# Sample of Final Exam Problems

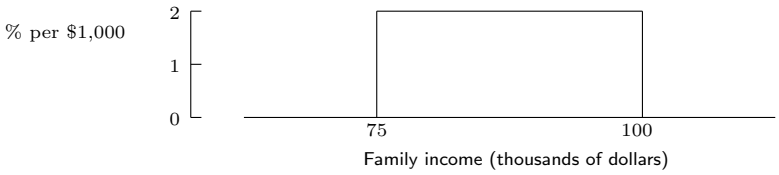
Math 125: Fall 2024

**Each problem is multiple choice. $3\frac{1}{2}$ points for a correct response, no points deducted for a wrong answer**

**In Problem 2, count each part 1/3 as much: $1\frac{1}{6}$ points for a correct answer, 1/6 point deducted for a wrong answer.**

(The actual final will have 22 somewhat similar questions, each with exactly 5 choices for the correct answer, and no multiple parts as in problem 2.)

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 \$75,000 and \$90,000 a year?




(A) 15% (B) 25% (C) 30% (D) 50% (E) 60%

2. 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%

3. It was found that 74 percent of the freshman class at U Mass/Boston scored over 450 points on the verbal section of the SAT. If the verbal SAT scores for the entire class have an SD of 80 points and follow the normal curve, what is the average?

   (A) 398 points (B) 426 points (C) 474 points (D) 502 points (E) 540 points

4. A group of women had heights that averaged 63.5 inches, and the SD was 3 inches.

   Estimate the 93rd percentile height.

   (A) 59 inches (B) 64.775 inches (C) 66.35 inches (D) 67.925 inches (E) 68.9 inches

5. The average height for a group of women was 65 inches and the SD was 3.32 inches.

   Using the normal curve, an estimate for the percent of women with heights between 64 and 68 inches is:

   (A) 13% (B) 40% (C) 43% (D) 57% (E) 87%

6.

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

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

(A) 0.0234 (B) 0.225 (C) 0.375 (D) 0.525 (E) 0.625

**For problems 7 to 12**

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

average weight = 175 pounds, SD = 45 pounds
average height = 69 inches, SD = 3 inches, $r = 0.42$

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

   (A) 67.6 inches (B) 69 inches (C) 69.47 inches (D) 70.4 inches (E) 72.333 inches

8. Suppose that the same group of men in the survey had their height listed in cm. The new average height is 175.26 cm, and the new SD height is 7.62 cm.

   What will the correlation coefficient, $r$, then equal?

   (A) 0.16535 (B) 0.42 (C) 1.0668 (D) 2.54 (E) 3

9. A man who weighed 225 pounds and was 72 inches tall gained 20 pounds and now weighs 245 pounds. What's his new height?

   (A) 72 inches (B) 72.19 inches (C) 72.56 inches (D) 73.33 inches (E) 75 inches

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

    (A) 1.74 inches (B) 2.4708 inches (C) 2.72257 inches (D) 3 inches (E) 40.839 pounds

11. Find the regression equation for predicting height in inches from weight in pounds.

    (A) height = 0.028 × weight + 64.1 (B) height = 0.0667 × weight + 57.3275
    (C) height = 0.15873 × weight + 41.222 (D) height = 6.3 × weight − 259.7
    (E) height = 15 × weight − 860

12. Use the equation to predict the height (in inches) for a man whose weight was 225 pounds. Show the calculation resulting from plugging in the given value.

    (A) $0.028(225) + 64.1 = 70.4$ (B) $0.0667(225) + 57.3275 = 72.335$
    (C) $0.15873(225) + 41.222 = 76.93625$ (D) $6.3(225) - 259.7 = 1157.8$ (E) $15(225) - 860 = 2515$

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

    (A) 2.52 pounds (B) 6.3 pounds (C) 37.8 pounds (D) 45 pounds (E) 90 pounds

14. For the 988 men age 18–24 in the HANES sample

    average height ≈ 70 inches SD ≈ 3 inches
    average weight ≈ 162 pounds SD ≈ 30 pounds
    correlation ≈ 0.47

    One man in the sample was 66 inches tall and weighed 140 pounds. In comparison with the other men in the sample of the same height, this man would be

    (A) a little light (B) a little heavy

15. For the 988 men age 18–24 in the HANES sample

    average height $\approx$ 70 inches  SD $\approx$ 3 inches
    average weight $\approx$ 162 pounds  SD $\approx$ 30 pounds
    correlation $\approx$ 0.47

    One man in the sample was both one SD above average in height and one SD above average in weight. In comparison with the estimated average weight of all men of his height in the study, his weight will be:

    (A) more.  (B) less.  (C) equal.

**For Problems 16 and 17:**

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

16. 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%

17. 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%

18. Three cards are drawn at random without replacement from a standard deck of cards. (A standard deck has 26 red cards among the 52 cards.)

    What is the exact chance that all three of the cards drawn are red?

    (A) 1/17  (B) 2/17  (C) 1/8  (D) 25/102  (E) 15/17

19. A die is rolled 10 times. Find the chance of not getting 10 sixes.

    (A) $(1/6)^{10}$  (B) $(5/6)^{10}$  (C) $1-(5/6)^{10}$  (D) $1-(1/6)^{10}$  (E) 2/3

20. 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

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

    (A) 1.84%  (B) 3.01%  (C) 3.68%  (D) 6%  (E) 52%

22. A fair coin is tossed and the number of tosses gets larger and larger.

    Only one of the following is correct? State the correct letter.

    (A) The difference between the number of heads observed and the expected number of heads and the difference between the percentage of heads observed and 50% both get smaller.

    (B) The difference between the number of heads observed and the expected number of heads and the difference between the percentage of heads observed and 50% both get larger.

    (C) The difference between the number of heads observed and the expected number of heads gets smaller, while the difference between the percentage of heads observed and 50% gets larger.

    (D) The difference between the number of heads observed and the expected number of heads gets larger, while the difference between the percentage of heads observed and 50% gets smaller.

    (E) None of the four above statements are true.

23. A coin is tossed 16 times.

The number of heads is like the sum of 16 draws made at ranodm from which of the following boxes?

(A) | head | tail |

(B) | 0 | 1 |

(C) | 0 | 1 | 1 |

24. 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%

25. 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%

26. A researcher takes a simple random sample of 900 students from the 16,000 students at UMass. On the average, there are 0.63 cats per sample student, and the SD is 0.717.

Only one of the following statements is true. Which one?

(A) The 0.63 is 0.717 or so off the average number of cats per student in the whole school.

(B) The correct 95%-confidence interval for the average number of cats per student in the whole school is 0.6061 to 0.6539.

(C) 38% of the students at UMass have between 0.2715 and 0.9885 cats.

(D) A 95%-confidence level will be about right because the number of cats follows the normal curve.

(E) A 95%-confidence level will be about right because, with 900 draws from the box, the probability histogram for the average number of cats in the sample follows the normal curve.

27. A survey organization wants to take a simple random sample in order to estimate the percentage of people who have seen a certain television program. To keep the costs down, they want to take as small a sample as possible. But their client will only tolerate chance errors of 1/4 of 1 percentage point or so in the estimate. How large a sample should they use?

(A) 100 (B) 2,500 (C) 10,000 (D) 40,000 (E) 1,000,000

(You may assume the population to be very large.)

28. Taking the average of 225 measurements would divide the likely size of the chance error by a factor of _____

(A) 5 (B) 10 (C) 15 (D) 25 (E) 225

29. A machine makes sticks of butter whose average weight is 4.0 ounces. The SD of the weights is 0.05 ounces. There is no trend or pattern to the data. There are 4 sticks to a package.

Fill in the blank: A package weighs one pound, give or take _____ or so.

(A) 0.0125 ounces (B) 0.025 ounces (C) 0.05 ounces (D) 0.1 ounces (E) 0.2 ounces

30. In a long series of trials, a computer program is found to take on average 23.7 seconds of CPU time to execute, with an SD of 1.23 seconds. There is no trend or pattern in the times. It will take about 9480 seconds of CPU time to execute the program 400 times, give or take _____ seconds or so. (The CPU is the "central processing unit," where the machine does logic and arithmetic.)

(A) 0.003075 seconds (B) 0.0615 seconds (C) 1.23 seconds
(D) 24.6 seconds (E) 492 seconds

31. One hundred draws are made at random with replacement from a box. The average of the draws is 22.7, and the SD is 10. Someone claims that the average of the box equals 20. Is this plausible?

Find $P$ and decide whether the average of the box equals 20 or is more than 20.

(A) $P = 0.345\%$, more than 20 (B) $P = 1\%$, equals 20 (C) $P = 2.7\%$, more than 20
(D) $P = 40\%$, equals 20 (E) $P = 80\%$, equals 20

32. A person built a number generator, and claims that it produces digits from 0 to 9 randomly and equally. In a trial run of 1000 numbers, the digits produced were:

117 0's; 98 1's; 105 2's; 120 3's; 92 4's; 86 5's; 121 6's; 76 7's; 98 8's; 87 9's.

Make an appropriate statistical test to decide if the generator is fair. State $P$ and the conclusion.

(A) $P = 1\%$, not fair (B) $P = 10\%$, fair (C) $P = 21.68\%$, fair (D) $P = 30\%$, fair (E) $P = 50\%$, fair