

Suggested Answers for WarmUps for Lesson 16

Random Variable	Distribution	Parameters
Let X represent the price of gold in 100 days.	Uniformly distributed between \$420 and \$460	$E(X) = \$440$ $V(X) = 133$

1.	What is the probability that Y is between 0.7 and 1.2 pounds? Be sure to write your Excel command as well as your answer.
Answer	=NORMDIST(1.2,1,0.3,1)-NORMDIST(0.7,1,0.3,1) = 0.589
2.	A statistician is interested in discovering the distribution of sample means of X for n=10. Briefly describe how the statistician would achieve this goal.
Answer	The method used would be to take many samples of size n=10 from the population of gold prices. The mean of each sample would be calculated. The sample means would be plotted on a graph and descriptive statistics would be calculated for the means. A reasonable estimate of the distribution will be obtained; the more samples taken the easier it will be to see the distribution.
3.	Assuming that the process you described in the previous question has been followed for both X and Y, what is the distribution of X-bar (sample mean of X) and Y-bar (sample mean of Y)? You need to describe TWO different distributions here. Be complete.
Answer	$X \sim N(440, \text{SQRT}(133/10)=3.647)$ $Y \sim N(1, 0.3/\text{SQRT}(10) = 0.0949)$
4.	How would your results differ in the previous question if you worked with samples of size 50 instead? Be very specific.
Answer	$X \sim N(440, \text{SQRT}(133/50)=1.631)$ $Y \sim N(1, 0.3/\text{SQRT}(50) = 0.0424)$
5.	Using the information from question 3, where n=10, calculate the probability that is Y-bar is between 0.7 and 1.2 pounds. Include your Excel command.
Answer	=NORMDIST(1.2,1,0.0949,1)-NORMDIST(0.7,1,0.0949,1) = 0.9817
6.	Compare the results you obtained from question 1 and question 5. Are they different? Explain why or why not in no more than two sentences.

Answer	#1: 0.589 #5: 0.9817 The answers are clearly different, 5 is half again as large as 1. The difference is due to the different values for standard deviation and standard error. The distribution of the sample mean is much more compact and focused and thus more probability will be found over the same interval as the first problem
7.	Using Excel, calculate the probability that a bunch of grapes weighs between 0.7 and 1.2 pounds, when you only have $s = 0.5$, the sample standard deviation, calculated from a sample of 15 bunches of grapes. Include your Excel command as well as the result.
Answer	$t_{0.7} = \frac{0.7 - 1}{0.5} = -0.6 \quad t_{1.2} = \frac{1.2 - 1}{0.5} = 0.4$ $= 1 - (\text{TDIST}(0.4, 14, 1) + \text{TDIST}(0.6, 14, 1)) = 1 - \text{TDIST}(0.4, 14, 1) - \text{TDIST}(0.6, 14, 1) = 0.373357$
8.	Compare the results you obtained from 1 and 7. Are they different? Explain why or why not in no more than two sentences.
Answer	Normal: 0.589 t: 0.373 The area under the curve of the t distribution is much smaller over the same interval than the area under the curve of the normal. Two things account for the difference, the fact that the t distribution is being used but, more importantly the larger standard deviation from the sample, 0.5. Calculating the TDIST command using 0.3 for the standard deviation generates a probability of 0.575, much closer to the normal.