Answer on Question #49745 – Math – Statistics and Probability

After the quizzes are marked, you're told that the scores on the exam were distributed normally (μ=50, σ=10). You are also told that students with scores in the top 10% will receive a chocolate bar, and students with scores in the top 25% will receive a stick of gum.

a) What is the minimum score needed to receive a chocolate bar?

b) Would a score of 57 earn a stick of gum?

Solution

We need to convert the normal distribution to the standard normal distribution:

$$Z = \frac{x-\mu}{\sigma}.$$

a) $P(X > x_1) = P(Z > z_1) = 1 - P(Z < z_1) = 0.1 \to P(Z < z_1) = 0.9.$

Then from normal table, $z_1 = 2.33.$

So

$$z_1 = \frac{x_1-\mu}{\sigma} \to x_1 = \mu + z_1\sigma = 50 + 2.33 \cdot 10 = 73.3.$$

Answer: 73.3.

b) $P(Z > z) = P\left(Z > \frac{x_1-\mu}{\sigma}\right) = P\left(Z > \frac{57-50}{10}\right) = \mathrm{P(Z > 0.7)} = 1 - \mathrm{P(Z < 0.7)}.$

Then from normal table,

$$\mathrm{P(Z < 0.7)} = 0.7580.$$

And

$$P(Z > z) = 1 - 0.758 = 0.242 < 0.25.$$

Hence a score of 57 would earn a stick of gum.