

Name: Solutions

Math 130

Date: 3/13/2025

Quiz 9.5

A formula you may need: $Z = \frac{X - \mu}{\sigma}$

1. (2, 3, 4, 1 points) Lengths of Elvis songs are normally distributed with a mean of 153 seconds and a standard deviation of 9 seconds.

a) If an Elvis song is randomly selected, what is the probability that it will be at least 166 seconds long?

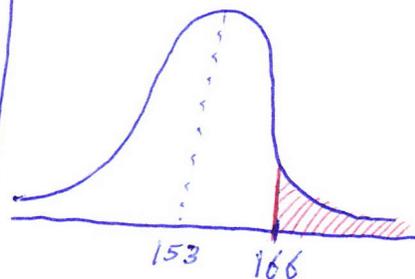
Let X be the length of a randomly selected Elvis song.

X is normal

$\mu = 153$ sec.

$\sigma = 9$ sec.

$$P(X > 166) \stackrel{z\text{-trans.}}{=} P\left(\frac{X - \mu}{\sigma} > \frac{166 - \mu}{\sigma}\right) = P\left(Z > \frac{166 - 153}{9}\right)$$



X -dist.

$$= P(Z > 1.44) = 1 - P(Z < 1.44)$$

$$= 1 - 0.9251 = \boxed{0.0749}$$

b) If an Elvis song is randomly selected, what is the probability that it will be between 130 and 149 seconds long?

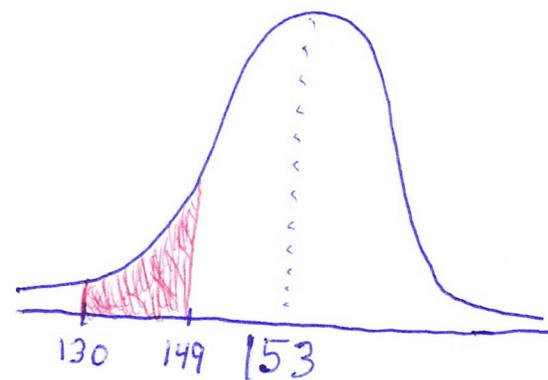
$$P(130 < X < 149) \stackrel{z\text{-trans.}}{=} P\left(\frac{130 - \mu}{\sigma} < \frac{X - \mu}{\sigma} < \frac{149 - \mu}{\sigma}\right)$$

$$= P\left(\frac{130 - 153}{9} < Z < \frac{149 - 153}{9}\right)$$

$$= P(-2.56 < Z < -0.44)$$

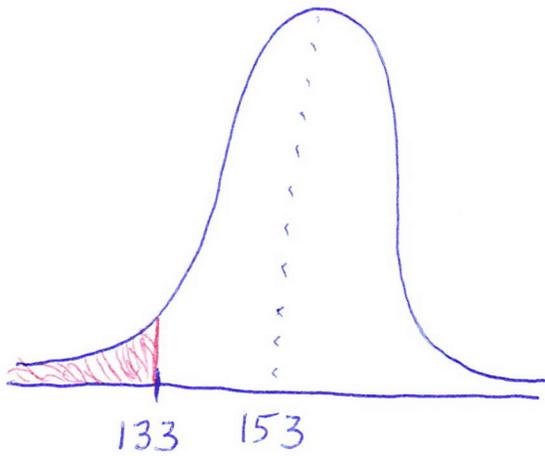
$$= P(Z < -0.44) - P(Z < -2.56)$$

$$= 0.3300 - 0.0052 = \boxed{0.3248}$$



X -dist.

c) If an Elvis song is randomly selected, what is the probability that it will be less than 133 seconds long?



x-dist.

$$\begin{aligned} P(X < 133) &\stackrel{z\text{-trans}}{=} P\left(\frac{X - \mu}{\sigma} < \frac{133 - \mu}{\sigma}\right) \\ &= P\left(Z < \frac{133 - 153}{9}\right) = P(Z < -2.22) \\ &= \boxed{0.0132} \quad (= 1.32\%) \end{aligned}$$

d) What does the probability you found in part (c) mean?

If many Elvis songs are randomly selected, the songs will be less than 133 seconds long about 1.32% of the time.