MSC 600 Quantitative ...

Q1 a) The 95% confidence interval can be calculated using the formula below;

$$CI = (mean1 - mean2) \pm (1.96 \times SEmean)$$

Where SEmean is the standard error mean

Therefore,

$CI = (64.9 - 63.1) \pm (1.96 \times 0.11)$

$CI = (-2.76, -2.44)$

Interpretation:

A 95% confidence interval for the difference between population mean height for the younger women and that for the older women is $(-2.76, -2.44)$.

This means that we can be 95% confident that the true difference between population mean height for the younger women and that for the older women lies between -2.76 and -2.44 inches

Q 1 b) The null hypothesis (H_0) states that there is no difference between the population mean height for those aged 20-39 and those aged 60 and older.

The alternative hypothesis (H_a) states that the population mean height for those aged 20-39 is greater than that for those aged 60 and older.

To test these hypothesis at a significance level of 0.001 using the rejection region approach, we could calculate the test statistic, which is the difference in the sample means divided by the standard error mean.

$$\text{Test statistic} = (64.9 - 63.1)/0.11 = 8.09$$

Interpretation:

Since the test statistic is greater than the critical value of 3.091 (which is the critical value for a two-tailed test with a significance level of 0.001), we reject the null hypothesis and conclude that the population mean height for those aged 20-39 is greater than those aged 60 and older.

Q1 c) The p-value for the test carried out in (b) above is 0.000. This means that the probability of getting a test statistic as extreme or more extreme than 8.09 is 0.000

Since the p-value is less than any reasonable significance level, we would reject the null hypothesis at any reasonable significance level. This means that we can conclude with a high level of confidence that the population mean height for those aged 20-39 is greater than that ~~of~~ for those aged 60 and older.

Q1 d.) The appropriate hypothesis in this case would be

$$H\_0: \mu\_1 - \mu\_2 \leq 1 \quad \text{and} \quad H\_a: \mu\_1 - \mu\_2 > 1$$

The null hypothesis states that the population mean height for the older age group is not greater than the population mean height for the yonger age group by more than 1 inch; while the altomative hypothesis states that the population mean height for the older age group is greater than the population mean height for the yonger age group by more than 1 inch.

Q 2.

$H_0: \mu_{older} = \mu_{younger}$

$H_a: \mu_{older} > \mu_{younger}$

Test statistic: $t = (\mu_{older} - \mu_{younger}) - 0 / \sqrt{S2/n_{older}}$

$+ S2/n_{younger}$

$= (801 - 780) - 0 / \sqrt{117^\wedge 2/28 + 72^\wedge 2/16}$

$= 20.94 / 15.43$

Degrees of Freedom: df $= 28 + 16 - 2$

$= 42$

At $\alpha = 0.05$ and df $= 42$, the critical value of t is 1.68

Since $1.35 < 1.68$, we fail to reject the null hypothesis. There is insufficient evidence to conclude that the true average stance duration is larger among elderly individuals than among younger individuals.

3 (a)) Sample mean difference

$\bar{x}_D = (2126 + 2885 + 2895 + 1942 + 1750 + 2184 + 2164 + 2626 + 2006 + 2627) - (1928 + 2549 + 2825 + 1924 + 1628 + 2175 + 2114 + 2621 + 1843 + 2541)$

$= 25.7$

Sample standard deviation

$s_D = \sqrt{(((2126-25.7)^2 + (2885-25.7)^2}$

$+ (2895-25.7)^2 + (1942-25.7)^2 + (1750-25.7)^2$

$+ (2184-25.7)^2 + (2164-25.7)^2 + (2626-25.7)^2$

$+ (2006-25.7)^2 + (2627-25.7)^2/9)$

$= 54.7$

We can the calculate the test statistic;

$t = (25.7 - 25)/(54.7/\sqrt{10})$

$= 2.94$

Q 3 a.) CONT

$H_0: \mu_D \leq 25$

$H_A: \mu_D > 25$

Test Statistic: $t = 2.94$

Critical value: $t_{0.05,9} = 1.833$

Because the test statistic (t) 2.94 is greater than the critical value 1.833, we reject the null hypothesis and conclude that the true average total body bone mineral content during postweaning exceeds that during lactation by more than 25g.

Q 3 b)

NO, the incorrect use of the two-sample t-test would not lead to the same conclusion. The two-sample test is used to test the difference of means between two independent groups. Here, we are testing the difference of one group to a fixed value (25). This requires the use of a one-sample t-test, which we used in part (a)