Lab 4: Statistics 213 (L05) - Fall 2007

- To find the area above and below a z-value under the Standard Normal curve

---

- Turn on the computer and activate the MINITAB program

  Start ⇒ **Programs** ⇒ **MINITAB 14** ⇒ **MINITAB**

- a random variable Z, $\mathcal{N}(0, 1)$

  Calc $\Longrightarrow$ **Probability Distribution** $\Longrightarrow$ **Normal**

- To calculate a cumulative probability $P(Z \leq 4)$
  - click "cumulative probability";
  - Mean $\Longrightarrow$ type 0
  - Standard deviation $\Longrightarrow$ type 1
  - Input constant $\Longrightarrow$ type 4

  1. Given that Z is a standard normal random variable, compute the following probabilities:
     a. $P(-0.72 \leq Z \leq 0)$
     b. $P(-0.35 \leq Z \leq 0.35)$
     c. $P(-0.22 \leq Z \leq 1.87)$
     d. $P(Z \leq -1.02)$
     e. $P(Z \geq -0.88)$

- To find a z-value that corresponds to a probability of 0.95, $P(Z \leq z_0) = 0.95$
  - click "Inverse cumulative probability";
  - Mean $\Longrightarrow$ type 0
  - Standard deviation $\Longrightarrow$ type 1
  - Input constant $\Longrightarrow$ type 0.95

  2. Given that Z is a standard normal random variable, determine z_0 if it is known that:
     a. $P(-z_0 \leq Z \leq z_0) = 0.90$
     b. $P(Z \geq z_0) = 0.20$
     c. $P(-1.66 \leq Z \leq z_0) = 0.25$
     d. $P(Z \leq z_0) = 0.40$
     e. $P(z_0 \leq Z \leq 1.80) = 0.20$

3. A random variable X is normally distributed in such a way that $P(X \leq 10) = 0.0228$ and $P(X > 19.1125) = 0.05$. Find the mean and standard deviation of X.

4. A government agency would like to estimate the average family income in a city with a margin of error less than 1000 and at the 95% confidence level. Assuming that the standard deviation is $\sigma = 5,000$, Find the minimum sample size required to achieve the goal.

- Exit MINITAB: MINITAB will ask you if you want to save things, select NO

Solutions

---

1. (a). 0.2642, (b). 0.2736, (c). 0.5564, (d). 0.1539 (e) 0.8106
2. (a). 1.645 (b). 0.842 (c). -0.529 (d). -0.253 (e). 0.72
3. $\mu = 15$, $\sigma = 2.5$
4. $K = 1000$: margin of error, $\alpha = 0.05$, $z_{1-\alpha/2} = z_{0.975} = 1.96$, $\sigma = 5000$, $z_{0.975} \times \frac{5000}{\sqrt{n}} = 1000$, $n = 96.04 \approx 97$