

Q1

As sample size > 30 central limit theory applies:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{.62}{\sqrt{35}} = .105$$

$$\mu_{\bar{x}} = \mu = 98$$

$$\begin{aligned} P(\bar{X} \leq 98.2) &= P\left(Z < \frac{98.2 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right) \\ &= P\left(Z < \frac{98.2 - 98}{.105}\right) \\ &= P(Z < 1.9) \\ &= .86 \end{aligned}$$

$$\begin{aligned} P(\text{random person}) &= P(X < 98.2) \\ &= .86 \end{aligned}$$

$$\begin{aligned} P(97.85 \leq X \leq 98.15) &= P\left(\frac{97.85 - \mu_{\bar{x}}}{\sigma_{\bar{x}}} < Z < \frac{98.15 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right) \\ &= P\left(\frac{97.85 - 98}{.105} < Z < \frac{98.15 - 98}{.105}\right) \\ &= P(-1.43 < Z < 1.43) \\ &= .924 - .764 \\ &= 0.16 \end{aligned}$$

$$\begin{aligned} P(X > 98.2) &= P\left(Z > \frac{98.2 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right) \\ &= P\left(Z > \frac{98.2 - 98}{.105}\right) \\ &= P(Z > 1.90) \\ &= 1 - P(Z < 1.90) \\ &= 1 - .971 \\ &= 0.029 \end{aligned}$$

$$1 - \text{pnorm}(98.7, 98, .62/\text{sqrt}(35)) = 1.199241e - 11$$

Q2

$$\begin{aligned}
P(\text{within 3 units}) &= P\left(\frac{3}{\sigma_{\bar{x}}} < Z < \frac{-3}{\sigma_{\bar{x}}}\right) \\
&= P\left(\frac{3}{1.8} < Z < \frac{-3}{1.8}\right) \\
&= P(1.67 < Z < -1.67) \\
&= 0.953 - 0.475 \\
&= 0.478
\end{aligned}$$

Q3

lv = 8.7 + qnorm(.1) * 2.2

up = 8.7 + qnorm(.9) * 2.2

Range is 5.9 tp 11.5 hrs/week of excercise is the average exercise of the middle 80%