AMS7: WEEK 4. CLASS 2

The Normal distribution (Cont.)
Wednesday April 22nd, 2015
NOTATION

• $P(a \leq z \leq b) =$ Probability that $z$ Score is between $a$ and $b$
• $P(z > a) =$ Probability that $z$ Score is greater than $a$
• $P(z < b) =$ Probability that $z$ Score is less than $b$
Finding $z$ Scores from known areas

AREA = 0.95

What is the corresponding value of $Z$???
Procedure

• Get the closest probability value in the body of the Table A-2 and identify the corresponding z Score

• EXAMPLE: Find the temperature reading corresponding to the \( P_{95} \) value (95\textsuperscript{th} percentile)

• \( Z \) Score = 1.645  

95\% of the readings will be less than or equal to 1.645 \( ^\circ C \)
Converting values on a non-standard Normal distribution to a z Score

- Use the formula:

\[ z = \frac{x - \mu}{\sigma} \]

Graphically what we are doing is:
EXAMPLE

• Assume that adults have IQ scores that are normally distributed with mean of 100 and a standard deviation of 15. Find the probability that a randomly selected adult has an IQ between 110 and 120 (referred to as bright normal)

STEPS

1) Draw curve and locate values: We want the area between 110 and 120
Example (Cont.)

2) Find scores:

\[ z_1 = \frac{110 - 100}{15} = \frac{10}{15} = \frac{2}{3} = 0.666... \approx 0.67 \]

\[ z_2 = \frac{120 - 100}{15} = \frac{20}{15} = \frac{4}{3} = 1.333... \approx 1.33 \]

\[ P(110 \leq X \leq 120) = P(0.67 \leq Z \leq 1.33) \]

3) Find area from Table:
   - Area below \( z_1 = P(Z \leq 0.67) = 0.7486 \)
   - Area below \( z_2 = P(Z \leq 1.33) = 0.9082 \)
Example (Cont.)

We want the area between $z_1 = 0.67$ and $z_2 = 1.33$

$$P(110 \leq X \leq 120) = 0.9082 - 0.7486 = 0.1596$$

15.96% of adults will be *bright normal*
Finding values from known areas

STEPS

1) Find the corresponding z Score by looking at the body of the table

2) Use formula to get values

\[ x = \mu + (z \cdot \sigma) \]

Z Score from Table