AP Statistics - NP: Normal Probabilities

AP Statistics Normal Probabilities (NP) - 21 questions

21 Questions | 42 min

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1. Diet Plan A advertises an average monthly weight loss of 10 pounds with a standard deviation of 3 pounds. Diet Plan B claims an average monthly weight loss of 12 pounds with a standard deviation of 1.8 pounds. Assuming both assertions are correct and assuming roughly normal distributions, which diet plan is more likely to result in a monthly weight loss of over 15 pounds?

(A) Diet Plan A is more likely to result in a monthly weight loss of over 15 pounds because of its greater standard deviation.

(B) Diet Plan B is more likely to result in a monthly weight loss of over 15 pounds because of its greater mean.

(C) For both plans, the probability of a weight loss over 15 pounds is 0.04779.

(D) For both plans, the probability of a weight loss over 15 pounds is 0.95221.

(E) The problem cannot be solved from the information given.

2. Which of the following are true statements? I. The area under a normal curve is always equal to 1, no matter the mean and standard deviation. II. The smaller the standard deviation of a normal curve, the higher and narrower the graph is. III. Normal curves with different means are centered around different numbers.

(A) I and II only

(B) I and III only

(C) II and III only

(D) I, II, and III

(E) None of the above gives the complete set of true responses.

3. A cell phone takes an average of 11 minutes to move through an assembly line. If the standard deviation is 2 minutes and if the distribution is roughly normal, what is the probability that a cell phone will take over 12 minutes to move through the assembly line?

(A) $P\left(z > \dfrac{12-11}{2}\right)$

(B) $P\left(z > \dfrac{12-11}{\frac{2}{\sqrt{2}}}\right)$

(C) $P\left(z > \dfrac{11-12}{2}\right)$

(D) $P\left(z > \dfrac{11-12}{\frac{2}{\sqrt{2}}}\right)$

(E) $2P\left(t > \dfrac{11-12}{2}\right)$

4. A bowler's scores are approximately normally distributed with a mean of 210. What is the standard deviation if 30 percent of her scores are below 200?

(A) $\dfrac{200-210}{-0.5244}$

(B) $\dfrac{200-200}{-0.5244}$

(C) $\dfrac{200-210}{0.5244}$

(D) $\dfrac{200-210}{0.4756}$ 210-200

(E) $\dfrac{210-200}{0.4756}$

5. Which of the following is a true statement?

(A) The area under the standard normal curve between 0 and 2 is twice the area between 0 and 1.

(B) The area under the standard normal curve between 0 and 2 is half the area between −2 and 2.

(C) For the standard normal curve, the interquartile range is approximately 3.

(D) For the standard normal curve, approximately 1 out of 1,000 values are greater than 10.

(E) The 68-95-99.7 rule applies only to normal curves where the mean and standard deviation are known.

6. The starting national average salary for a computer security specialist is $58,760. Assuming a roughly normal distribution and a standard deviation of $6,500, what is the probability that a randomly chosen computer security specialist will start with a salary between $50,000 and $60,000?

(A) $P\left(\frac{50000}{6500} < z < \frac{60000}{6500}\right)$

(B) $2P\left(z > \frac{60000 - 50000}{6500}\right)$

(C) $P\left(\frac{58760 - 50000}{6500} < z < \frac{58760 - 60000}{6500}\right)$

(D) $P\left(\frac{58760 - 50000}{\frac{6500}{\sqrt{n}}} < z < \frac{58760 - 60000}{\frac{6500}{\sqrt{n}}}\right)$

(E) $P\left(\frac{50000 - 58760}{6500} < z < \frac{60000 - 58760}{6500}\right)$

7. Populations P_1 and P_2 are roughly normally distributed and have identical means. However, the standard deviation of P_1 is half the standard deviation of P_2. What can be said about the percentage of observations falling within one standard deviation of the mean for each population?

(A) The percentage for P_1 is twice the percentage for P_2.

(B) The percentage for P_1 is greater, but not twice as great, as the percentage for P_2.

(C) The percentage for P_2 is twice the percentage for P_1.

(D) The percentage for P_2 is greater, but not twice as great, as the percentage for P_1.

(E) The percentages are identical.

8. A college library determines that books are checked out for an average of 8 days with a standard deviation of 2 days. Assuming a roughly normal distribution, what is the shortest time interval for which two-thirds of the books are out?

(A) 0 to 8.9 days

(B) 6.1 to 7.1 days

(C) 6.1 to 8 days

(D) 6.1 to 9.9 days

(E) 7.1 to 14 days

9. A set of employee commuting distances from work has a roughly normal distribution with a mean of 12 miles and a standard deviation of 3.5 miles. If a randomly selected employee commutes over 10 miles, what is the probability she commutes under 15 miles?

(A) 0.521 (B) 0.545 (C) 0.647 (D) 0.716 (E) 0.727

10. Which of the following statements is incorrect?

(A) In all normal distributions, the mean and median are equal.

(B) Bell-shaped curves may not have normal distributions.

(C) Virtually all the area under a normal curve is within three standard deviations of the mean, no matter the particular mean and standard deviation.

(D) A normal distribution is completely determined by two numbers, its mean and its standard deviation.

(E) Standardized scores (z-scores) always have a normal distribution no matter the original distribution.

11. A trucking firm determines that the miles per gallon (mpg) achieved by trucks in its fleet are roughly normally distributed with a standard deviation of 2.5 mpg. What is the mean mpg if 75 percent of the trucks achieve better than 13.2 mpg?

(A) 13.2 + 0.3255(2.5)

(B) 13.2 + 0.6745(2.5)

(C) 13.2 + 0.7500(2.5)

(D) 13.2 − 0.6745(2.5)

(E) 13.2 − 0.7500(2.5)

12. The mean yearly medical expenses (including insurance payments) for individuals in a large city is $15,300 with a standard deviation of $3,600. Assuming a roughly normal distribution, what is the probability that two randomly chosen individuals in the city both have yearly medical expenses over $20,000?

(A) $2P\left(z > \dfrac{20000 - 15300}{3600}\right)$

(B) $\left[P\left(z > \dfrac{20000 - 15300}{3600}\right)\right]^2$

(C) $\dfrac{1}{2}P\left(z > \dfrac{20000 - 15300}{3600}\right)$

(D) $P\left(z > \dfrac{20000 - 15300}{\sqrt{3600}}\right)$

(E) $P\left(z > \dfrac{20000 - 15300}{\frac{3600}{\sqrt{2}}}\right)$

13. The monthly rental paid per person for college students living off campus has a roughly normal distribution with a mean of $275 and a standard deviation of $40. Ninety percent of the rentals are greater than what amount?

(A) $275 - 1.282(40)$

(B) $275 - 1.645(40)$

(C) $275 - 1.96(40)$

(D) $275 + 1.282(40)$

(E) $275 + 1.96(40)$

14. Suppose women's foot lengths are roughly normally distributed with a mean of 20 cm and a standard deviation of 4 cm, while men's foot lengths are roughly normally distributed with a mean of 26 cm and a standard deviation of 5 cm. If a policeman measures a footprint to be 22.5 cm, is there a greater probability that it belongs to a man or to a woman?

(A) Man, because 22.5 − 20 < 26 − 22.5

(B) Man, because $\frac{2.5}{4} < \frac{3.5}{5}$

(C) Woman, because 22.5 − 20 < 26 − 22.5

(D) Woman, because $\frac{2.5}{4} < \frac{3.5}{5}$

(E) This cannot be answered without knowing if we can assume independence.

15. A couple is looking to purchase their first house. In the neighborhood in which they are interested, home prices are roughly normally distributed with a mean of $275,000 and a standard deviation of $35,000. They ask the realtor to show them only homes under $300,000. What percentage of the homes shown to them will be over $250,000?

(A) 0.312 (B) 0.475 (C) 0.525 (D) 0.688 (E) 0.763

16. Among 2,500 subjects signing up for a program to stop smoking, the distribution of their daily number of cigarettes was roughly normal with a mean of 27.1 and a standard deviation of 4.6. Which expression below represents the 60th percentile of the distribution?

(A) 27.1 – (0.25)(4.6)

(B) 27.1 – (0.40)(4.6)

(C) 27.1 – (0.60)(4.6)

(D) 27.1 + (0.25)(4.6)

(E) 27.1 + (0.40)(4.6)

17. The women's 500 m skating times are roughly normally distributed with a mean of 40.44 seconds. The z-score of China's Peiyu Jin's time of 38.69 seconds is –1.944. What percent of all women's 500 m skating times are above 42 seconds?

(A) 1.56 (B) 1.75 (C) 4.15 (D) 98.25 (E) 95.85

18. The number of miles that a highway construction team can lay on good-weather days is roughly normally distributed with a mean of 3 and a standard deviation of 0.35. The number of miles that a highway construction team can lay on bad-weather days is roughly normally distributed with a mean of 1.9 and a standard deviation of 0.4. If the probability of good weather is 0.7 (and of bad weather is 0.3), what is the probability of laying at least 2.5 miles on a random day?

(A) 0.06681 (B) 0.49511 (C) 0.64638 (D) 0.6664 (E) 0.92344

19. A distribution of scores is approximately normal with a mean of 28 and a standard deviation of 3.4. Which of the following equations should be used to find a score x with 20 percent of the scores above it?

(A) $\frac{x-28}{3.4}=0.80$
(B) $\frac{x-28}{\sqrt{3.4}}=0.80$
(C) $\frac{x-28}{3.4}=0.84$
(D) $\frac{x-28}{\sqrt{3.4}}=0.84$
(E) $\frac{x-28}{3.4^2}=0.84$

20. A large data set is approximately normally distributed. What is the proper order, from smallest to largest, of l, m, and n, where l = the value with a z-score of −0.6 m = the value of the first quartile n = the value of the 30th percentile

(A) $l < m < n$ (B) $m < l < n$ (C) $m < n < l$ (D) $l < n < m$ (E) $n < l < m$

21. A city's average winter low temperature is 28°F with a standard deviation of 10°F, while the city's average summer low temperature is 66°F with a standard deviation of 6°F. In which season is it more unusual to have a day with a low temperature of 51°F?

(A) Winter, because 51 − 28 = 23 is greater than 66 − 51 = 15

(B) Winter, because 10 is greater than 6

(C) Winter, because 51 sounds like a more unusual temperature for winter than summer

(D) Summer, because $|\frac{51-66}{6}|$ is more than $|\frac{51-28}{10}|$

(E) Summer, because $\frac{28+66}{2} = 47 < 51$