# Sample Final Exam <span style="font-size:smaller">Math 125, Spring 2023</span>

**Problems 1–12 are multiple choice. 4 points for each correct response, 1 point deducted for each wrong answer**

**For Problems 1 and 2.**

A group of 40,000 families were sorted by size. A histogram was made from that distribution. In the category of size 5 to 7, there are 1,476 families.

1. The height of that block for 5 to 7 inclusive is:

(A) 3.69%  (B) 3.69% per person  (C) 1.845% per person  (D) 1.23% per person  (E) 0.9225% per person

2. The area of that block (from 5 to 7) represents:

   (A) family size        (B) percent per family member        (C) density
   (D) percent of families     (E) width of the base

3. True or false: in a block of a histogram, the height of the block represents the percent of the population and the area of the block represents the density.

4. A list has 9 entries, numbered 2 to 10.

   (a) Convert the largest number on the list to standard units.

       (A) 1.333      (B) 1.429      (C) 1.549      (D) 1.6      (E) 2

   (b) What percent of the entries were within 1.25 SDs of the average?

       (A) 44%      (B) 56%      (C) 67%      (D) 78%      (E) 89%

   (c) If a list followed the normal curve, what percent would be within 1.25 SDs of the average?

       (A) 34%      (B) 39%      (C) 68%      (D) 79%      (E) 89%

5. The average height for a group of women was 63.274 inches and the SD was 2.8934 inches. The height of a certain woman was 0.5 SDs above average.

   What is her height in standard units?

   (A) 0.5      (B) 1      (C) 1.4467      (D) 2      (E) 2.8934      (F) 64.72

**For Problems 6 and 7:**

A champion dart player has a 23% chance of hitting the bulls eye. He throws four darts, randomly and independently.

6. The chance that at least one of the four throws results in a bullseye is around:
   (A) 0.3%      (B) 23%      (C) 35%      (D) 65%      (E) 92%      (F) 99.7%

7. The chance that exactly one of the four throws results in a bullseye is around:
   (A) 0.3%      (B) 3.7%      (C) 10.5%      (D) 23%      (E) 35%      (F) 42%

8. A fair coin is tossed 350 times. Estimate the chance of getting exactly 182 heads.

   (A) 1.84%      (B) 3%      (C) 3.68%      (D) 6%      (E) 52%

9. A standard deck contains 52 cards: 20 even-numbered cards and 32 cards that are not even-numbered. Two hundred draws are made at random with replacement from such a deck.

   The percentage of even-numbered cards drawn should end up around 38.46%, give or take:

   (A) 0.118%      (B) 1.674%      (C) 2.7196%      (D) 3.44%      (E) 5.439%

10. **This problem is a challenge problem.**

A fair die is rolled twice. Event A is getting a four on the first roll. Event B is getting different numbers on the two rolls.

Find the chance of A or B (or both). That is the probability of at least one of the results: A, B.

(A) 1/6     (B) 1/3     (C) 5/36     (D) 11/36     (E) 5/6     (F) 31/36     (G) 1

11. A box contains a large number of tickets. The numbers on these tickets average out to 120, and the SD is 20.

Eighty-one (81) tickets are drawn at random with replacement.

Find the chance that the average of the draws will be in the range 117 to 123.

(A) 5.96%     (B) 11.92%     (C) 41.15%     (D) 82.30%     (E) 99.31%

12. A patient is weighed 30 times by a nurse. The 30 readings average 187.63 pounds, and the SD of the 30 readings is 0.65 pounds. (Assume the Gauss model.)

The actual weight of the patient is off from 187.63 pounds by about how much?

(A) 0.0217 lbs  (B) 0.119 lbs  (C) 0.65 lbs  (D) 3.56 lbs  (E) 6.25 lbs  (F) 19.5 lbs  (G) 34.256 lbs

**Problems 13 to 20 are worth 6 points each. Show all work. No deductions for wrong answers.**

13.

| x | y |
|---|---|
| 6 | 3 |
| 8 | 11 |
| 2 | 12 |
| 10 | 9 |
| 14 | 15 |

Find the correlation coefficient, $r$, for the above data set.

**For problems 14, 15, 16, and 17**

A group of men in a survey produced the following data:

$$\text{average weight} = 175 \text{ pounds}, \quad \text{SD} = 45 \text{ pounds}$$
$$\text{average height} = 69 \text{ inches}, \quad \text{SD} = 3 \text{ inches}, \quad r = 0.42$$

14. A man picked at random from the above group weighs 225 pounds. Predict his height.

15. Find the root-mean-square error of the regression line for predicting height from weight.

16. Find the regression equation for predicting height from weight. Use it to predict heights for 175 pounds and for 225 pounds.

17. Ralph is 6 inches taller than Morton. How much more is he predicted to weigh?

18. A coin was tossed 800 times and got 450 heads.

Find $P$ and decide if the coin is fair or gets too many heads.

19. A die was rolled 600 times and got 125 fours.

Find $P$ and decide if the die is fair or gets too many fours.

20. A gambler is accused of using a loaded die, but he pleads innocent. A record has been kept of the last 600 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 the left table.

| Value | Observed frequency |
|-------|--------------------|
| 1     | 87                 |
| 2     | 115                |
| 3     | 94                 |
| 4     | 125                |
| 5     | 78                 |
| 6     | 101                |

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

Estimate $P$ and state the conclusion for the data at left.

A second set of data was collected. Run the same $\chi^2$-test on this data.

Estimate $P$ and make a conclusion for the data at right.

| Value | Observed frequency |
|-------|--------------------|
| 1     | 100                |
| 2     | 98                 |
| 3     | 109                |
| 4     | 121                |
| 5     | 85                 |
| 6     | 87                 |