

Math 14, Chapters 7 and 8  
Practice Test Questions

**Questions 1 – 2**

Know the following characteristics of the distribution curve of the sample means of any distribution:

- The area under the curve is always 1.
- The tails never touch the axis.
- The curve is symmetric.
- The mean, median, and mode are equal.
- The mean is equal to the mean of the population,  $\mu$ .
- The standard deviation is equal to  $\frac{\sigma}{\sqrt{n}}$ .

**Questions 3 – 5**

Know the following characteristics of a confidence interval:

- CL represents the confidence level
- $\alpha$  represents the area under the tails
- $\alpha = 1 - \text{CL}$
- The higher the confidence, the larger the interval
- The larger the sample size, the higher the confidence
- The error bound is  $z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}}$ .

6. The length of songs in a collector's iTunes album collection is uniformly distributed from 2.1 to 4.3 minutes. Suppose we randomly pick 16 songs from the collection.

(a) Complete the summary notation for this distribution ( $X \sim U(a, b)$ ).

$$X \sim \underline{\hspace{2cm}} (\underline{\hspace{2cm}}, \underline{\hspace{2cm}})$$

(b) For this distribution (to 5 decimal places *x.xxxxx*)

$$\mu = \frac{a+b}{2} = \underline{\hspace{2cm}} \quad \sigma = \sqrt{\frac{(b-a)^2}{12}} = \underline{\hspace{2cm}}$$

(c) Complete the summary notation for the distribution of sample means

( $\bar{X} \sim N(\mu, \frac{\sigma}{\sqrt{n}})$ ). (Round to 4 decimal places *x.xxxx*)

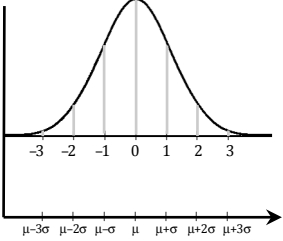
$$\bar{X} \sim \underline{\hspace{2cm}} (\underline{\hspace{2cm}}, \underline{\hspace{2cm}})$$

(d) What is the probability that the mean of the 16 songs is less than 3.3?

Step 1		Step 3
Identify the variable values	Label the $X$ -axis with $X_U$ , label the $z$ -axis with $z_U$ , shade the appropriate region	Use the $z$ -table or statistics calculator to find the associated area under the normal curve. Round to the nearest thousandth.
$\bar{X}_U = \quad \mu =$  $n = \quad \sigma =$		
Step 2		Step 4
Find $z_U = \frac{\bar{X}_U - \mu}{\frac{\sigma}{\sqrt{n}}}$		Find the desired probability
		$P(X < \quad )$ $= P(z < \quad )$  $=$

7. Recently, a random sample of 16 cars from a large community got a mean mileage of 28.5 mpg per vehicle. The population standard deviation is 4.3 mpg per vehicle. Estimate the true mean gas mileage with 98% confidence.

Round your answer to the nearest tenth.

Step 1	Step 2
<p>(Round to 3 decimal places. x.xxx)</p> <p><math>n =</math>                      <math>CL =</math></p> <p><math>\frac{\sigma}{\sqrt{n}} =</math>                      <math>\alpha =</math></p>	<p>Use the <math>z</math>-table or a statistics calculator (invNorm function) to find: (Round to 2 decimal places. x.xx)</p> <p><math>z_{\frac{\alpha}{2}} =</math></p> <p><math>z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}} =</math></p>
<p>Shade approximately 98% of the area under the curve centered about the mean and label the <math>x</math>-axis with the confidence interval boundaries.</p> 	<p style="text-align: center;"><b>Step 3</b></p> <p style="text-align: center;">Find the confidence interval such that</p> $P\left(\bar{X} - z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right) < \mu < \bar{X} + z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)\right) = CL$ <p>The 98% confidence interval for the mean is</p> <p style="text-align: center;">(                      ,                      )</p>

8. How large a sample is needed to estimate the true mean gas mileage within 1 mpg of the true population mean with a 98% confidence?

Use the formula:  $E = z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$