**ASSIGNMENT 3.2**

**Problem Statement-1:**

Engineers must consider the breadths of male heads when designing motorcycle helmets for men. Men have head breadths that are normally distributed with a mean of 6.0 inches and a standard deviation of 1.0 inch

a. If one male is randomly selected, what is the likelihood that his head breadth is less than 6.2 inches?

b. The Safeguard Helmet company plans an initial production run of 100 helmets. How likely is it that 100 randomly selected men have a mean head breath of less than 6.2 inches?

c. The production manager sees the result in part b and reasons that all helmets should be made for men with head breadths of less than 6.2 inches, because they would fit all but a few men. What is wrong with that reasoning?

**Solution:**

1. Given,

Mean=6.0 and Standard Deviation=1.0

For the given breadth of 6.2, Z-score will be,

Z= (x-μ)/σ = (6.2-6.0)/1.0= 0.2

Therefore, Z-Score for 6.2 = 0.2

Using Z-tables,

Area to the left of 0.2 Z-score = 0.5793

Thus,

Likelihood of his head breadth less than 6.2 inch = 0.5793

1. Given,

n=100, mean head breath should be less than 6.2 inches

Z= (x-μ)/(σ/n^0.5)

= (6.2-6.0)/ (1.0/100^0.5)

= 0.2/0.1

= 2

Therefore,

Z-score= 2 and thus area to the left of this Z-score from Z-Tables is,

Probability (less than 6.2 for 100 samples) =0.9772.

1. Even though 97.72% of head breaths fall less than 6.2 inches, 2.28% of the people still face problems wearing these helmets.

That is,

2.28, approximately 3 people out of 100 couldn’t use this helmet.

If at all the designed size of this helmet is 6.3 inches, 99.87 people will be benefited that is approximately every person can wear this helmet without any problem.

**Problem Statement-2:**

Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4 kg. In a sample of 35 penguins same time this year in the same colony, the mean penguin weight is 14.6 kg. Assume the population standard deviation is 2.5 kg. At .05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?

**Solution:**

Null Hypothesis: Mean Penguin weight does not differ from last year

Alternate Hypothesis: Mean Penguin weight differ from last year

Given,

μ= 15.4 kg, σ=2.5 kg,

x-bar= 14.6 kg, n= 35 Penguins

Thus,

Z= (x-bar – μ)/ (σ/ sqrt(n)) = (14.6-15.4)/(2.5/sqrt(35))

= -1.89314553

At 0.05 significance level,

-1.89314553 lies within -1.96 and 1.96.

Hence,

We do not reject null hypothesis that the mean penguin weight does not differ from last year.