Common Final Examination

Math 125: May 20, 2022

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

Each question is worth 7 points.

1. A histogram is to be drawn for some census data based on the number of children in the household. Families with between 5 and 8 children, inclusive, constitute 12% of the households in the survey.

For that block, the height in the appropriate units is:

- (A) 4% (B) 4% per child (C) 3% (D) 12% (E) None of the above.
- 2. The heights of adult women in a recent survey averaged 63.75 inches; the SD was 3 inches; and the heights followed the normal curve.

The percentage of the women in that survey with heights between 66 and 69 inches was:

(A) 7% (B) 19% (C) 37% (D) 73% (E) None of the above.

3. A statistical analysis was made of the midterm and final scores in large course, with the following results: average midterm score ≈ 60 , SD ≈ 18

average final score ≈ 45 , SD ≈ 24 , $r \approx 0.8$

The scatter diagram was football-shaped. For each student, the final score was predicted from the midterm using the regression line.

(a) Estimate the average score on the final for students whose midterm score was 87.

(A) 74 (B) 79 (C) 81 (D) 83 (E) 85

(b) This prediction is likely to be off by how many points or so?

(A) 11 (B) 14 (C) 18 (D) 19 (E) 24

4. (a) Find the SD of the list $\{-1, 0, 1\}$.

(A) 1/2 (B) 3/4 (C) $\sqrt{6}/3$ (D) $\sqrt{3}/2$ (E) 1

(b) Find the correlation coefficient, r, for the following data set.

$$\begin{array}{c|cccc} A & B \\ \hline -1 & 4 \\ 0 & 0 \\ 1 & 2 \end{array}$$
(A) $-1/2$ (B) $-1/3$ (C) 0 (D) $1/3$ (E) 1

(c) Find the equation of the regression line that predicts B when A is given.

(A) B = -1/3A + 2. (B) B = -1/2A + 2. (C) B = -A + 2. (D) B = -A + 3. (E) B = -2/3A + 2.

5. A box has four tickets, colored red, white, blue, and yellow.

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R W B Y.
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Two tickets are drawn from the box without replacement. True or false, and explain:

- (a) There is 1 chance in 4 for the second ticket drawn to be blue.
- (b) There is 1 chance in 4 for the first ticket drawn to be red.
- (c) The chance of drawing the red ticket first and then the blue ticket is $1/4 \times 1/4$.
- (d) When three tickets are drawn from the box without replacement, the chance of drawing at least one red ticket is 1/4 + 1/4 + 1/4.
- 6. A box has five tickets, one marked with a star, and the other four blank:

|--|--|--|

Two draws are made at random without replacement from this box.

The chance of getting the star at least once in the two draws is:

(A) 36% (B) 40% (C) 41% (D) 45% (E) 50%

7. A die is rolled 10 times. What is the chance of getting exactly three fours?
(A) 4.3%
(B) 11.7%
(C) 15.5%
(D) 29%
(E) 36%

8. One hundred draws are going to be made at random with replacement from the box

4 7 8 11 .

Find the chance of getting a sum of draws greater than 770.

(A) 2% (B) 5% (C) 16% (D) 21% (E) $34 \ 1/2\%$

- 9. A fair die is rolled 720 times. Estimate the chance of getting exactly 120 threes.
 - (A) 2% (B) 4% (C) 8% (D) 12% (E) $16 \ 2/3\%$
- 10. Forty-eight hundred (4,800) draws are going to be made at random with replacement from the box

 1
 2
 2
 4
 .

Find the chance that between 24% and 26% of tickets drawn have the 4 on them.

(\mathbf{A})) 5.48%	(B) 11.92%	(C) 51.61%	(D) 68.27%	(E) 89.04%
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11. The National Assessment of Educational Progress (NAEP) tests nationwide samples of students in school. One of the sample questions was: "Name the President of the United States who succeeded Andrew Jackson."

Of the grade-12 students in a random sample of 1,164 students, only 3% could answer this question correctly.

Find a 68%-confidence interval for the percentage of all 12th-graders in the country who could answer this question correctly.

(A) 0% to 6% (B) 0.068% to 5.932% (C) 1.534% to 4.466% (D) 2% to 4% (E) 2.5% to 3.5%

- 12. 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 value 2.30 can be used to estimate the average number of persons per household in the whole city.
 - (b) The 2.30 is 0.07 or so off the average number of persons per household in the whole city.
 - (c) A 95%-confidence interval for the average household size in the sample is 2.16 to 2.44.
 - (d) A 95%-confidence interval for the average household size in the city is 2.16 to 2.44.
 - (e) 95% of the households in the city contain between 2.16 and 2.44 persons.
 - (f) Household size in the city follows the normal curve.
 - (g) The 95%-confidence level is about right because household size follows the normal curve.
- 13. A surveyor is measuring the distance between five points A, B, C, D, and E. They are all on a straight line. He finds that each of the four distances AB, BC, CD, and DE measures one mile, give or take an inch or so. These four measurements are made independently, by the same procedure.



The distance from A to E is about four miles, give or take around

(A) 4 inches (B) 2 inches (C) 1 inch (D) $\frac{1}{2}$ inch (E) $\frac{1}{4}$ inch.

Explain briefly. (You may assume the Gauss model, with no bias.)

14. A die is rolled 6480 times, resulting in 1127 · 's.

Does the result indicate that the die is fair?

(Use a statistical test to decide, and state the value of P and your conclusion.)

(A) P = 0.009%, unfair (B) P = 3%, fair (C) P = 3%, unfair (D) P = 6%, fair (E) P = 12%, fair

15. 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.

	Observed	
Value	frequency	
1	7	Make a χ^2 -test of the null
2	11	hypothesis that the die is
3	10	fair.
4	8	
5	14	
6	10	

State the value of P and your conclusion.

(A) P = 80%, fair (B) P = 70%, fair (C) P = 40%, fair (D) P = 10%, unfair (E) P = 1%, unfair