Study Guide for Chapter 7

Study section 7.1 for the basics of continuous random variables and how they differ from discrete random variables.

Normal Distribution

Study Sections 7.2 through 7.5. Ignore the mechanics of how the book solves the examples using a table; instead, make sure you understand the business meaning of each example, and use the following solution methods. I give the Excel mechanics below.

Study Sections 7.2 through 7.5 but use the Excel methods below instead of the table methods in the book.

Section 7.2 The Normal probability Distribution

Example 2: \[P(2,000 \text{ hours} < X < 2,400 \text{ hours} \mid \mu = 2,000 \text{ hours}, \sigma = 200 \text{ hours})\]
\[= P(X < 2,400 \text{ hours} \mid \mu = 2,000 \text{ hours}, \sigma = 200 \text{ hours}) - P(X < 2,000 \text{ hours} \mid \mu = 2,000 \text{ hours}, \sigma = 200 \text{ hours})\]

Excel: \[=\text{NORMDIST}(2400,2000,200,\text{TRUE})-\text{NORMDIST}(2000,2000,200,\text{TRUE})\]

Example 3: \[P(X > 2,400 \text{ hours} \mid \mu = 2,000 \text{ hours}, \sigma = 200 \text{ hours})\]
\[= 1 - P(X > 2,200 \text{ hours} \mid \mu = 2,000 \text{ hours}, \sigma = 200 \text{ hours})\]

Excel: \[=1-\text{NORMDIST}(2200,2000,200,\text{TRUE})\]

Section 7.3 Percentile points for Normally Distributed Variables

Example 4: 90th percentile of standard normal by Excel: \[=\text{NORMINV}(0.90,0,1)\]

Example 5: 10th percentile of component life by Excel: \[=\text{NORMINV}(0.10,2000,200)\]

Section 7.4 Normal Approximation of Binomial Probabilities

Example 7: \[P(X \geq 10 \text{ purchases} \mid n = 30 \text{ prospects}, 0.20 \text{ chance of purchase for each prospect})\]

= \[1 - P(X \leq 9 \text{ purchases} \mid n = 30 \text{ prospects}, 0.20 \text{ chance of purchase for each prospect})\]

Exact binomial probability \[=1-\text{BINOMDIST}(9,30,.20,\text{TRUE})\]
Normal Approximation \[=1-\text{NORMDIST}(9.5,(30*0.20),\sqrt{30*.02*0.80},\text{TRUE})\]

Section 7.5 Normal Approximation of Poisson Probabilities

Example 8: \[P(X > 15 \text{ calls tomorrow} \mid \text{average calls per day} = 10)\]

= \[1 - P(X \leq 15 \text{ calls tomorrow} \mid \text{average calls per day} = 10)\]

Exact Poisson probability \[=1-\text{POISSON}(15,10,\text{TRUE})\]
Normal Approximation \[=1-\text{NORMDIST}(15.5,10,\sqrt{10})\]
Chapter 7, continued

Exponential Probability Distribution

Section 7.6 Exponential Probability Distribution
The exponential probability distribution is the flip side of the Poisson distribution. Poisson gives the probability of n events in a specified period of time or distance in space. Exponential gives the probability the next event occurs within a specified period of time or distance in space.

We will not be calculating exponential probabilities; just be sure you know what it's FOR.

Solved Problems

Think about why the scenarios (NOT the math!) for the normal solved problems and the exponential solved problems are similar within categories but different between categories including the three categories in chapter six.

Then look over the numerical solutions on the website. (Not the exponential ones.) Try to duplicate at least some of them.
Study Guide for Chapter 8, Sect. 8.1-8.5

Sampling Distributions

Study Section 8.1 Point Estimation of a Population Parameter or Process Parameter
\( \bar{x} \) versus \( \mu \), \( \sigma \) versus \( s \), \( \sigma_{\bar{x}} \) versus \( s_{\bar{x}} \)

Study Section 8.2 The Concept of a Sampling Distribution
Population Distribution: unaffected by the sample size
Distribution of the Sample: an empirical distribution, resembles population distribution when \( n \) is large
Sampling Distribution of \( \bar{x} \): resembles normal distribution in \( n \) is large or if population distr. is normal

Study Section 8.3 Sampling Distribution of the Mean

Study Section 8.4 Central Limit Theorem

Study Section 8.5 Determining Probability Values for the Sample Mean
but use Excel rather than the tabular method for Examples

Example 6: \( P( \text{ sample mean} < $250 \mid \text{Population mean} = $260, \text{Population s.d } = $45, \text{sample size} n = 36 \text{ accounts} \)
\( P(\bar{x} \leq 250 \mid \mu_x = 260, \sigma_x = 45, n = 36) \)
\( =NORMDIST(250, 260, 45/\sqrt{36}) \)

Example 7: \( P( \text{ sample mean between $245 and $275 } \mid \text{Pop. mean } = $260, \text{Pop. s.d } = $45, \text{sample size } = 36 \text{ accounts} \)
\( P(\bar{x} \leq 275 \mid \mu_x = 260, \sigma_x = 45, n = 36) - P(\bar{x} \leq 245 \mid \mu_x = 260, \sigma_x = 45, n = 36) \)
\( =NORMDIST(275, 260, 45/\sqrt{36})-NORMDIST(245, 260, 45/\sqrt{36}) \)