Student Information

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Answer 1

a)

Since the sample sizes are small (i.e., n1¡ 30 and n2¡ 30), the confidence interval formula with t is appropriate
Our variables are those:
1st Sample size → n_1 = 19 1st Sample mean → $\bar{x_2}$ = 3.375 1s Standart deviation → s_1 = 0.96

2nd Sample size → n_2 = 15 2nd Sample mean → $\bar{x_2}$ = 2.05 2nd Standart deviation → s_2 = 1.12

We need to compute S_p, the pooled estimate of the common standard deviation.
$S_p = \sqrt{((n_1 - 1)(s_1)^2 + (n_2 - 1)(s_2)^2)/(n_1 + n_2 - 2)}$

$S_p = 1.0330$

Sp is falling in between the standard deviations in the two groups. The degrees of freedom (df) = n_1 + n_2 - 2 = 19+15-2 = 32. To %95 confidence interval $\alpha = 0.05$ and t is 2.037 from the t-Table A5 at the book.

Then computation is follows like that:

$\bar{x_1}$- $\bar{x_2}$ ± t S_p $\sqrt{1/n_1 + 1/n_2}$

Put the values for both equation:

3.375 - 2.05 + 2.037 × 1.0330 × $\sqrt{1/19 + 1/15}$ = 2.051

3.375 - 2.05 - 2.037 × 1.0330 × $\sqrt{1/19 + 1/15}$ = 0.598

So the %95 confidence interval for the difference is [0.598, 2.051]

b)

Since we did all the calculations in subsection-a we are not gonna do it again.
This time our t is 1.694 since $\alpha = 0.1$ since to have confidence interval %90

Then computation is follows like that:

$\bar{x_1}$- $\bar{x_2}$ $\pm$ t S_p $\sqrt{1/n_1 + 1/n_2}$
Put the values for both equation:

3.375 - 2.05 + 1.679 $\times$ 1.0330 $\times$ $\sqrt{1/19 + 1/15} = 1.924$
3.375 - 2.05 - 1.679 $\times$ 1.0330 $\times$ $\sqrt{1/19 + 1/15} = 0.725$

So the %95 confidence interval for the difference is [0.725, 1.924]

c)

We need to find the confidence interval of people with age 40 and above supports with confidence level %95
Confident interval for the mean is:

$\bar{x}$ $\pm$ $t_{a/2}$ $\times$ S $\sqrt{n}$
We already now the standart deviance of the elder group. S = 0.96
And mean of the sample is $\bar{x} = 3.375$
We can find $t_{a/2}$ from the table 5a at the book. df (degrees of freedom) is n-1 = 18 and $\alpha = 0.05$
So $t_{a/2} = 2.101$

So confident interval is: [2.912, 3.837].
The confidence interval with confidence level of %95 is not always over 3 we can not say that age 40 and above supports BREXIT with %95 confidence level.

Answer 2

a)

As given in the question 20.00 kg olympic bars being produced.
From that we can state the null hypothesis:
$H_0 : \mu = 20.00$

b)

If product have different weight than 20.00 kg it is not qualified. Also the alternative hypothesis is mathematical opposite of the null hypothesis.

So, we can state the alternative hypothesis:
H_a : $\mu \neq 20.00$

c)

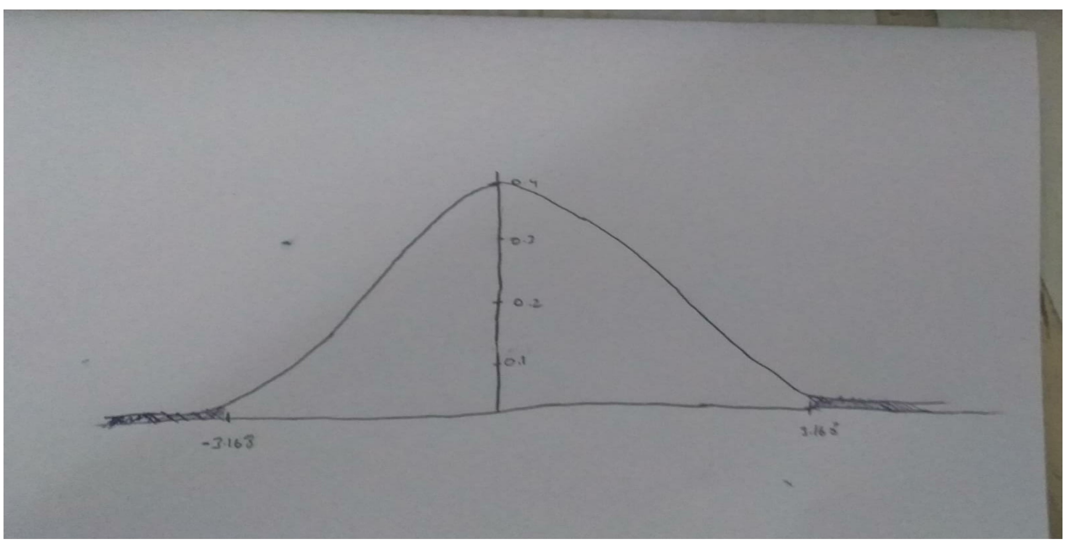
We are going to find test statistic t by using t-test formula t-test formula to draw t- test diagram.

Our variables are those:
Sample average $\rightarrow \bar{x} = 20.7$ Expected mean $\rightarrow \mu_0 = 20$ Standart deviation $\rightarrow$ s = 0.07. Also $\alpha =$ 0.01 is can be deriven from the question. (statistical significance)

The test formula is below:

t = ($\bar{x}$ - μ_0) / (s / $\sqrt{n}$)
So, t = 3.317

Then, we need to find the rejection region to draw the t-test diagram and find out the answer of question.
Degrees of freedom is n - 1 = 11 - 1 = 10 and $\alpha = 0.01$
By using these we can find the $t_{a/2}$ from the t-table 5a from the book.
$t_{a/2} = 3.168$
So the diagram is:



The painted areas indicates the rejection regions. It is(-∞, -3.169] ∪ [3.169,∞).

Now, we can clearly observe the fact that the test statistic t locates in rejection region. (3.316)

So, the null hypothesis got rejected. Hence, they should stop the production and check the line.

Answer 3

a)

Lets call existing painkiller drugs in market A and the new claimed to-be superior drug B. Null hypothesis is stated as:
H_0 : $\mu_A = \mu_B$

b)

Lets call existing painkiller drugs in market A and the new claimed to-be superior drug B. Alternate hypothesis is stated as:
H_0 : μ_A ¡ μ_A

c)

We are going to use z formula formula to draw z-test diagram.

Our variables are those:
Mean $\rightarrow \mu_0 = 3$. Standart deviation $\rightarrow \sigma = 1.4$. Also $\rho = 0.05$ is can be deriven from the question. (level of significance)

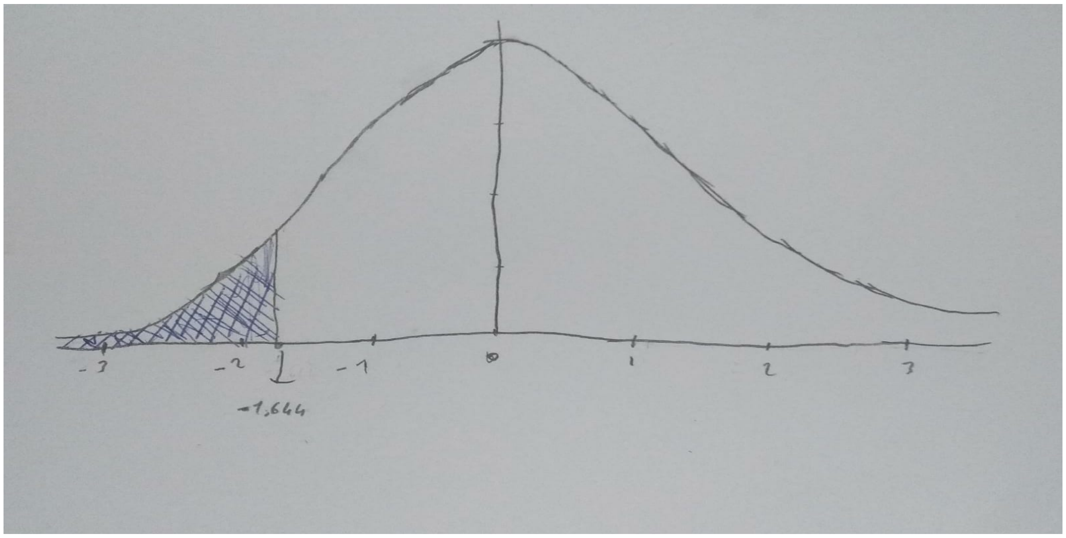
The test formula is below:

Z = (μ - μ_0) / (σ / $\sqrt{n}$)

So Z = -1.18

Also we know the $z_{0.05} = 1.644$ from the book. We are ready to draw the diagram.

So the diagram is:



The painted areas indicates the rejection regions.

Because of the the z value that observed does not reside in the rejection region, we can't state that new painkiller drug really produce better results.