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Probability and Statistics.

Ans1) worker A : 21, 24, 25, 27, 23, 24   n=6
worker B : 23, 19, 20, 26, 22   n=5

Formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}}$$

$$\bar{x}_1 = 21 + 24 + 25 + 27 + 23 + 24 = \frac{144}{6} = 24$$

$$\bar{x}_2 = 23 + 19 + 20 + 26 + 22 = \frac{110}{5} = 22.$$

s_p we will find s_1 and s_2

$$s_1 = \sqrt{\frac{6(3476) - 20736}{6(5)}}$$

$$s_1 = \sqrt{\frac{4120}{30}} = 2$$

x	x^2
21	441
24	576
25	625
27	729
23	529
24	576
144	3476

For s_2

x	x^2
23	529
19	361
20	400
26	676
22	484
110	2450

$$s_2 = \sqrt{\frac{5(2450) - (110)^2}{5(4)}}$$

$$s_2 = \sqrt{\frac{12250 - 12100}{20}}$$

$$s_2 = \sqrt{\frac{150}{20}} = 2.739$$

$$s_p = \sqrt{\frac{(6-1)(2)^2 + (5-1)(2.739)^2}{6+5-2}}$$

$$s_p = 2.357$$

Use t-test

$$t = \frac{(24-22)}{2.357\sqrt{\frac{1}{6}+\frac{1}{5}}}$$

$$t = \frac{2}{2.357 \times 0.61}$$

$$\boxed{t = 1.40}$$

using the value given degree of freedom

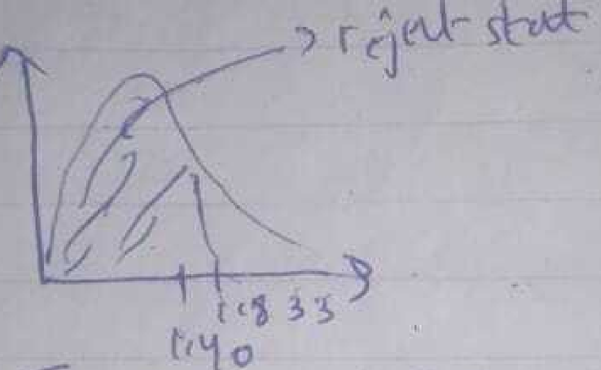
$n_1 + n_2 - 2 = 9$

$t_{0.05, 9} = 1.833$

my answer:

$\boxed{t = 1.40}$

Therefore we can say we can reject the given value as it is left tailed.



Ans2) $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{6.1 - 6}{0.2 / \sqrt{100}}$

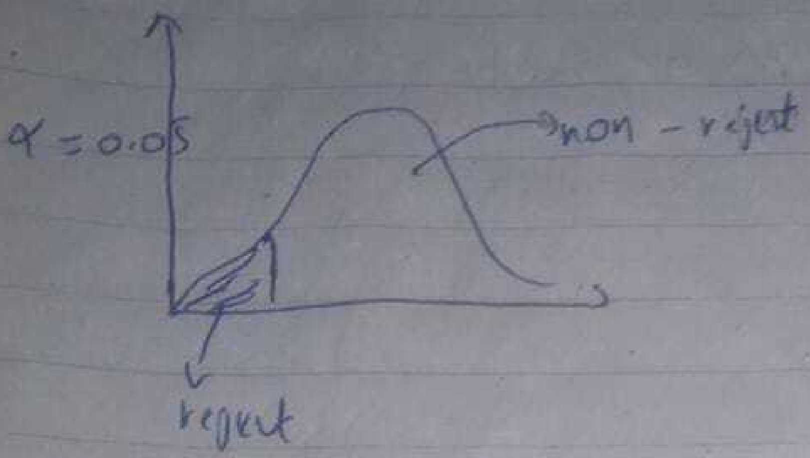
$\boxed{z = 5.}$

Null hypothesis: H_0 $\mu = 6$

Alternative hypothesis H_1 $\mu < 6$.

$z_{0.05} = -1.645$

And our calculated value is $z = 5$



Since the value is greater, it is not rejected.

(b) Given

$Z_{\alpha/2} = 1.96$

$\sigma = 0.2$

$n = 100$

$\bar{x} = 6.1$

$$\bar{x} \pm Z_{\alpha/2} \frac{\sigma}{\sqrt{n}} = 6.1 \pm 1.96 \left[\frac{0.2}{\sqrt{100}}\right]$$

$6.0608 < \mu < 6.1392$ Ans.

~~The answer~~

Ans 3)

X_1	X_2	D	D^2
210	219	-9	81
230	236	-6	36
182	179	3	9
205	204	1	1
262	270	-8	64
253	250	3	9
219	222	-3	9
216	216	0	0
		$\Sigma D = 19$	$\Sigma D^2 = 209$

$$\bar{X}_D = \frac{\Sigma D}{n} = \frac{19}{8} = 2.375$$

$$S.D = \sqrt{\frac{8(209) - (-19)^2}{8(7)}}$$

$$S = \sqrt{\frac{1672 - 361}{56}}$$

$$S = 4.838$$

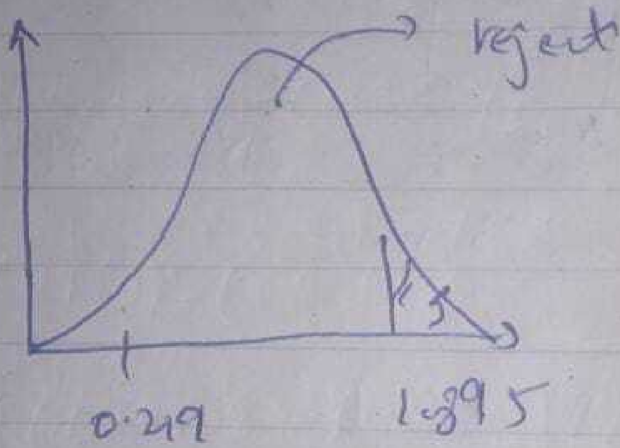
$$t = \frac{\bar{X}_D - \mu_0}{SD\sqrt{n}} = \frac{2.375 - 2}{4.838 / \sqrt{8}} = 0.219$$

degree of freedom = n-1 = 7

$t_{0.05, 7} = 1.875$

↳ ~~taken from inter~~

reject the hypothesis as it is not in range using right tailed hypothesis.



Q4)

n	x	y	xy	x^2	y^2
1	19	66	1254	361	4356
2	23	74	1702	529	5476
3	25	72	1800	625	5184
4	24	76	1824	576	5776
5	26	78	2028	676	6084
6	21	72	1512	441	5184.

$\Sigma x = 138$

$\Sigma y = 438$

$\Sigma xy = 10120$

$\Sigma x^2 = 3208$

$\Sigma y^2 = 32060$

To calculate $a: \dfrac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$

$b: \dfrac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$

$a = \dfrac{438(3208) - 138(10120)}{6(3208) - (138)^2}$

$a = \dfrac{1405104 - 1396560}{19248 - 19044} = \dfrac{8544}{204}$

$a = 41.88$

$b = \dfrac{6(10120) - (138)(438)}{6(3208) - (138)^2}$

$b = 1.353$

using the equation

$y' = a + bx$

$y' = 41.88 + 1.353x$

To calculat r we will use this formula

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{n(\Sigma x^2) - (\Sigma x)^2)\,(n(\Sigma y^2) - (\Sigma y)^2)}}$$

putting the values in calculated in part (a)

$$\cancel{r = n(\Sigma x}$$

$$\cancel{r = \frac{6(10120) - (138)(438)}{\sqrt{[(6\times 3208) - (138)^2]\,(6(\Sigma y^2) - (\Sigma y)^2)}}}$$

$$r = \frac{6(10120) - (138)(438)}{\sqrt{[(6\times 3208) - (138)^2]\,[(6\times 32060) - (438)^2]}}$$

$$r = 0.8506.$$

Hypotensis sales and temprature given using t-table at $\alpha = 0.05$ is

$t_{0.025, 4} = 2.776$

Since $df = n-2 = 6-2 = 4$

Now calculating the alternative hypothesis using:

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

$$r = 0.8506\sqrt{\frac{6-2}{1-(0.8506)^2}}$$

$$t = 0.8506(3.803)$$

$$\boxed{t = 3.235}$$

Since the value of t-test in greater than the t-table value therefore they both are independent.

Ans 5)

A	B	C	D
10	11	13	18
9	16	8	23
5	9	9	25

let Ho be $\mu_1 = \mu_2 = \mu_3$

H_a be Atleast 1 differene among the means

$\alpha = 0.01$

$df = k-1 = 4-1 = 3$

Between.

$dF = N-K = 12-4 = 8.$

Given $F_{0.01}(3,8) = 7.59$

Next step is to calculate mean of each row,

$\bar{X}_1 = 10+9+5 = 24/3 = 8.$

$\bar{X}_2 = 11+16+9 = 36/3 = 12.$

$\bar{X}_3 = 13+8+9 = 30/3 = 10$

$\bar{X}_4 = 18+23+25 = 66/3 = 22$

Now calculate $\frac{G}{N} = \frac{156}{12} = 13,$

Calculate SD Sum!

$$S_{total} = \Sigma(x-\bar{x})^2 =$$

$$(10-13)^2 + (9-13)^2 + (5-13)^2 + (11-13)^2 + (16-13)^2 + (9-13)^2 + (13-13)^2 + (8-13)^2 + (9-13)^2 + (18-13)^2 + (23-13)^2 + (25-13)^2$$

$S_{Total} =$ ~~9161~~ $428.$

$$S_{within} = \Sigma(x_1-\bar{x}_1)^2 + (x_2-\bar{x}_2)^2 + (x_3-\bar{x}_3)^2.$$

$S_{within} = 80.$

$$S_{Between} = 428 - 80 = 348$$

$$M_{s\,Between} = \frac{S_{Between}}{df_{Between}} = \frac{348}{3} = 3$$

$$M_{s\,within} = \frac{S_{within}}{df_{within}} = \frac{80}{8} = 10$$

$$F = \frac{M_{s\,Between}}{M_{s\,within}} = \frac{11.6}{10} = 11.6$$

$F_{critical} = 11.6$ Ans.

Since $11.6 > 7.59$ therefore we are failed for null hypothesis. As the value is greater then that given in F table.