5.5 Notes

Monday, June 1, 2015 9:49 AM

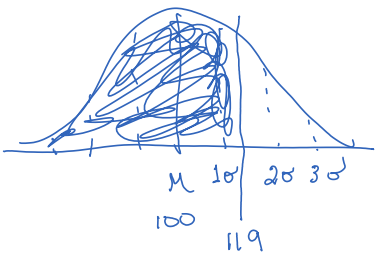
5.5 – Z-Scores

- Z-Score
  - A standardized value that indicates the number of standard deviations of data value above or below the mean.
  - $z = \frac{x-\mu}{\sigma}$
- Standard Normal Distribution
  - A normal distribution that has a mean of zero and a standard deviation of one
- You will need a z-score table or else your life will be miserable.

5.5 Examples

IQ Tests are sometimes used to measure intelligence at a particular time. IQ scores are normally distributed and have a mean of 100 and standard deviation of 15. If a person scores 119 on an IQ test, how does this score compare with the scores of the general population?

1. Look at a normal curve. Determine the IQ scores for 1, 2, and 3 standard deviations away from the mean. Decide where 119 fits into these deviations. This serves as a good estimate for you.



$\mu + \sigma = 100 + 15 = 115$

$\mu + 2\sigma = 100 + 2(15) = 130$

$\mu + 3\sigma = 100 + 3(15) = 145$

2. Use the z-score formula to determine the exact z-score.

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

$$= \frac{119-100}{15} = 1.27$$

3. Use your z-score table to find the area under the curve.

$1.27 \rightarrow 0.8980$

4. Convert this to a percentage.

$0.8980 = 89.8\%$

Athletes should replace their shoes before their shoes lose their ability to absorb shock.

Running shoes lose their shock-absorption after a mean distance of 640 km, with a standard deviation of 160 km. Zack wants to replace his shoes when 25% of people replace their shoes. At what distance is this?

1. Convert 25% to a decimal.

$25\% = 0.25$

2. Find the z-score closest to 0.25 in your table.

$z = -0.675$

3. Substitute this value into your z-score formula. Solve for x.

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

$$(160)\ -0.675 = \frac{x - 640}{160} \quad (160)$$

$$-108 = x - 640 \quad +640$$

$$532 = x$$

Zack should replace his shoes after 532 km.

p. 127 # 1-6, 8 + # 1-7 (handout)