

# Common Final Examination

Math 125: December 18, 2020

To get full credit you **must show your work**. No work, no credit.

Each question is worth about 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) The percentage who smoked 10 cigarettes or less per day is around

1.5%    15%    30%    50%

- (b) The percentage who smoked more than a pack a day, but not more than 2 packs, is around

1.5%    15%    30%    50%

(There are 20 cigarettes in a pack.)

- (c) The percent who smoked more than a pack a day is around

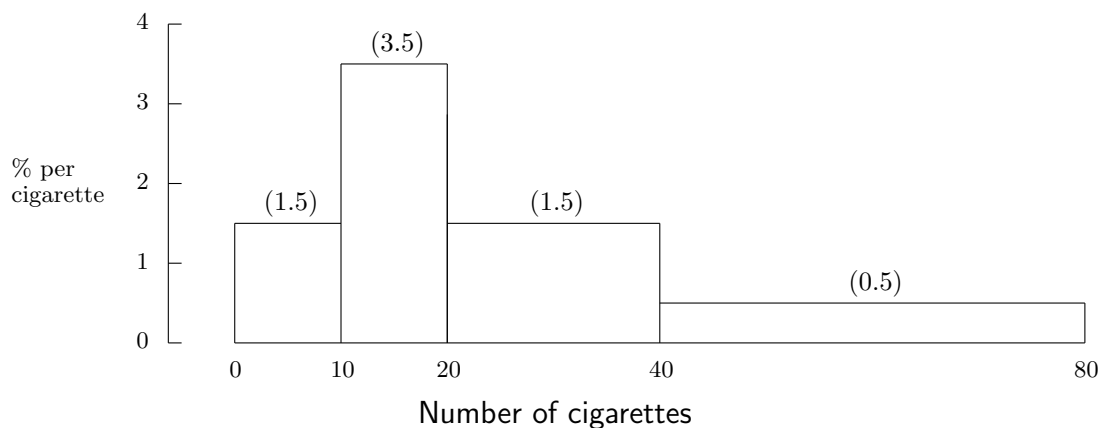
1.5%    15%    30%    50%

- (d) The percent who smoked more than two-and-a-half packs a day is around

1.5%    15%    30%    50%

- (e) The percent who smoked 15 cigarettes per day is around

0.35 of 1%    0.5 of 1%    1.5%    3.5%    10%



2. For the women age 18–24 in a national survey, the average height was about 64.3 inches; the SD was about 2.6 inches. Using the normal curve, estimate the percentage of women with heights—

- (a) below 66 inches.

- (b) between 60 inches and 66 inches.

3. 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).

4. A die is rolled 3 times. What is the chance of getting at least one ace?

An ace is a result with one spot.

5. A coin is tossed 25 times. Estimate (to nearest 0.01%) the chance of getting 12 heads and 13 tails.

6. One hundred draws are going to be made at random with replacement from 

1	2	3	4	5
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. What is the chance of getting between 8 and 32 tickets marked "5"?

7. In a certain town there are 30,000 registered voters, of whom 12,000 are Democrats. A survey organization is about to take a simple random sample of 1,000 registered voters.

- (a) The expected value for the percentage of Democrats in the sample is \_\_\_\_\_. The SE for the percentage of Democrats in the sample is \_\_\_\_\_.
- (b) The percentage of Democrats in the sample is likely to be around \_\_\_\_\_, give or take \_\_\_\_\_ or so.
- (c) Find the chance that between 39% and 41% of the registered voters in the sample are Democrats.

8. A newspaper article says that on average, college freshmen spend 7.5 hours a week going to parties. One administrator does not believe that these figures apply at her college, which has nearly 3,000 freshmen. She takes a simple random sample of 100 freshmen, and interviews them. On average, they report 6.6 hours a week going to parties, and the SD is 9 hours. Is the difference between 6.6 and 7.5 real?

- (a) Formulate the null and alternative hypotheses in terms of a box model.
- (b) Fill in the blanks. The null says that the average of the box is \_\_\_\_\_.  
The alternative says that the average of the the box is \_\_\_\_\_.
- (c) Now answer the question: is the difference real?

9. 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  $\chi^2$ -test of the null hypothesis that the die is fair.

10. In employment discrimination cases, courts have held that there is proof of discrimination when the percentage of blacks among a firm's employees is lower than the percentage of blacks in the surrounding region, provided the difference is "statistically significant" by the  $z$ -test. Suppose that in one city, 10% of the people are black. Suppose too that every firm in the city hires employees by a process which, as far as race is concerned, is equivalent to simple random sampling. Would any of these firms ever be found guilty of discrimination by the  $z$ -test? Explain briefly.