

March 30, 2011  
It is E370 Time!!!

- ❑ Announcements
  - ✓ Sungjoo Yoon will hold a review session for the lab exam this evening in WY005 from 6:30 to 8:30 PM.
  - ✓ A peer tutor review session for the lab exam will be held this evening at 8:00 PM in BH308.
  
- ❑ A question to get you thinking:
  
- ❑ The number of cargo cars carried by freight trains on Sodor Island is a normally distributed random variable with a mean of 110 and a standard deviation of 40.
  - ✓ What is the maximum number of cargo cars carried by the middle 70% of freight trains?
  - ✓ If 64 trains are selected randomly, what is the probability that their mean number of cargo cars will be at most 112?
  - ✓ The Institute for Sodor Railroad Development reports that freight trains on Sodor Island carry 120 cargo cars. What is the Z-score of the number of cargo cars carried by a Sodor Island train?
  
- ❑ What will we do today?
  - ✓ Practice some exam-like questions.
  - ✓ Practice a little sample size calculation.
  - ✓ Consider an "ideal" confidence interval.
  - ✓ Determine factors that can affect confidence intervals.
  - ✓ Create a confidence interval for number of deaths per shift at a VA hospital.

- ✓ Perform a hypothesis test using the confidence interval.
- ✓ Consider the anatomy of hypotheses.
- ✓ Practice writing hypotheses.

- An important use of confidence intervals is calculating the minimum  $n$  for a particular level of confidence. We use the margin of error,  $e$ , to estimate  $n$ .

$$✓ \quad e = Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

Solve for  $n$ : 
$$n = \left( \frac{Z_{\frac{\alpha}{2}} \cdot \sigma}{e} \right)^2$$

- Lara Giddings, the attorney general for the island state of Tasmania, stated that Australian wallabies had been found creating crop circles in fields of poppies after consuming some of the opiate-laden crop and running in circles. In order to estimate the length of time the wallabies would run in circles after consuming poppies, a small study revealed a standard deviation of 5.2 minutes. At a level of 98%, what size sample is necessary to estimate the "mean circle time" for all wallabies within 30 seconds?

- Proportions work the same way

$$e = Z_{\frac{\alpha}{2}} * \sqrt{\frac{p(1-p)}{n}} \Rightarrow$$

$$n = p(1-p) \left( \frac{Z_{\frac{\alpha}{2}}}{e} \right)^2$$

- In 2008, when Doritos broadcast the first ever advertisement directed towards potential extra terrestrial life, 61% of UK residents sampled by BBC-Lite thought that regular communication with an alien species was an excellent idea. How many UK residents would need to be polled to estimate the proportion of UK residents who feel this way at a level of 99% to get an interval no wider than 5%?

- What do we want in a Confidence Interval?

- ✓ Precision! a function of ...
  - ✧ a high level of confidence
  - ✧ a narrow interval

- How do we get these?

- ✓ Three things affect the width of the interval
  - ✧ level of confidence
  - ✧ sample size
  - ✧ population standard deviation/population proportion
- ✓ Two are under our control
  - ✧ level of confidence
  - ✧ sample size

- How do they affect it?
  - ✓ Level of Confidence: *Ceteris paribus*, the higher the level of confidence, the wider the interval.
  - ✓ Sample Size,  $n$ : *Ceteris paribus*, the larger the sample size, the narrower the interval.
  - ✓ Population Standard Deviation/Population Proportion
    - ✧ *Ceteris paribus*, the larger the Population Standard Deviation, the wider the interval.
    - ✧ *Ceteris paribus*, as  $\pi$  approaches 0.5, the wider the interval.
- Typically, nurses at VA hospitals work one of 3 possible daily shifts. Over the period from September, 1994 through February, 1996, a sample of 257 shifts recorded 40 shifts with at least one patient death. Estimate a 99% confidence interval for the proportion of shifts on which at least one death occurs.
  - ✓  $=\text{NORMSINV}(0.995) = 2.576$
  - ✓  $=\text{TINV}(0.01, 256) = 2.595$
- At a VA hospital in Massachusetts, over the period from September, 1994 through February, 1996, over a span of 547 days, nurses worked a total of 1641 shifts. Of those 1641, 74 shifts had at least one patient death. Is it possible that the population proportion of shifts with at least one patient death is 0.045?
- What are we asking?
  - $H_0$ :
  - $H_1$ :