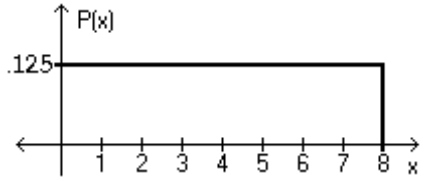
Review 3

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Using the following uniform density curve, answer the question.



1) What is the probability that the random variable has a value less than 6? 1) _____

A) 0.500 B) 0.875 C) 0.750 D) 0.625

Assume that the weight loss for the first month of a diet program varies between 6 pounds and 12 pounds, and is spread evenly over the range of possibilities, so that there is a uniform distribution. Find the probability of the given range of pounds lost.

2) Less than 9 pounds 2) _____

A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{1}{6}$ D) $\frac{5}{7}$

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

3) The probability that Z lies between 0.7 and 1.98 3) _____

A) 0.2175 B) 0.2181 C) 1.7341 D) -0.2181

The Precision Scientific Instrument Company manufactures thermometers that are supposed to give readings of 0°C at the freezing point of water. Tests on a large sample of these thermometers reveal that at the freezing point of water, some give readings below 0°C (denoted by negative numbers) and some give readings above 0°C (denoted by positive numbers). Assume that the mean reading is 0°C and the standard deviation of the readings is 1.00°C. Also assume that the frequency distribution of errors closely resembles the normal distribution. A thermometer is randomly selected and tested. Find the temperature reading corresponding to the given information.

4) If 7% of the thermometers are rejected because they have readings that are too high, but all other thermometers are acceptable, find the temperature that separates the rejected thermometers from the others. 4) _____

A) 1.39° B) 1.26° C) 1.45° D) 1.48°

Find the indicated probability.

5) The volumes of soda in quart soda bottles are normally distributed with a mean of 32.3 oz and a standard deviation of 1.2 oz. What is the probability that the volume of soda in a randomly selected bottle will be less than 32 oz? 5) _____

A) 0.4013 B) 0.3821 C) 0.0987 D) 0.5987

Solve the problem.

6) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 74 inches, and a standard deviation of 12 inches. What is the probability that the mean annual snowfall during 36 randomly picked years will exceed 76.8 inches? 6) _____

A) 0.0808 B) 0.5808 C) 0.0026 D) 0.4192

Use the normal distribution to approximate the desired probability.

7) Merta reports that 74% of its trains are on time. A check of 60 randomly selected trains shows that 38 of them arrived on time. Find the probability that among the 60 trains, 38 or fewer arrive on time. Based on the result, does it seem plausible that the "on-time" rate of 74% could be correct? 7) _____

A) .0409 , no B) .0409 , yes C) .0316 , no D) .0316 , yes

Solutions

Problem 1

The probability in question is the area of the rectangle with base 6 and height 0.125 which is 0.750. The correct answer is "C".

Problem 2

Because the distribution is uniform the probability that the loss of weight will be less than 9 pounds, i.e. between 6 and 9 pounds will be ½ of the total probability that the loss of weight is between 6 and 12 pounds. The correct answer is "B".

Problem 3

We use Table A-2 (page 773, or between pages 62 and 63). From this table we find that the area under the standard normal curve to the left of 1.98 is 0.9761 and the Area to the left of 0.70 is 0.7580. The area we are interested in is the difference of these two areas: 0.9761 – 0.7580 = 0.2181. The correct answer is "B".

Problem 4

By the conditions of the problem the temperature has standard normal distribution. Let the temperature we are looking for be *z*; then the area under the standard normal curve to the right of *z* is 0.07 whence the area to the left of *z* is 0.93. The closest to 0.93 value of the area in Table A-2 is 0.9306 which corresponds to *z* = 1.48. The correct answer is "D".

Problem 5

The *z*-score of 32 can be computed as

$$z = \frac{32 - \mu}{\sigma} = \frac{32 - 32.3}{1.2} = -0.25$$

From Table A-2 we see that the area under the standard normal curve to the left of -0.25 is .4013. The correct answer is "A".

Problem 6

We use the formulas from page 282 for the mean and standard deviation of the sample means for random samples of size *n*.

$$\mu_{\bar{x}} = \mu = 74,$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{36}} = 2.$$

The *z*-score of 76.8 is

$$z = \frac{76.8 - 74}{2} = 1.40.$$

The area under the standard normal curve to the right of 1.40 is (from Table A-2) 1 – 0.9192 = 0.0808. The correct answer is "A".

Problem 7

We deal here with the binomial distribution with the parameters $p = 0.74$ and $n = 60$

Then $np = 44.4$ and $n(1-p) = 15.6$ **and therefore we can apply normal approximation to binomial distribution. The parameters of the approximating normal distribution are**

$$\mu = np = 44.4, \quad \sigma = \sqrt{np(1-p)} = \sqrt{60 \bullet .74 \bullet .26} \approx 3.398.$$

Using the continuous correction factor we see that we need the area under the normal curve with these parameters and to the left of 38.5. The z**-score of 38.5 is**

$$z = \frac{38.5 - 44.4}{3.398} \approx -1.74.$$

From the Table A-2 we find the area under the standard normal curve to the left of -1.74 to be .0409, about 4%. Thus, the Merta's claim does not seem very plausible. The correct answer is "A".