

Q1)

a) The population mean is 72 bpm

Sample mean is 69 bpm

b) Null hypothesis:-

New relaxation app ^{not} reduces the average resting heart rate.

Alternative hypothesis:-

New relaxation app reduces the average resting heart rate.

c) standard error is the unit to measure the distance of sample mean from the base line.

$$\text{S.E} = \frac{\sigma}{\sqrt{n}}$$

$$(\text{standard deviation})\sigma = 10$$

$$n = 64 (\text{no. of users})$$

$$\begin{aligned} \text{S.E} &= \frac{10}{\sqrt{64}} = \frac{10}{8} = \frac{5}{4} \\ &= 1.25 \end{aligned}$$

d) Z-score is the distance of sample mean from the base line in terms of standard error.

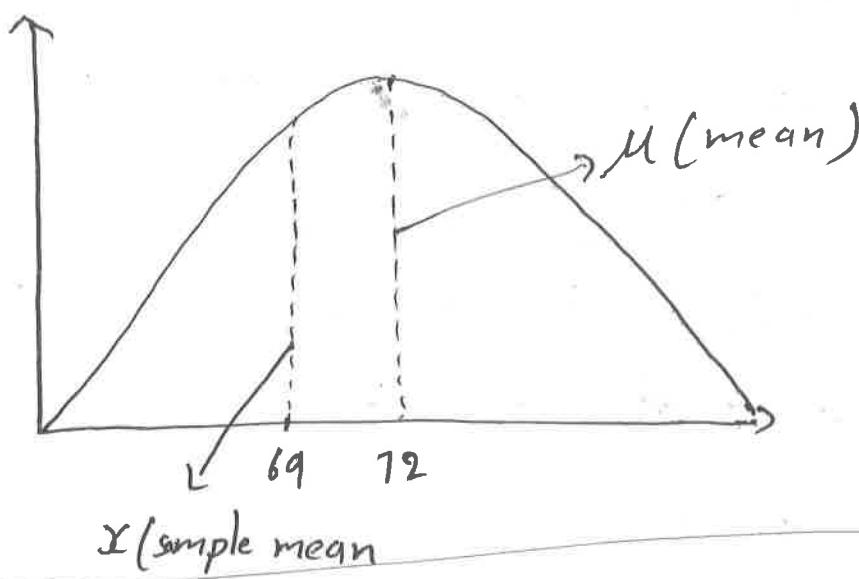
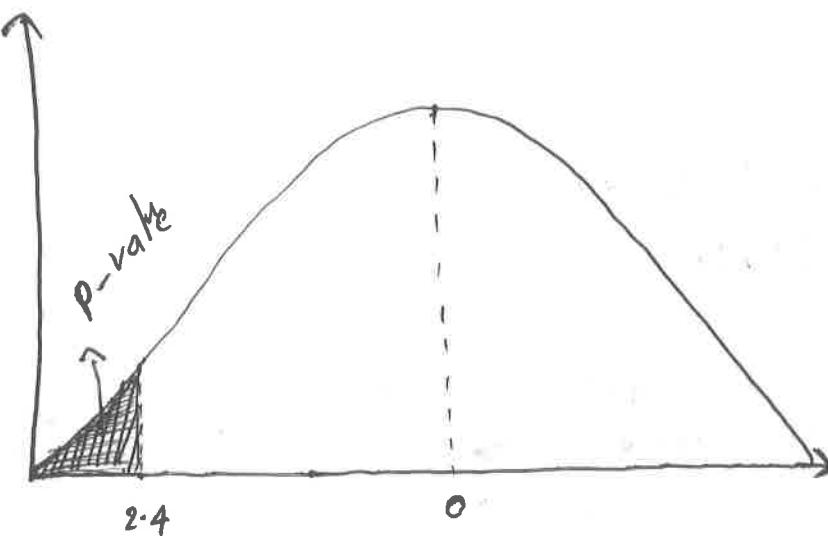
$$Z = \frac{x - \mu}{\text{S.E}}$$

x = sample mean
 μ = mean

$$Z = \frac{69 - 72}{1.25} = \frac{-3}{1.25} = \frac{300}{125} = \frac{12}{5}$$

 $Z = -2.4$ [Lve' indicate sample mean is there on the left side of the mean]

e)



(Q2)

Given that

$$P(S) = 20\% \quad (\text{Probability of getting spam calls.})$$

$\stackrel{=} {0.2}$

$$P(S^c) = 0.8 \quad (80\%)$$

$P(fs|s) = 0.9$ (The probability of message is spam, the filter marks it as "spam".)

$P(fs|s^c) = 0.05$ (The probability of message is not spam, the filter marks it as "spam")

$$P(S|fs) = \frac{P(s) P(fs|s)}{P(fs|s) P(s) + P(fs|s^c) P(s^c)}$$

a) In the above equation prior probability is $P(s)$

$$\begin{aligned} P(s) &= 20\% \\ &= 0.2 \end{aligned}$$

b) The posterior probability of the above equation is $P(s/f_s)$

$P(s/f_s)$ means the probability of a message given that the filter marks it as "spam" and is spam

$$c) P(f_s) = p(s)P(f_s/s) + P(f_s/s')P(s')$$

$$\begin{aligned} &= 0.2 \times 0.9 + 0.05 \times 0.8 \\ &= \cancel{0.18} \cancel{+ 0.04} = 0.18 + 0.04 \\ &= \cancel{0.22} = 0.22 \end{aligned}$$

$$d) P(s/f_s) = \frac{0.2 \times 0.9}{0.22} = \frac{0.18}{0.22} = 18/22$$

$$\text{Posterior} = 18/22$$

$$\text{Prior} = P(s) = 0.2$$

Posterior will be the more value because

The ~~the~~ getting ^{actual} x spam call is less than
that the the filter show the spam calls.
filter show.