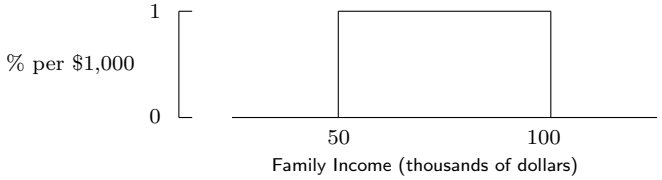
Final Examination

(May 23)

Math 125, Spring 2025

Multiple Choice. 5 points for each correct response, 1 point deducted for each wrong answer

1. Someone has sketched one block of a family-income histogram for a wealthy suburb. About what percentage of the families in this suburb had incomes between \$50,000 and \$75,000 a year?



(A) 12.5% (B) 25% (C) 50% (D) 75% (E) 80%

2. Find the SD of the list $\{-2, 0, 2\}$.

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

3. Among first-year students at a certain university, scores on the Verbal SAT follow the normal curve; the average is always around 500.

One year, of 1,401 first-year students, there were about 1,300 students with scores in the range 300–700 on the Verbal SAT. About _____ of them had scores in the range 400 to 600 (an interval half as wide).

(A) 443 (B) 500 (C) 650 (D) 885 (E) 1,000

4. Among freshmen at a certain university, scores on the Math SAT followed the normal curve, with an average of 550 and an SD of 100.

A student who scored 520 on the Math SAT was at about the _____th percentile of the score distribution.

(A) 12th (B) 24th (C) 26th (D) 38th (E) 44rd

5. Find the correlation coefficient, r, for the following data set.

A	B
−1	0
0	4
1	2

(A) −1/2 (B) −1/3 (C) 0 (D) 1/2 (E) 1

6. The correlation between height and weight among men age 18–74 in the U.S. is about 0.40.

Which of the following five statements is false?

(A) Taller men tend to be heavier.

(B) The correlation between weight and height for men age 18–74 is about 0.40.

(C) The correlation between height and weight is the same, no matter what units of measurement are used.

(D) Heavier men tend to be shorter.

(E) If someone eats more and puts on 10 pounds, his height will remain the same.

7. For the first year students at a certain university, the average GPA was 2.6 and the SD was 0.6. The correlation between SAT scores and first-year GPA was 0.46. The SAT scores followed the normal curve.

   Estimate the average first-year GPA for students whose percentile rank on the SAT was 86%.

   (A) 2.6 (B) 2.83 (C) 2.90 (D) 3.06 (E) 3.26

8. A statistical analysis was made of the midterm and final scores in large course, with the following results:

   average midterm score ≈ 50, SD ≈ 25
   average final score ≈ 55, SD ≈ 20, $r \approx 0.60$

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

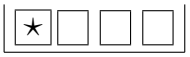
   For about 1/3 of the students, the prediction for the final score was off by more than _____ points.

   (A) 8 (B) 12 (C) 16 (D) 20 (E) 25

9. Every week you buy a ticket in a lottery that offers one chance in a thousand of winning. What is the chance that you never win, even if you keep this up for a whole year? Find a numeric answer rounded to the nearest one percent (nearest 1%).

   (A) 5% (B) 41% (C) 50% (D) 59% (E) 95%

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

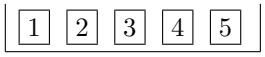
    

    Two draws are made at random without replacement from this box.

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

    (A) 44% (B) 50% (C) 56% (D) 60% (E) 75%

11. A box contains five tickets, numbered as shown

    .

    Two tickets are drawn at random, without replacement, from the box. Find the chance that the three tickets left in the box are 3, 4, and 5.
    (That is the same as asking: Find the chance that the two tickets drawn are the 1 and 2—in either order.)

    (A) 1/5 = 20% (B) 4/25 = 16% (C) 1/20 = 5% (D) 1/10 = 10% (E) 3/5 = 60%

12. A coin is tossed twice. Find the chance that a head comes up on exactly one toss.

    (A) 1/4 (B) 3/8 (C) 1/2 (D) 3/4 (E) 1

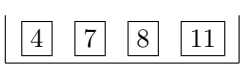
13. A die is rolled 9 times. What is the chance of getting exactly three fours?

    (A) 0.155% (B) 13% (C) 16.4% (D) 17.6% (E) 50%

14. A fair die is rolled 600 times. Estimate the chance of getting exactly 100 threes.

    (A) 2% (B) 4% (C) 8% (D) 12% (E) 16 2/3%

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

    . The SD of the box is 2.5.

    Find the chance of getting a sum of draws greater than 755.

    (A) 5% (B) 8% (C) 16% (D) 21% (E) 42%

16. A simple random sample of 4,400 persons is taken to estimate the percentage of Democrats among the 2,500,000 eligible voters in a large city. It turns out that 2409 people in the sample are Democrats.

    Find a **99.7**%-confidence interval for the percentage of Democrats among all 2,500,000 eligible voters.

    (A) 52.50% to 57% (B) 53.25% to 56.25% (C) 53.63% to 55.87%
    (D) 54% to 55.50% (E) 54.37% to 55.13%

17. A box contains a large number of tickets. The numbers on these tickets average out to 100, and the SD is 2.

    Twenty-five (25) tickets are drawn at random with replacement.

    Find the chance that the average of the draws will be in the range 99 to 101.

    (A) 1.6% (B) 7.97% (C) 38.29% (D) 98.76% (E) 100%

18. The speed of light is measured 100 times by a new procedure. The 100 measurements are recorded, and show no trend or pattern. The investigators work out the average and SD of the 100 numbers; the average is 299,793.7 kilometers per second and the SD is 24 kilometers per second. (You may assume the Gauss model, with no bias.)

    Only one of these five statements is false. Which one?

    (A) The average of all 100 measurements is off the speed of light by 24 or so.

    (B) Each measurement is off 299,793.7 by 24 or so.

    (C) Although we do not know it, we would estimate the standard deviation of the error box to be 24, based on the observed data.

    (D) Although we do not know it, we would estimate the standard error for the average of the draws to be 2.4, based on the observed data and the sample size.

    (E) A 95%-confidence interval for the speed of light is $299{,}793.7 \pm 4.8$.

19. A die is rolled 6480 times, resulting in 1145 $\boxed{\cdot}$'s.

    Does the result indicate that the die is fair, or that it gets too many $\boxed{\cdot}$s?

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

    (A) P = 0.009%, unfair (B) P = 1.58%, unfair (C) P = 1.58%, fair
    (D) P = 3.16%, unfair (E) P = 6%, fair

20. A gambler is accused of using a loaded die, but he pleads innocent. A record has been kept of the last 90 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	13
2	21
3	12
4	18
5	10
6	16

    A χ^2-test of the null hypothesis that the die is fair was made. State P and the conclusion.

    (A) 3%, unfair (B) 6%, unfair (C) 14%, fair (D) 35%, fair (E) 90%, fair