

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.

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

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

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

$$S.E = \frac{10}{\sqrt{64}} = \frac{10}{8} = \frac{5}{4}$$

$$= 1.25$$

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

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

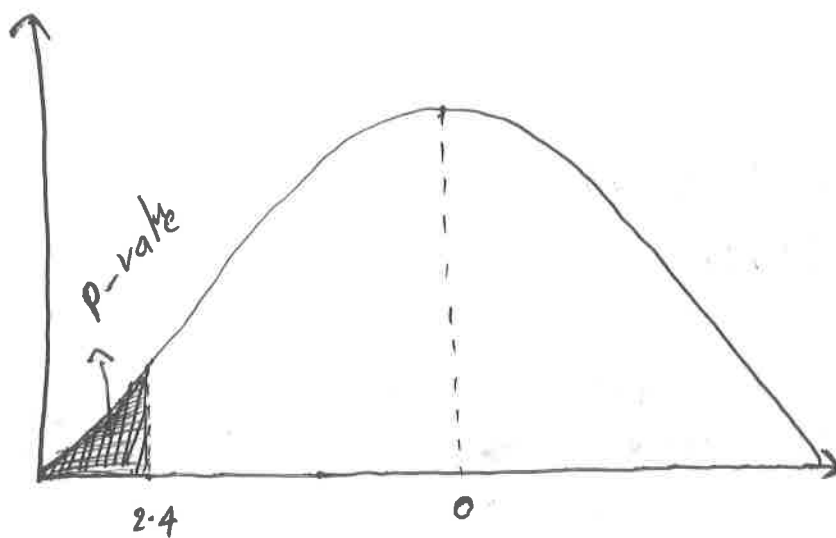
x - sample mean

μ = mean

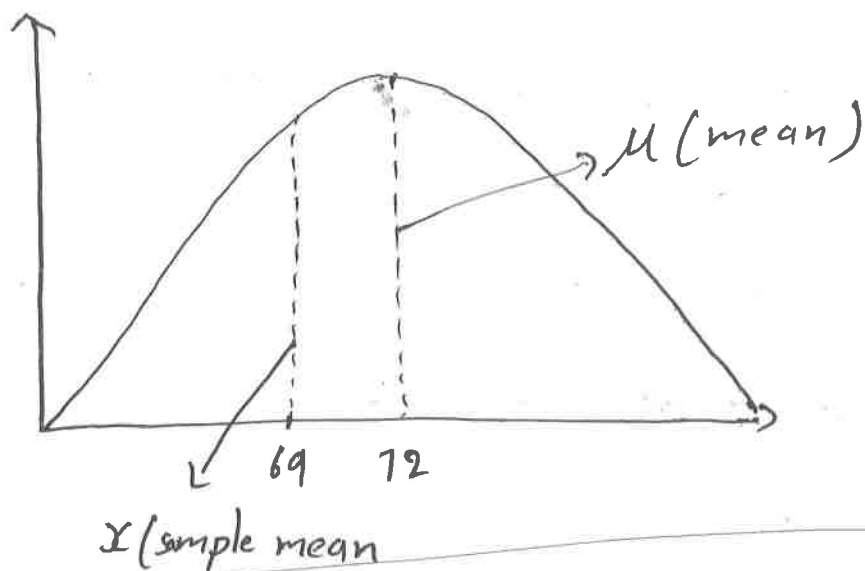
$$Z = \frac{69 - 72}{1.25} = \frac{-3}{1.25} = \frac{300}{125} = \frac{12}{5}$$

$Z = -2.4$ [-ve, indicate sample mean is there on the left side of the mean.

e)



$$Z\text{-score} = 2.4$$



Q2)

Given that

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

$$= 0.2$$

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

$$P(f_s/s) = 0.9 \quad (\text{The probability of message is spam, the filter marks it as "spam"})$$

$$P(f_s/s^c) = 0.05 \quad (\text{The probability of message is not spam, the filter marks it as "spam"})$$

$$P(s/f_s) = \frac{P(s) P(f_s/s)}{P(f_s/s) P(s) + P(f_s/s^c) P(s^c)}$$

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

$$P(s) = 20\% \\ = 0.2$$

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

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

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

$$= 0.2 \times 0.9 + 0.05 \times 0.8$$

$$= \cancel{0.18} + \cancel{0.04} = 0.18 + 0.04$$

$$= \cancel{0.22} = 0.22$$

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

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

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

Posterior will be the more value because

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

filter show.