Study Guide for the Final Examination

Math 125, Exam Time: December 18, 2020 from 3 to 5 p.m.

To get full credit on the final examination you **must show your work**. No work, no credit. Each question on the final exam will be worth 10 points.

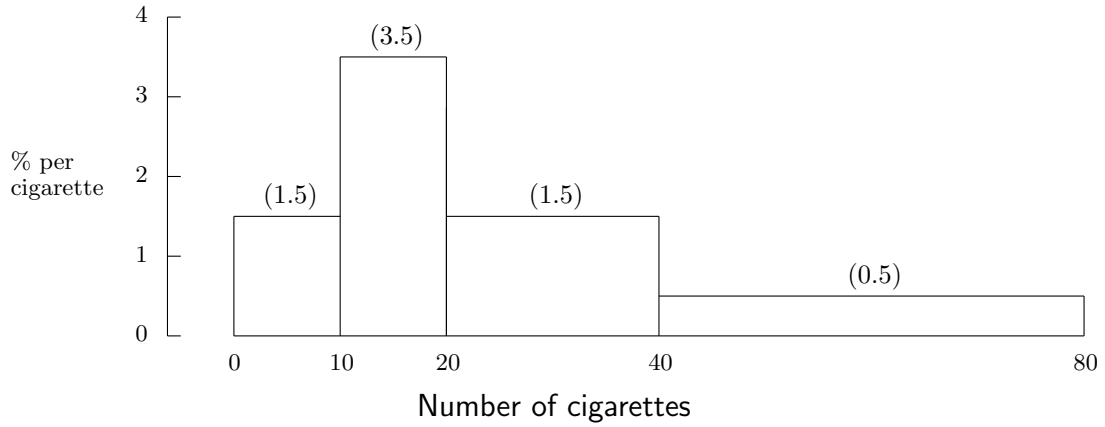
1. In a Public Health Survey, a histogram was plotted showing the number of cigarettes per day smoked by each subject (current male smokers), as shown below. The density is marked in parentheses. The class intervals include the right endpoint, not the left.

   (a) Is the percentage who smoked between 10 and 80 cigarettes or less per day around 5.5%, 55%, 85%, or 98.5%?

   (b) In which interval are there more smokers: 0–10 cigarettes or 40–80 cigarettes?

   (c) Which interval is more crowded: 0–10 cigarettes or 40–80 cigarettes?

   (d) On the interval 20–40 cigarettes, the height of the histogram is about 1.5% per cigarette. What percentage of the men had daily cigarette use in this class interval?



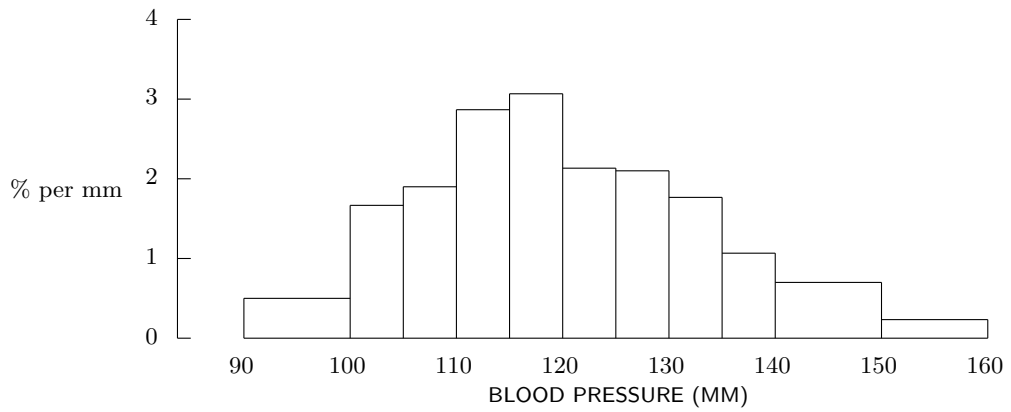
2. The figure below is a histogram showing the distribution of blood pressure for about 14,000 women in a drug study. Use the histogram to answer the following questions:

   (a) Is the percentage of women with blood pressures between 90 mm and 160 mm around 1%, 50%, or 99%?

   (b) In which interval are there more women: 135–140 mm or 140–150 mm?

   (c) Which interval is more crowded: 135–140 mm or 140–150 mm?

   (d) On the interval 125–130 mm, the height of the histogram is about 2.1% per mm. What percentage of the women had blood pressures in this class interval?



3. The histogram below shows the distribution of final scores in a certain class. (Assume that the distribution is uniform on each class interval.)

   (a) Which block represents the people who scored between 60 and 80?

   (b) Ten percent scored between 20 and 40. About what percentage scored between 40 and 60?

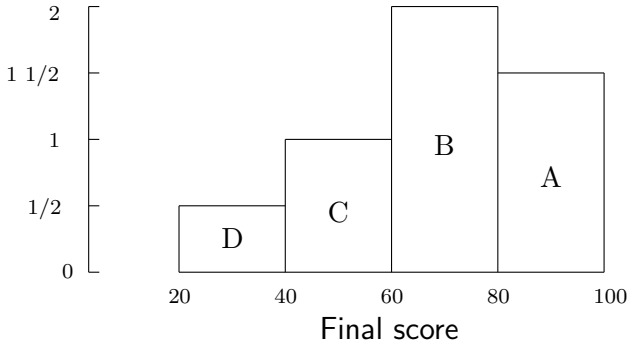
   (c) About what percentage scored over 60?

   (d) About what score is the median score?

   (e) About what score is at the 50th percentile?

   (f) Estimate the 80th percentile score.

   (g) Approximately how many points separate the 25th and 75th percentile scores?



4. Among first-year students at a certain university, scores on the Verbal SAT follow the normal curve; the average is around 550 and the SD is about 100.

   (a) What percentage of these students have scores in the range 400 to 600?

   (b) What percentage of these students scored below 700?

5. For the first-year students at a certain university, the correlation between SAT scores and first-year GPA was 0.60. The scatter diagram is football-shaped. Predict the percentile rank on the first-year GPA for a student whose percentile rank on the SAT was

   (a) 90% (b) 30% (c) 50% (d) unknown

6. A die is rolled thirteen 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.

7. True or false, and explain:

   (a) If a die is rolled three times, the chance of getting at least one ace is $1/6 + 1/6 + 1/6 = 1/2$.

   (b) If a coin is tossed twice, the chance of getting at least one head is 100%.

8. A pair of dice is rolled 36 times. What is the chance of getting at least one double-ace?

9. Four draws are going to be made at random with replacement from the box $\boxed{1}\ \boxed{2}\ \boxed{2}\ \boxed{3}\ \boxed{3}$. Find the chance that $\boxed{2}$ is drawn at least once.

10. A box contains four tickets, one marked with a star and the other three blank.

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    Four draws are made at random with replacement from this box.

    What is the chance of getting the star at least once in the four draws?

    Hint. First find the chance of: (i) a blank ticket on any given draw; (ii) blank tickets on all four draws; (iii) not getting the star in the four draws. Then from the chance of (iii), derive the chance of getting the star at least once in the four draws.

11. A coin is tossed 100 times. Estimate the chance of getting 60 heads and 40 tails.

12. Fifty draws are made at random with replacement from the box

0	0	1	1	1

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    The expected number of 1 's is _____, and the SE is _____.

13. A large group of people get together. Each one rolls a die 720 times, and counts the number of ⚀ 's. About what percentage of these people should get counts in the range 105 to 135?

14. Three hundred draws will be made at random with replacement from the box

60,000 0 's 20,000 1 's

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    (a) The expected value for the percentage of 1's among the draws is _____. The SE for the percentage of 1's among the draws is _____.

    (b) The percentage of 1's among the draws is likely to be around _____, give or take _____ or so.

    (c) Find the chance that between 20% and 30% of the tickets drawn will be 1's.

15. Many companies are experimenting with "flex-time," allowing employees to choose their schedules within broad limits set by management. Among other things, flex-time is supposed to reduce absenteeism. One firm knows that in the past few years, employees have averaged 6.3 days off from work (after vacations). This year, the firm introduces flex-time. Management chooses a simple random sample of 100 employees to follow in detail, and at the end of the year, these employees average 5.5 days off from work, and the SD is 2.9 days. Did absenteeism really go down, or is this just chance variation? Formulate the null and alternative hypotheses in terms of a box model, then answer the question.

16. One large course has 900 students, broken down into section meetings with 30 students each. The section meetings are led by teaching assistants. On the final, the class average is 63, and the SD is 20. However, in one section the average is only 55. The TA argues this way:

    > If you took 30 students at random from the class, there is a pretty good chance they would average below 55 on the final. That's what happened to me—chance variation.

    Is this a good defense? Answer yes or no, and explain briefly.

17. A gambler is accused of using a loaded die, but be 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.

Value	*Observed frequency*
1	5
2	7
3	17
4	16
5	8
6	7

    Compute the value of χ^2, the degrees of freedom, and P.

    What can be inferred?

18. To test whether the number generators used in State Lotteries are truly random, eighty-five investigators run the χ^2-test on the first digits of the results from various games across the United States. Five of these investigators get significant values of P.

    Comment on this result. How can this be explained unless some of the games are not random?