Possible Solutions for Homework 8
Econ 29000
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1. From Blackboard. For a Standard Normal distribution,
   a. what is the area to the right of -1.2? Find 1 – Normsdist(-1.2) = 0.885.
   b. what is the area to the left of 0.5? Normsdist(0.5) = .691.
   c. what is the area to the left of 1.3? Normsdist(1.3) = 0.903
   d. what is the area to the right of 2.1? 1 - Normsdist(2.1) = .018.
   e. what is the area in both tails farther than -1.7? 2 * Normsdist(-1.7) = .089.
   f. what is the area in both tails farther than -0.6? 2* Normsdist(-.6) = .549.
   g. what distance from the mean (in absolute value) leaves 0.4 in both tails? Normsinv(.20) = ± .84.
   h. what distance from the mean (in absolute value) leaves 0.16 in both tails? Normsinv(.08) = ± 1.41.
2. From Blackboard. For a Normal distribution,
   a. with mean 1 and standard deviation of 6, what is the area to the right of 8.2? Find Z = (8.2 – 1)/6 = 1.2 then 1 – Normsdist(1.2) = .115.
   b. with mean -8 and standard deviation of 1, what is the area to the right of -9.6? Z = (-9.6 – (-8))/1 = -1.6 then 1 – Normsdist(-1.6) = .945.
   c. with mean 3 and standard deviation of 5, what is the area in both tails farther from the mean (in absolute value) than -3.5? Z = (-3.5 – 3)/5 = -1.3 then 2*Normsdist(-1.3) = .194.
   d. with mean -12 and standard deviation of 3, what is the area in both tails farther from the mean (in absolute value) than -7.8? Z = (-7.8 – (-12))/3 = 1.4 then 2*Normsdist(-1.4) = .162.
   e. with mean -1 and standard deviation of 9 what values leave 0.25 in both tails? Find Normsinv(.125) so Z=±1.15 so the values are Z*9 – 1 = (-11.35, 9.35).
   f. with mean 11 and standard deviation of 7 what values leave 0.8 in both tails? Find Normsinv(.4) = ±.253. Convert these by Z*7 + 11 = (9.23, 11).

3. With the ATUS dataset, people 20-50 years old with positive earnings were selected and then grouped into "low-earning" (people in families with earnings below the 25th percentile) and "high-earning" (people in families with earnings above the 75th percentile). The following statistics, the sample average and sample standard deviation, were calculated by SPSS:

	hours watching TV per day		
	N	Average	Std Dev
low earnings	9372	2.31	2.40
high earnings	9503	1.90	2.01

   a. What is the difference in average time spent watching TV? For the null hypothesis of zero difference, form a hypothesis test and explain the result.

   The difference in TV time is 2.31 – 1.90 = 0.41. To form a hypothesis test against the null hypothesis of no difference, we need the standard error of the difference in means. First find the standard error of each mean; these are 2.4/sqrt(9372) = .025 and 2.01/sqrt(9503) = .021. The standard error of the difference is the square root of the sum of these two, squared, which is 0.032. Divide the difference in means by its

standard error to find Z = 12.72. The area in both tails farther from this value is approximately zero so we can reject the null hypothesis of no difference.

b. What is a confidence interval for the difference?

A confidence interval could be constructed as ±1.96σ, where σ is the standard error of the difference in means, so this is ±(1.96)(.032) = ±.063. So a 95% Confidence Interval for the difference in means is .(347, .473). Since this does not include zero we can again conclude that we can reject, with 95% certainty, the null hypothesis.

c. What is the p-value of the difference?

The p-value of the difference is approximately zero (found above).

4. SPSS produces the following output from the CPS data, a crosstab of income category with kids in the household. "Low family income" means that the reference person is in a family with income in the lowest quartile; middle means income in the next two quartiles; high is in the top quartile. Each household is classified with either no children, children under 6, or children under 18 but not under 6. (At 6 years old, children must start school.)

family income categories * children in hh categories Crosstabulation

Count

		children in hh categories			
		no kids	kids under 6	kids older than 6 but less than 18	Total
family income categories	low family income (less than 25th percentile)	8337	3115	3026	14478
	mid family income (25th - 75th percentile)	11988	7242	9299	28529
	high family income (more than 75th percentile)	6218	3407	5379	15004
Total		26543	13764	17704	58011

a. What is the marginal probability for a household with young (under 6 years old) children to have a high family income? What is the marginal probability for a household with young children to have a low family income?

The probability for a household to be high-income, conditional on having young kids is 24.75%; the probability for a household to be low-income, conditional on having young kids, is 22.63%.

b. What is the marginal probability for a household with a high family income to have children over 6 years old but under 18? What is the marginal probability for a household with low family income to have children over 6 years old but under 18?

The probability for a household to have older kids, conditional on having a high income, is 35.85%; the probability for a household to have older kids, conditional on having a low income, is 20.90%.

5. Using the ATUS dataset that we've been using in class (download from Blackboard), form a comparison of the mean amount of time spent on religious activities by two groups of people (you can define your own groups, based on any of race, ethnicity, gender, age, education, income, or other of your choice).
   a. What are the means for each group?
   b. What is the standard deviation of each mean? What is the standard error of each mean?
   c. What is a 95% confidence interval for each mean?
   d. Is the difference statistically significant? Explain carefully. What can be concluded from this?

Answers will vary.