The Case of the Missing Parameters: Solved

How can Will find the mean and standard deviation?

Will can use probability tables and standard scores to get expressions for the mean and standard deviation that he can then solve.

First of all, we know that $P(X < 5) = 0.0045$. From probability tables, $P(X < z_1)$ where $z_1 = -2.61$, which means that the standard score of 5 is -2.61. If we put this into the standard score formula, we get

$$-2.61 = \frac{5 - \mu}{\sigma}$$

Similarly, $P(X < 15) = 0.9641$, which means that the standard score of 15 is 1.8. This gives us

$$1.8 = \frac{15 - \mu}{\sigma}$$

This gives us two equations we can solve to find μ and σ.

$$-2.61\sigma = 5 - \mu$$
$$1.8\sigma = 15 - \mu$$

This is a pair of equations we can now solve.

If we subtract the first equation from the second, we get

$$1.8\sigma + 2.61\sigma = 15 - \mu - 5 + \mu$$

$$4.41\sigma = 10$$

$$\sigma = 2.27$$

If we then substitute this into the second equation, we get

$$1.8 \times 2.27 = 15 - \mu$$

$$\mu = 15 - 4.086$$

$$= 10.914$$

In other words,

$$\mu = 10.914$$
$$\sigma = 2.27$$

These are the values of μ and σ.