Name_____ Course Number:_____ Section Number:_____

Directions: Answer the questions in the spaces provided, or attach paper. Circle the correct choice for each response set. If required, show calculations in the blank spaces near the problems.

Provide an appropriate response.

1) If selecting samples of size n > 30 from a population with a known mean and standard deviation, what requirement, if any, must be satisfied in order to assume that the distribution of the sample means is a normal distribution?

   A) None; the distribution of sample means will be approximately normal.

   B) The population must have a standard deviation of 0.

   C) The mean must be equal to the standard deviation.
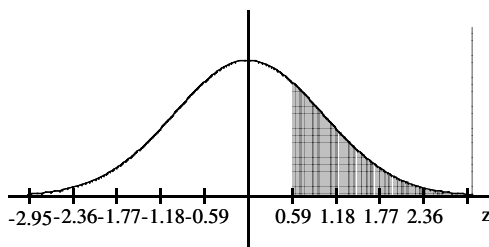
   D) The population must have a normal distribution.

Using the following uniform density curve, answer the question.
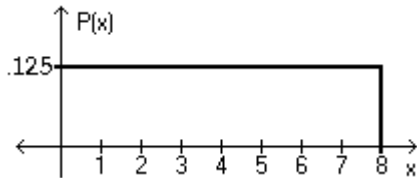
2) What is the probability that the random variable has a value less than 7?

   A) 0.625   B) 0.875   C) 1.000   D) 0.750

Find the area of the shaded region. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.
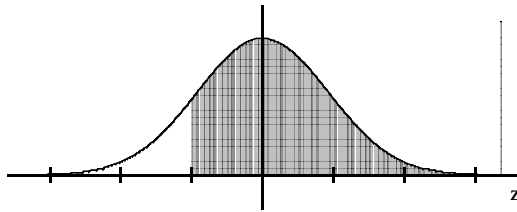
3)

   A) 0.2190   B) 0.2224   C) 0.7224   D) 0.2776

Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

4) Shaded area is 0.8599.

    A) –1.08   B) –0.98   C) 1.08   D) 0.98

If z is a standard normal variable, find the probability.

5) The probability that z is greater than –1.82

   A) 0.4656   B) –0.0344   C) 0.0344   D) 0.9656

Solve the problem.

6) For a standard normal distribution, find the percentage of data that are between 3 standard deviations below the mean and 1 standard deviation above the mean.

    A) 84.00%   B) 16.00%   C) 15.74%   D) 99.74%

Provide an appropriate response.

7) Find the indicated IQ score. The graph depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test).
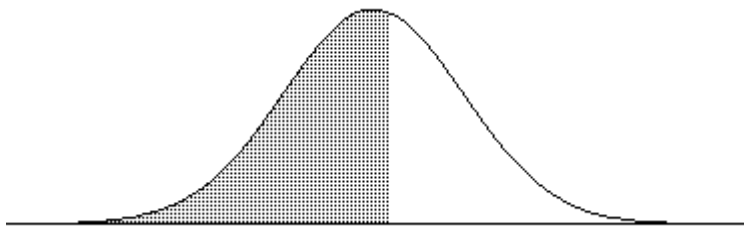
The shaded area under the curve is 0.5675.

    A) 102.6   B) 97.5   C) 110.7   D) 129.6

Solve the problem. Round to the nearest tenth unless indicated otherwise.

8) Scores on a test are normally distributed with a mean of 65.3 and a standard deviation of 10.3. Find P_{81}, which separates the bottom 81% from the top 19%.

    A) 68.3   B) 74.4   C) 0.88   D) 0.291

Find the indicated probability.

9) The incomes of trainees at a local mill are normally distributed with a mean of $1100 and a standard deviation of $150. What percentage of trainees earn less than $900 a month?

    A) 40.82%   B) 90.82%   C) 9.18%   D) 35.31%

Provide an appropriate response.

10) A recent survey based on a random sample of n = 470 voters, predicted that the Independent candidate for the mayoral election will get 24% of the vote, but he actually gets 27%. Can it be concluded that the survey was done incorrectly?

Solve the problem.

11) The annual precipitation amounts in a certain mountain range are normally distributed with a mean of 91 inches, and a standard deviation of 14 inches. What is the probability that the mean annual precipitation during 49 randomly picked years will be less than 93.8 inches?

A) 0.4192   B) 0.5808   C) 0.9192   D) 0.0808

12) A bank's loan officer rates applicants for credit. The ratings are normally distributed with a mean of 200 and a standard deviation of 50. If 40 different applicants are randomly selected, find the probability that their mean is above 215.

A) 0.3821   B) 0.4713   C) 0.1179   D) 0.0287

13) A final exam in Math 160 has a mean of 73 with standard deviation 7.8. If 24 students are randomly selected, find the probability that the mean of their test scores is greater than 71.

A) 0.8962   B) 0.9012   C) 0.0008   D) 0.5036

The given values are discrete. Use the continuity correction and describe the region of the normal distribution that corresponds to the indicated probability.

14) The probability of at least 49 boys

A) The area to the right of 49   B) The area to the left of 48.5

C) The area to the right of 48.5   D) The area to the right of 49.5

15) The probability of no more than 71 defective CD's

A) The area to the left of 71   B) The area to the right of 71.5

C) The area to the left of 70.5   D) The area to the left of 71.5

For the binomial distribution with the given values for n and p, state whether or not it is suitable to use the normal distribution as an approximation.

16) n = 15 and p = 0.2

A) Normal approximation is not suitable.

B) Normal approximation is suitable.

Estimate the indicated probability by using the normal distribution as an approximation to the binomial distribution.

    17) A product is manufactured in batches of 120 and the overall rate of defects is 5%. Estimate the probability that a randomly selected batch contains more than 6 defects.

   A) 0.5871   B) 0.4641   C) 0.0832   D) 0.4168

Use the normal distribution to approximate the desired probability.

    18) A coin is tossed 20 times. A person, who claims to have extrasensory perception, is asked to predict the outcome of each flip in advance. She predicts correctly on 16 tosses. What is the probability of being correct 16 or more times by guessing? Does this probability seem to verify her claim?

        A) 0.0069, yes   B) 0.4931, no   C) 0.4931, yes   D) 0.0069, no

Solve the problem.

    19) A normal quartile plot is given below for the weekly incomes (in dollars) of a sample of engineers in one town. Use the plot to assess the normality of the incomes of engineers in this town. Explain your reasoning.
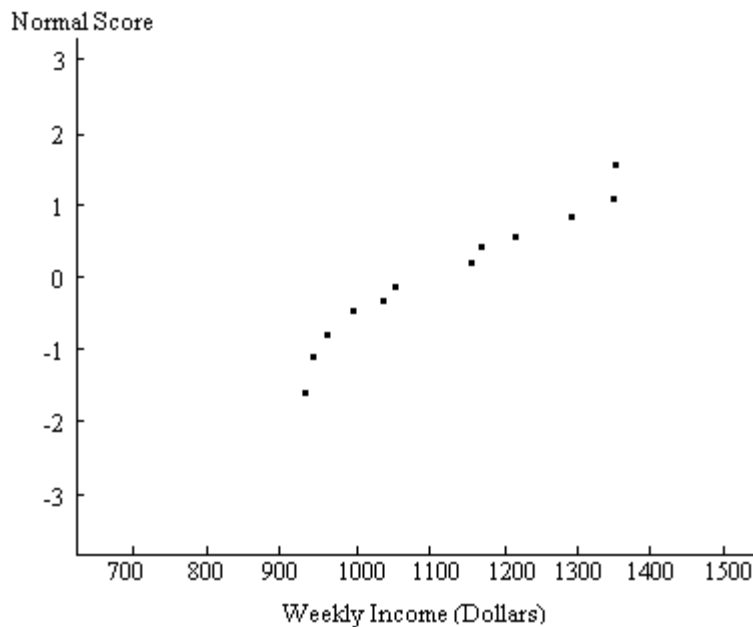
Examine the given data set and determine whether the requirement of a normal distribution is satisfied. Assume that the requirement for a normal distribution is loose in the sense that the population distribution need not be exactly normal, but it must have a distribution which is basically symmetric with only one mode. Explain why you do or do not think that the requirement is satisfied.

20) The heart rates (in beats per minute) of 30 randomly selected students are given below. (Hint: Use computer assistance.)

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78  64  69  75  80
63  70  72  72  68
77  71  74  84  70
62  67  71  69  58
74  70  80  63  88
60  68  69  70  71
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1) A
2) B
3) D
4) A
5) D
6) A
7) A
8) B
9) C
10) No, because of sampling variability, sample proportions will naturally vary from the true population proportion, even if sampling is done with a perfectly valid procedure.
11) C
12) D
13) A
14) C
15) D
16) A
17) D
18) A
19) Since the normal quartile plot displays curvature, it appears that incomes of engineers in this town are probably not normally distributed.
20) The requirement for normality is satisfied since a histogram of the data is roughly bell-shaped; it is roughly symmetric with a single mode. Further, STATDISK's Ryan-Joiner test shows data points closely fit to the line in the normal quantile plot.