Answer on Question #57529 - Math – Statistics and Probability

Question

Heights of men on a baseball team have a bell-shaped distribution with a mean of 178 cm and a standard deviation of 5 cm. Using the empirical rule, what is the approximate percentage of the men between the following values?

a. 168 cm and 188 cm
b. 163 cm and 193 cm

Solution

If the mean of the standard normal distribution is m =178 and the standard deviation is σ =5, then

$$P(m-\sigma \le \xi \le m+\sigma) = P(178-5 \le \xi \le 178+5) = P(173 \le \xi \le 183) = 0.6827,$$
$$P(m-2\sigma \le \xi \le m+2\sigma) = P(178-2\cdot 5 \le \xi \le 178+2\cdot 5) = P(168 \le \xi \le 188) =$$

$$= 0.9545,$$

$$P(m-3\sigma \le \xi \le m+3\sigma) = P(178-3\cdot 5 \le \xi \le 178+3\cdot 5) = P(163 \le \xi \le 193) =$$

$= 0.9973$ according to the empirical rule.

a. The percentage of men in range between 168 cm and 188 cm is given by

$$\frac{1}{5\sqrt{2\pi}} \int_{168}^{188} e^{-\frac{(x-178)^2}{2\cdot 5^2}} dx = \operatorname{erf}(\sqrt{2}) = 0.9545$$

Thus, the percentage is 95.45%.

b. The percentage of men in range between 168 cm and 188 cm is given by

$$\frac{1}{5\sqrt{2\pi}} \int_{163}^{193} e^{-\frac{(x-178)^2}{2\cdot 5^2}} dx = 0.9973$$

Thus, the percentage is 99.73%.

Answer: a. 95.45%, **b.** 99.73%.