STA 291
Spring 2009

LECTURE 14
TUESDAY, 24 MARCH

Le Menu

- **8 Continuous Probability Distributions**

  8.2 Normal Distribution

- *Next online homework is due* ***Saturday***
- Suggested Reading
  - Study Tools Chapter 8.2 (Normal Distribution)
  - OR: Section 8.2 in the textbook
- Suggested problems from the textbook:

8.16, 8.18, 8.22, 8.26, 8.30, 8.36, 8.44, 8.56, 8.70

Calculation of Normal Probabilities

Table 3:

Gives amount of probability $\leq z$, the *standard normal* random variable.

Example exercises:

p. 274, #8.17, 24, and 27.

So what about the "probability to the left of $\mu + z\sigma$" stuff from last time?

Normal Distribution Table

- Table 3 shows, for different values of z, the probability to the left of $\mu + z\sigma$ (the cumulative probability)
- Probability that a normal random variable takes any value up to z standard deviations above the mean
- For z =1.43, the tabulated value is .9236
- That is, the probability **less than or equal to $\mu + 1.43\sigma$** for a normal distribution equals .9236

Why the table with Standard Normal Probabilities is all we Need

- When values from an arbitrary normal distribution are converted to *z*-scores, then they have a standard normal distribution
- The conversion is done by subtracting the mean μ, and then dividing by the standard deviation σ:

$$z = \frac{x - \mu}{\sigma}$$

- Example exercises:

  p. 274, #8.38, 45

z-scores: properties and uses

- The z-score for a value x of a random variable is the number of standard deviations that x is above μ
- If x is below μ, then the z-score is negative
- The z-score is used to compare values from different (normal) distributions

z-scores: properties and uses

- The *z*-score is used to compare values from different normal distributions
- SAT: $\mu = 500$, $\sigma = 100$
- ACT: $\mu = 18$, $\sigma = 6$
- Which is better, 650 in the SAT or 25 in the ACT?

$$z_{SAT} = \frac{650 - 500}{100} = 1.5 \qquad z_{ACT} = \frac{25 - 18}{6} = 1.17$$

Backwards *z* Calculations

- We can also use the table to find *z-values* for given probabilities
- Find the *z-value* corresponding to a right-hand tail probability of 0.025
- This corresponds to a probability of 0.975 to the left of *z* standard deviations above the mean
- Table: $z = 1.96$

Going in Reverse, S'More

- Find the *z-value* for a right-hand tail probability
  - of 0.1 is $z =$ _____.
  - of 0.01 is $z =$ _____.
  - of 0.05 is $z =$ _____.

Attendance Question #14

Write your name and section number on your index card.

Today's question: