of light a 26th time by the same procedure, and get 299,781 kilometers per second. Is this a surprising result?
- Yes _____ No _____
- Check one, and give your reason.
10. A coin is tossed 10,000 times, and it lands heads 5,067 times. Is the chance of heads equal to 50%? Or are there too many heads for that?
- (a) Formulate the null and alternative hypotheses in terms of a box model.
- (b) Compute z and P .
- (c) What do you conclude?
11. A gambler is accused of using a loaded die, but he pleads innocent. A record has been kept of the last 60 throws. There is disagreement about how to interpret the data and a statistician is called in.

The observed frequencies for the six numbers on the die are summarized in this table.

<i>Value</i>	<i>Observed frequency</i>
1	9
2	11
3	10
4	8
5	12
6	10

Make a χ^2 -test of the null hypothesis that the die is fair.