Final Examination – Version C
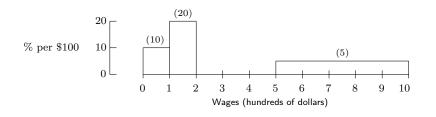
Multiple Choice. 5 points for each correct response, 1 point deducted for each wrong answer

1. A histogram of monthly wages for part-time employees is shown below (densities are marked in parentheses). Nobody earned more than \$1,000 a month. The block over the class interval from \$200 to \$500 is missing. How tall must it be?

   (A) 6.67% per \$100   (B) 10% per \$100   (C) 15% per \$100   21.67% pre \$100   (E) 45%

2. A list has 6 entries: 12, 15, 20, 23, 24, 26. The standard units for the entry 23 comes out to:

   (A) -0.6 (B) 0.12   (C) 0.6   (D) 3   (E) 5

3. Among first-year students at a certain university, scores on the Verbal SAT follow the normal curve; the average is always around 500, and the SD is about 100.

   One year, there were about 1,000 students with scores in the range 300–700 on the Verbal SAT. About _____ of them had scores in the range 400 to 600.

   (A) 500   (B) 561   (C) 715   (D) 882   (E) 900

4. Ninety-six percent of the freshman class at Stanford scored over 625 points on the math section of the SAT. If the math SAT scores for the entire class have an SD of 80 points and follow the normal curve, what is the average?

   (A) 577 points   (B) 625 points   (C) 673 points   (D) 757 points   (E) 789 points

5. Among all applicants to a certain university one year, the Math SAT scores averaged 535, the SD was 100, and the scores followed the normal distribution.

   Estimate the 90th percentile of the score distribution..

   (A) 620 points   (B) 635 points   (C) 665 points   (D) 700 points   (E) 731 points

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

x	y
4	4
4	2
3	1
3	5
3	5
1	7

   A) -0.75 (B) -0.42 (C) -0.33 (D) 0   (E) 0.33

7. In a large statistics class, the correlation between midterm scores and final scores is found to be nearly 0.65, 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 6%.

   (A) 6%   (B) 11%   (C) 11%   (D) 16%   (E) 21%

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

$$\text{average midterm score} \approx 50, \quad SD \approx 25$$
$$\text{average final score} \approx 60, \quad SD \approx 18, \quad r \approx 0.80$$

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

Predict the final score for a student whose midterm score was 80.

(A) 60   (B) 74.4   (C) 83   (D) 89   (E) 92

For problems 9, and 10

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

$$\text{average weight} = 168 \text{ pounds}, \quad SD = 30 \text{ pounds}$$
$$\text{average height} = 68 \text{ inches}, \quad SD = 3 \text{ inches}, \quad r = 0.48$$

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

(A) 0.6912 inches   (B) 1.44 inches   (C) 1.56 inches   (D) 2.3088 inches   (E) 2.6318 inches

10. Find the regression equation for predicting height from weight.

(A) $y = 0.048x + 59.936$ (B) $y = 0.1x + 51.2$ (C) $y = 0.1x + 161.2$
(D) $y = 4.8x - 738.4$ (E) $y = 10x - 1612$

11. A box contains six tickets, with the following letters:

$$\boxed{A}\,\boxed{A}\,\boxed{B}\,\boxed{C}\,\boxed{D}\,\boxed{E}\quad.$$

Three tickets are drawn at random, without replacement, from the box. Find the chance that none of the three tickets drawn were A's.

(A) 1/10   (B) 1/5   (C) 8/27   (D) 19/27   (E) 4/5

12. A die is rolled 3 times. What is the chance of getting at least one $\boxed{\bullet}$?

(A) 1/216   (B) 91/216   (C) 1/2   (D) 125/216   (E) 215/216

13. Separate the 13 spades from a standard deck of cards. Three of them are picture cards: the Jack, Queen, and King.

Now draw two cards at random from these 13 spades.

Find the probability (rounded to the nearest .01%) that at least one of the two cards drawn is a picture card, if they are drawn without replacement.

(A) 1/26   (B) 9/169   (C) 11/26   (D) 15/26   (E) 100/169

14. The unconditional probability of event A is 1/2. The unconditional probability of event B is 1/3. Only one of the following statements is true. Select that as your answer.

(A) The chance that A and B both happen must be $1/2 \times 1/3 = 1/6$.

(B) If A and B are independent, the chance that they both happen must be $1/2 \times 1/3 = 1/6$.

(C) If A and B are mutually exclusive, the chance that they both happen must be $1/2 \times 1/3 = 1/6$.

(D) The chance that at least one of A or B happens (A or B) must be $1/2 + 1/3 = 5/6$.

(E) If A and B are independent, the chance that at least one of them happens must be $1/2 + 1/3 = 5/6$.

15. A die will be rolled 6 times. What is the chance of obtaining exactly 1 [•] ?

   (A) 1.56%   (B) 7%   (C) 9%   (D) 17%   (E) 40%

16. 60% of the pupils in a particular university are male. What is the probability that a random sample of 400 pupils will contain fewer than 220 males?

   (A) about 1/2%   (B) about 2%   (C) about 5%   (D) about 6%   (E) about 10.6%

17. A certain town has 25,000 families. The average number of children per family is 2.6, with an SD of 0.80. The distribution is not normal, however, since 25% of the families have no children at all.

   If one draws a simple random sample of 90 families from the 25,000, what are the chances that between 23% and 27% of the sample families will have no children? (Any correction factors may be ignored.)

   (A) about 20%   (B) about 30%   (C) about 35%   (D) about 60%   (E) about 62%

18. The speed of light is measured 25 times by a new procedure. The 25 measurements are recorded, and show no trend or pattern. The investigators work out the average and SD of the 25 numbers; the average is 299,789.2 kilometers per second and the SD is 12 kilometers per second.

   Find an approximate 95%-confidence interval for the speed of light. (You may assume the Gauss model, with no bias.)

   (A) 299,777.2 to 299,801.2   (B) 299,783.2 to 299,795.2   (C) 299,784.4 to 299,794
   (D) 299,786.8 to 299,791.6   (E) 299,788.72 to 299,789.68

19. Five hundred draws are made at random with replacement from a box of numbered tickets; 280 are positive. Someone tells you that 50% of the tickets in the box show positive numbers.

   Use the sample data to assess whether or not this claim is credible and indicate your conclusion below.

   Clearly choose your null and alternative hypotheses, set up a box model, and run a test of hypotheses. You should base your conclusion on the results of that test. Decide whether the claim is credible or not credible.

   Answer with the value of P and the decision.

   (A) $P < 1\%$, not credible   (B) $P < 1\%$, credible   (C) $P = 27\%$, credible
   (D) $P = 46\%$, credible   (E) $P = 56\%$, credible

20. A random number generator in an ESP experiment is supposed to produce the digits one through five with equal frequency.

   In 900 trials, the results were:

   160 ones, 200 twos, 184 threes, 173 fours, and 183 fives.

   A statistical test will help decide if the random number generator is working properly.

   Run the appropriate test.

   Find P and decide whether each digit had equal chance.

   (A) $P = 1\%$, not equal chance (B) $P = 4.45\%$, not equal chance (C) $P = 4.86\%$, not equal chance
   (D) $P = 30\%$, equal chance   (E) $P = 44\%$, equal chance

21. 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?

   (A) No.   (B) Yes, at the 5% level, 5% of fair firms would be found guilty. (Data snooping.)

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

   (A) The SD (standard deviation) says how far a "typical" number on a list is from the average of that list.

   (B) Standard units tell how many SDs a value is above or below average.

   (C) If the data don't follow the normal curve, you can't use the curve to get significance levels.

   (D) The null hypothesis says that nothing is going on, besides chance variation.

   (E) A large value of P (the observed significance level) supports the null hypothesis.