

Chapter 7

Continuous Probability Distributions

True/False

1. The Empirical Rule of probability can be applied to the uniform probability distribution.

Answer:

2. Areas within a continuous probability distribution represent probabilities.

Answer:

3. The total area within a continuous probability distribution is equal to 100.

Answer:

4. The total area within any continuous probability distribution is equal to 1.00

Answer:

5. For any continuous probability distribution, the probability, $P(x)$, of any value of the random variable, X , can be computed.

Answer:

6. For any discrete probability distribution, the probability, $P(x)$, of any value of the random variable, X , can be computed.

Answer:

7. The uniform probability distribution's standard deviation is proportional to the distribution's range.

Answer:

8. For any uniform probability distribution, the mean and standard deviation can be computed by knowing the maximum and minimum values of the random variable.

Answer:

9. In a uniform probability distribution, $P(x)$ is constant between the distribution's minimum and maximum values.

Answer:

10. For a uniform probability distribution, the probability of any event is equal to $1/(b-a)$.

Answer:

11. The uniform probability distribution is symmetric about the mode.

Answer:

12. The uniform probability distribution's shape is a rectangle.

Answer:

13. The uniform probability distribution is symmetric about the mean and median.

Answer:

14. Asymptotic means that the normal curve gets closer and closer to the X-axis but never actually touches it.

Answer:

15. A continuity correction factor compensates for estimating a discrete distribution with a continuous distribution.

Answer:

16. The normal curve falls off smoothly in either direction from the central value. Since it is asymptotic, the curve gets closer and closer to the X-axis, but never actually touches it.

Answer:

17. When referring to the normal probability distribution, there is not just one; there is a "family" of distributions.

Answer:

18. Some normal probability distributions have equal arithmetic means, but their standard deviations may be different.

Answer:

19. Some normal probability distributions have different arithmetic means and different standard deviations.

Answer:

20. Some normal probability distributions are positively skewed.

Answer:

21. For a normal probability distribution, about 95 percent of the area under normal curve is within plus and minus two standard deviations of the mean and practically all (99.73 percent) of the area under the normal curve is within three standard deviations of the mean.

Answer:

22. The area under the normal curve within plus and minus one standard deviation of the mean is about 68.26%.

Answer:

23. The total area under the normal curve is 100%.

Answer:

24. A z-score is the distance between a selected value (X) and the population mean (μ) divided by the population standard deviation (σ).

Answer:

25. In terms of a formula the standardized value of z is found by $z = (X - \mu) / \sigma$.

Answer:

26. The mean (μ) divides the normal curve into two identical halves.

Answer:

27. The normal probability distribution is generally deemed a good approximation for the binomial probability distribution when $n\pi$ and $n(1 - \pi)$ are both greater than five.

Answer:

28. The number of different normal distributions is unlimited.

Answer:

29. A z-score is also referred to as the standard normal deviate or just the normal deviate.

Answer:

30. The mean of a normal distribution is represented by σ .

Answer:

31. The standard normal distribution is a special normal distribution with a mean of 0 and a standard deviation of 1.

Answer:

32. A computed z for X values to the right of the mean is negative.

Answer:

33. A computed z for X values to the left of the mean is positive.

Answer:

34. Non-stop Airlines determined that the mean number of passengers per flight is 152 with a standard deviation of ten passengers. Practically all flights have between 142 and 162 passengers.

Answer:

35. The binomial can be used to approximate the normal distribution.

Answer:

36. The number of different standard normal distributions is unlimited.

Answer:

Multiple Choice

37. The shape of any uniform probability distribution is

- A) Negatively skewed
- B) Positively skewed
- C) Rectangular
- D) Bell shaped

Answer:

38. The mean of any uniform probability distribution is

- A) $(b - a)/2$
- B) $(a + b)/2$
- C) $\sum x/\eta$
- D) $n\pi$

Answer:

39. The standard deviation of any uniform probability distribution is

- A) $(b - a)/2$
- B) $n(1 - \pi)$

- C) $\sqrt{\frac{(b-a)^2}{12}}$
- D) $\sum P(x)(x - \bar{x})^2$

Answer:

40. The upper and lower limits of a uniform probability distribution are

- A) positive and negative infinity
- B) plus and minus three standard deviations.
- C) 0 and 1
- D) the maximum and minimum values of the random variable.

Answer:

41. When using the binomial distribution to approximate a normal distribution, what is the value of the continuity correction factor?

- A) 1.00
- B) 0.50
- C) 100
- D) 1.96

Answer:

42. A new drug relieves nasal congestion in 90 percent of those with the condition. The new drug is administered to 300 patients with the condition. What is the probability that more than 265 will be relieved of nasal congestion?

- A) 0.0916
- B) 0.1922
- C) 0.8078
- D) 0.3078

Answer:

43. What is an important similarity between the uniform and normal probability distributions?

- A) The mean, median and mode are all equal.
- B) The mean and median are equal
- C) They are negatively skewed
- D) About 68% of all observations are within one standard deviation of the mean.

Answer:

44. Which of the following is NOT true regarding the normal distribution?

- A) Mean, median and mode are all equal
- B) It has a single peak
- C) It is symmetrical
- D) The points of the curve meet the X-axis at $z = -3$ and $z = 3$

Answer:

45. For the normal distribution, the mean plus and minus 1.96 standard deviations will include about what percent of the observations?

- A) 50%
- B) 99.7%
- C) 95%
- D) 68%

Answer:

46. For a standard normal distribution, what is the probability that z is greater than 1.75?

- A) 0.0401
- B) 0.0459
- C) 0.4599
- D) 0.9599

Answer:

47. What is the area under the normal curve between $z = 0.0$ and $z = 1.79$?

- A) 0.4633
- B) 0.0367
- C) 0.9599
- D) 0.0401

Answer:

48. What is the area under the normal curve between $z = -1.0$ and $z = -2.0$?

- A) 0.0228
- B) 0.3413
- C) 0.1359
- D) 0.4772

Answer:

49. What is the area under the normal curve between $z = 0.0$ and $z = 2.0$?

- A) 1.0000
- B) 0.7408
- C) 0.1359
- D) 0.4772

Answer:

50. The mean amount spent by a family of four on food per month is \$500 with a standard deviation of \$75. Assuming that the food costs are normally distributed, what is the probability that a family spends less than \$410 per month?

- A) 0.2158
- B) 0.8750
- C) 0.0362
- D) 0.1151

Answer:

51. Which of the following is NOT a characteristic of the normal probability distribution?

- A) Positively-skewed
- B) Bell-shaped
- C) Symmetrical
- D) Asymptotic

Answer:

52. What is the proportion of the total area under the normal curve within plus and minus two standard deviations of the mean?

- A) 68%
- B) 99.7%
- C) 34%
- D) 95%

Answer:

53. The mean score of a college entrance test is 500; the standard deviation is 75. The scores are normally distributed. What percent of the students scored below 320?

- A) About 50.82%
- B) About 34.13%
- C) About 7.86%
- D) About 0.82%

Answer:

54. The mean of a normally distributed group of weekly incomes of a large group of executives is \$1,000 and the standard deviation is \$100. What is the z-score for an income of \$1,100?

- A) 1.00
- B) 2.00
- C) 1.683
- D) -0.90

Answer:

55. A new extended-life light bulb has an average service life of 750 hours, with a standard deviation of 50 hours. If the service life of these light bulbs approximates a normal distribution, about what percent of the distribution will be between 600 hours and 900 hours?

- A) 95%
- B) 68%
- C) 34%
- D) 99.7%

Answer:

56. A study of a company's practice regarding the payment of invoices revealed that an invoice was paid an average of 20 days after it was received. The standard deviation equaled five days. Assuming that the distribution is normal, what percent of the invoices were paid within 15 days of receipt?

- A) 15.87%
- B) 37.91%
- C) 34.13%
- D) 86.74%

Answer:

57. An accelerated life test on a large number of type-D alkaline batteries revealed that the mean life for a particular use before they failed is 19.0 hours. The distribution of the lives approximated a normal distribution. The standard deviation of the distribution was 1.2 hours. About 95.44 percent of the batteries failed between what two values?

- A) 8.9 and 18.9
- B) 12.2 and 14.2
- C) 14.1 and 22.1
- D) 16.6 and 21.4

Answer:

58. The mean of a normal distribution is 400 pounds. The standard deviation is 10 pounds. What is the area between 415 pounds and the mean of 400 pounds?

- A) 0.5000
- B) 0.1932
- C) 0.4332
- D) 0.3413

Answer:

59. The distribution of the annual incomes of a group of middle management employees approximated a normal distribution with a mean of \$37,200 and a standard deviation of \$800. About 68 percent of the incomes lie between what two incomes?

- A) \$30,000 and \$40,000
- B) \$36,400 and \$38,000
- C) \$34,800 and \$39,600
- D) \$35,600 and \$38,800

Answer:

60. Which of the following is true in a normal distribution?

- A) Mean equals the mode and the median
- B) Mode equals the median
- C) Mean divides the distribution into two equal parts
- D) All of the above are correct

Answer:

61. Tables of normal distribution probabilities are found in many statistics books. These probabilities are calculated from a normal distribution with

- A) a mean of 1 and a standard deviation of 1
- B) a mean of 100 and a standard deviation of 15
- C) a mean of 0 and a standard deviation of 15
- D) a mean of 0 and a standard deviation of 1

Answer:

62. Two normal distributions are compared. One has a mean of 10 and a standard deviation of 10. The second normal distribution has a mean of 10 and a standard deviation of 2. Which of the following is true?

- A) the locations of the distributions are different
- B) the distributions are from two different families
- C) the dispersions of the distributions are different
- D) the dispersions of the distributions are the same

Answer:

63. A random variable from an experiment where outcomes are normally distributed

- A) can have any value between $-\infty$ and $+\infty$
- B) can have only a few discrete values
- C) can have a mean of 0 and a standard deviation of 1
- D) can have no values

Answer:

64. The total area of a normal probability distribution is

- A) between -3.0 and 3.0
- B) 1.00
- C) dependent on a value of 'z'.
- D) approximated by the binomial distribution.

Answer:

65. An area of a normal probability distribution represents

- A) a permutation
- B) a combination
- C) a likelihood
- D) a shaded area

Answer:

66. The standard normal probability distribution is one which has:

- A) A mean of 1 and any standard deviation
- B) Any mean and a standard deviation of 1
- C) A mean of 0 and any standard deviation
- D) A mean of 0 and a standard deviation of 1

Answer:

67. The weekly mean income of a group of executives is \$1000 and the standard deviation of this group is \$100. The distribution is normal. What percent of the executives have an income of \$925 or less?

- A) About 15%
- B) About 85%
- C) About 50%
- D) About 23%

Answer:

68. The weight of cans of fruit is normally distributed with a mean of 1,000 grams and a standard deviation of 50 grams. What percent of the cans weigh 860 grams or less?

- A) 0.0100
- B) 0.8400
- C) 0.0026
- D) 0.0001

Answer:

69. What is the distribution with a mean of 0 and a standard deviation of 1 called?

- A) Frequency distribution
- B) z-score
- C) Standard normal distribution
- D) Binomial probability distribution

Answer:

70. The seasonal output of a new experimental strain of pepper plants was carefully weighed. The mean weight per plant is 15.0 pounds, and the standard deviation of the normally distributed weights is 1.75 pounds. Of the 200 plants in the experiment, how many produced peppers weighing between 13 and 16 pounds?

- A) 100
- B) 118
- C) 197
- D) 53

Answer:

71. Ball-Bearings, Inc. produces ball bearings automatically on a Kronar BBX machine. For one of the ball bearings, the mean diameter is set at 20.00 mm (millimeters). The standard deviation of the production over a long period of time was computed to be 0.150 mm. What percent of the ball bearings will have diameters 20.27 mm or more?

- A) 41.00%
- B) 12.62%
- C) 3.59%
- D) 85.00%

Answer:

72. A national manufacturer of unattached garages discovered that the distribution of the lengths of time it takes two construction workers to erect the Red Barn model is approximately normally distributed with a mean of 32 hours and a standard deviation of 2 hours. What percent of the garages take between 30 and 34 hours to erect?

- A) 16.29%
- B) 76.71%

- C) 3.14%
- D) 34.13%

Answer:

73. A large manufacturing firm tests job applicants who recently graduated from college. The test scores are normally distributed with a mean of 500 and a standard deviation of 50. Management is considering placing a new hire in an upper level management position if the person scores in the upper 6 percent of the distribution. What is the lowest score a college graduate must earn to qualify for a responsible position?

- A) 50
- B) 625
- C) 460
- D) 578

Answer:

74. An analysis of the grades on the first test in History 101 revealed that they approximate a normal curve with a mean of 75 and a standard deviation of 8. The instructor wants to award the grade of A to the upper 10 percent of the test grades. What is the dividing point between an A and a B grade?

- A) 80
- B) 85
- C) 90
- D) 95

Answer:

75. The annual commissions per salesperson employed by a manufacturer of light machinery averaged \$40,000 with a standard deviation of \$5,000. What percent of the sales persons earn between \$32,000 and \$42,000?

- A) 60.06%
- B) 39.94%
- C) 34.13%
- D) 81.66%

Answer:

76. The mean of a normal probability distribution is 500 and the standard deviation is 10. About 95 percent of the observations lie between what two values?

- A) 475 and 525
- B) 480 and 520
- C) 400 and 600
- D) 350 and 650

Answer:

77. A cola-dispensing machine is set to dispense a mean of 2.02 liters into a container labeled 2 liters. Actual quantities dispensed vary and the amounts are normally distributed with a standard deviation of 0.015 liters. What is the probability a container will have less than 2 liters?

- A) 0.0918
- B) 0.3413
- C) 0.1926
- D) 0.8741

Answer:

78. The employees of Cartwright Manufacturing are awarded efficiency ratings. The distribution of the ratings approximates a normal distribution. The mean is 400, the standard deviation 50. What is the area under the normal curve between 400 and 482?

- A) 0.5000
- B) 0.4495
- C) 0.3413
- D) 0.4750

Answer:

79. Suppose a tire manufacturer wants to set a mileage guarantee on its new XB 70 tire. Tests revealed that the tire's mileage is normally distributed with a mean of 47,900 miles and a standard deviation of 2,050 miles. The manufacturer wants to set the guaranteed mileage so that no more than 5 percent of the tires will have to be replaced. What guaranteed mileage should the manufacturer announce?

- A) 44,528
- B) 32,960
- C) 49,621
- D) 40,922

Answer:

80. The mean amount of gasoline and services charged by Key Refining Company credit customers is \$70 per month. The distribution of amounts spent is approximately normal with a standard deviation of \$10. What is the probability of selecting a credit card customer at random and finding the customer charged between \$70 and \$83?

- A) 0.1962
- B) 0.4032
- C) 0.3413
- D) 0.4750

Answer:

81. Management is considering adopting a bonus system to increase production. One suggestion is to pay a bonus on the highest 5 percent of production based on past experience. Past records indicate that, on the average, 4,000 units of a small assembly are produced during a week. The distribution of the weekly production is approximately normally distributed with a standard deviation of 60 units. If the bonus is paid on the upper 5 percent of production, the bonus will be paid on how many units or more?

- A) 6255
- B) 5120
- C) 3196
- D) 4099

Answer:

Fill-in-the-Blank

82. About what percent of the area under the normal curve is within plus two and minus two standard deviation of the mean? _____

Answer:

83. What is a graph of a normal probability distribution called? _____

Answer:

84. In a standard normal distribution, $\mu =$ _____ and $\sigma =$ _____.

Answer:

85. What type of probability distribution is the normal distribution? _____

Answer:

86. What is the formula to convert any normal distribution to the standard normal distribution?

Answer

87. In what units does the standardized z value measure distance from the mean?

Answer:

88. What proportion of the area under a normal curve is to the right of a z-score of zero? _____

Answer:

89. The mean of a normal probability distribution is 60 and the standard deviation is 5. What percent of observations are between 50 and 70? _____ %

Answer:

90. What does a z value of -2.00 indicate about the corresponding X value? _____

Answer:

91. One of the properties of the normal curve is that it gets closer to the horizontal axis, but never touches it. What is this property of the normal curve called? _____

Answer

92. What proportion of the area under a normal curve is to the right of $z = -1.21$? _____

Answer:

93. What proportion of the area under a normal curve is to the left of $z = 0.50$? _____

Answer:

94. What proportion of the area under a normal curve is to the left of $z = -2.10$? _____

Answer

95. A statistics student receives a grade of 85 on a statistics midterm. If the corresponding z-score equals $+1.5$ and the standard deviation equals 7, what is the average grade on this exam? _____

Answer:

Use the following to answer questions 96-105:

A major credit card company has determined that customers charge between \$100 and \$1100 per month. Given that the average monthly amount charged is uniformly distributed, answer the following questions.

96. What is the average monthly amount charged? _____

Answer:

97. What is the standard deviation of the monthly amount charged? _____

Answer:

98. What percent of monthly charges are equal to \$500? _____

Answer:

99. What percent of monthly charges are between \$600 and \$889? _____

Answer:

100. What percent of monthly changes are between \$311 and \$889? _____

Answer:

101. What percent of monthly charges is less then \$100? _____

Answer:

102. What percent of monthly charges are between \$100 and \$1100? _____

Answer:

103. What is the probability that a person charges less than \$200 per month? _____

Answer: 0

104. What is the 3rd quartile of the distribution? _____

Answer:

105. 75% of all monthly charges are greater than _____?

Answer: \$

Use the following to answer questions 106-114:

A financial advising company has determined that the price-to-earnings ratios for 20 randomly selected publicly traded companies range between 0.9 and 2.9. Given that the price-to-earnings ratios are uniformly distributed, answer the following questions.

106. What is the average price-to-earnings ratio? _____

Answer:

107. What is the standard deviation of the price-to-earnings ratio? _____

Answer

108. What percent of price-to-earnings ratios are equal to 2.58? _____

Answer:

109. What percent of price-to-earnings ratios are between 1.90 and 2.48? _____

Answer

110. What percent of price-to-earnings ratios are between 1.32 and 2.48? _____

Answer:

111. What percent of price-to-earnings ratios are less than 0.9? _____

Answer:

112. What percent of price-to-earnings ratios are between .9 and 2.9? _____

Answer:

113. What is the probability that a price-to-earnings ratio is less than 2.1? _____

Answer:

114. What is the 3rd quartile of the distribution? _____

Answer:

115. 75% of all price-to-earnings ratios are greater than _____?

Answer:

Use the following to answer questions 116-121:

A sample of 500 evening students revealed that their annual incomes from employment in industry during the day were normally distributed with a mean income of \$30,000 and a standard deviation of \$3,000.

116. How many students earned more than \$30,000? _____

Answer:

117. How many students earned between \$27,000 and \$33,000? _____

Answer:

118. How many students earned between \$24,000 and \$30,000? _____

Answer:

119. How many students earned between \$20,000 and \$40,000? _____

Answer:

120. How many students earned less than \$22,500? _____

Answer:

121. How many students earned more than \$36,000? _____

Answer:

Use the following to answer questions 122-128:

The weight of a bag of corn chips is normally distributed with a mean of 22 ounces and a standard deviation of $\frac{1}{2}$ ounces.

122. What is the probability that a bag of corn chips is less than 20 ounces? _____

Answer: 0

123. What is the probability that a bag of corn chips weighs more than 21 ounces? _____

Answer: 0

124. What is the probability that a bag of corn chips is weighs more than 23 ounces? _____

Answer:

125. What is the probability that a bag of corn chips weighs less than 24 ounces? _____

Answer:

126. What is the probability that a bag of corn chips weighs between 20.75 and 23.25 ounces? _____

Answer:

127. What is the probability that a bag of corn chips weighs 22.25 ounces? _____

Answer:

128. What is the probability that a bag of corn chips weighs between 21.75 and 22.25 ounces? _____

Answer:

Use the following to answer questions 129-131:

Two business major students, in two different sections of economics, were comparing test scores. The following gives the students scores, class mean, and standard deviation for each section.

Section	Score	μ	σ
1	84	75	7
2	75	60	8

129. Which student scored better compared to the rest of the section? _____

Answer

130. What is the z-score of the student from section 1? _____

Answer:

131. What is the z-score of the student from section 2? _____

Answer:

Multiple Choices

Use the following to answer questions 132-134:

The average score of 100 students taking a statistics final was 70 with a standard deviation of 7.

132. Assuming a normal distribution, approximately how many scored 90 or higher?

- A) 0.4979
- B) 0.0021
- C) 0.9979
- D) 2.86

Answer:

133. Assuming a normal distribution, approximately how many scored less than 60?

- A) 0.2271
- B) 0.3729
- C) 0.8929
- D) -1.14
- E) None of the above

Answer:

134. Assuming a normal distribution, approximately how many scored greater than 65?

- A) 0.2611
- B) 0.2389
- C) 0.7611
- D) -0.714

Answer:

Use the following to answer questions 135-138:

Bottomline Ink, a forms management company, fills 100 orders a day with a 2% error rate in the completed orders. Assume this to be a binomial distribution.

135. What is the mean for this distribution?

- A) 0.02
- B) 1.4
- C) 2
- D) There is no mean for this type of distribution.

Answer:

136. What is the standard deviation for this distribution?

- A) 0.02
- B) 4
- C) 2
- D) There is no standard deviation for this type of distribution.

Answer:

137. What is the probability that there will be more than 5 order errors in a given day?

- A) 0.1894 B Difficulty: Medium Goal: 8
- B) 0.4838
- C) 0.9838
- D) 2.1428

Answer:

138. The probability of less than 1 order error in a given day is

- A) 0.7143.
- B) 0.3520
- C) 0.2611.
- D) 2.7611.

Answer:

Fill-in-the-Blank

139. How is the expected value of a uniform distribution computed? _____

Answer

140. How is the standard deviation of a uniform distribution computed?

Answer:

141. How is the expected value of a normal distribution computed?

Answer:

142. How is the standard deviation of a normal distribution computed?

Answer:

Essay

143. Identify two similarities of the uniform and normal distributions?

Answer:

144. For a binomial distribution with both $n\pi$ and $n\pi(1 - \pi)$ greater than 5, what can we conclude about the characteristics of the distribution?

Answer: