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work!

Standard Normal Calculations

Key

1. Suppose the distribution of GPAs at Jefferson High School has a mean of 2.7 and a standard deviation of 0.37. The GPAs at Washington High School has a mean of 2.8 and a standard deviation of 0.33.

a) Ted, a student at Washington High School, has a GPA of 3.25, and Frank, at Jefferson High School, has a GPA of 3.17. Calculate the z-score for Ted and Frank and comment on which of them has the higher GPA relative to his peers.

$$\boxed{\text{Ted} = 1.36} \quad \text{Frank} = 1.27$$

b) What GPA would Ted need to have the same z-score as Frank?

$$X = 3.22$$

c) Terry, another student at Jefferson High School, has a GPA of 3.07. Assuming that these GPAs follow a mound-shape distribution (Normal), approximately what is the probability of Jefferson High School students have a larger GPA?

$$16\%$$

d) What GPA would you need to have to be in the top 10% of the class at each high school?

$$\begin{aligned} \text{Jefferson} &= 3.17 \\ \text{Washington} &= 3.22 \end{aligned}$$

2. The EPA fuel economy estimates for automobile models tested recently predicted a Normal model with a mean of 24.8 mpg and a standard deviation of 6.2 mpg.

a) In what interval would you expect the central 68% of autos to be found?

$$18.6 - 31 \text{ mpg}$$

b) About what percent of autos should get less than 31 mpg?

$$84\%$$

c) What is the probability of cars should get between 31 and 37 mpg?

$$13.4\%$$

d) What is the probability of cars should get more than 20 mpg?

78.1%

e) Describe the gas mileage of the worst 20% of all cars?

19.6 mpg or lower

3. Some IQ tests are standardized to a Normal model with a mean of 100 and a standard deviation of 16.

a) What score would begin the interval for the top 16% of all scores? You may use the Empirical Rule to answer this.

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b) The top 10% of all scores represent the label of "genius". What is the range of scores for anyone who qualifies as a genius?

$X \geq 120.5$

c) What is the probability of test takers score a 130 or higher?

3.0%

4. Assume the cholesterol levels of Adult American women can be described by a Normal model with a mean of 188 mg/dL and a standard deviation of 24.

a) What is the probability of adult women do you expect to have cholesterol levels over 200 mg/dL?

30.9%

b) What percent of adult women do you expect to have cholesterol levels between 150 and 170 mg/dL?

17%

c) About what is the interval of cholesterol levels for 99.7% of the Adult American women?

116 - 260

d) Above what value are the highest 15% of women's cholesterol levels?

212.9