Soln # Problem Statement 1:

1. $H_0: \mu = 25$, $H_1: \mu \neq 25$

Statement in correct

H_0: has equality

H_1: has all inequality

& μ is mean of population

2. $H_0: \sigma > 10$, $H_1: \sigma = 10$

Statement in incorrect

H_0: has no equality statement

3. $H_0: \bar{x} = 50$, $H_1: \bar{x} \neq 50$

Statement in incorrect as $\bar{x}$ is used for sample.

4. $H_0: p = 0.1$, $H_1: p = 0.5$

Statement in incorrect as alternate Hypothesis has equality

&

5. $H_0: s = 30$, $H_1: s > 30$

Statement in correct.

Solⁿ: Problem Statement 2

Given:

mean(μ) = 52

Std. deviation (σ) = 4.5

sample size (n) = 100

sample mean ($\bar{x}$) = 52.8

alpha(α) = 5% = 0.05

So,

$H_0: \mu \leq 52$

$H_1: \mu > 52$

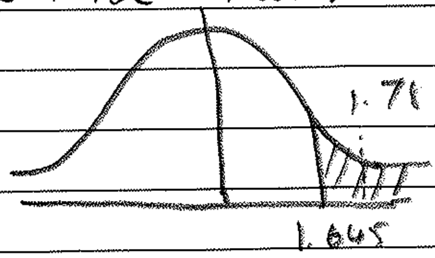
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{52.8 - 52}{4.5/\sqrt{100}} = 1.78$$

$Z_\alpha = Z_{0.05} = 1.645$

$Z > Z_{0.05} \Rightarrow 1.78 > 1.645$

So Reject Ho (Null Hypothesis)

This concludes that the average cost in higher than the bookstore's claim.



Z value falls under rejection region.

Soln: Problem statement 3:

Given: $\mu = 34$

$\sigma = 8$

$n = 50$

$\bar{x} = 32.5$

$\alpha = 1\% = 0.01$

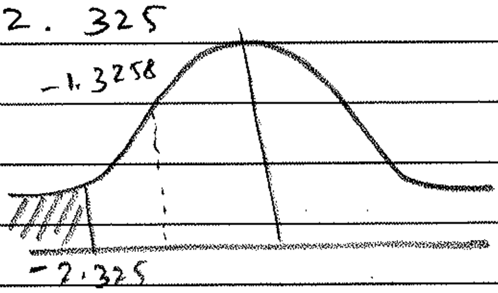
So,

$H_0: \mu \geq 34$

$H_1: \mu < 34$

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{32.5 - 34}{8/\sqrt{50}} = -1.3258$$

$Z_{0.01} = -2.325$



Z value doesn't fall under rejection region so null hypothesis (H_0) should not be rejected. This concludes that the avg. chemical pollutant in the Genesee River is greater than or equal to 34ppm.

Sol^n: Problem Statement 4:

Given $\mu_0 = 1135$

$n = 22$

$\bar{y} = 1031.318$

$s = 240.37$

So,

$H_0: \mu = 1135$

$H_1: \mu \neq 1135$

$$t = \frac{\bar{y} - \mu_0}{s/\sqrt{n}}$$

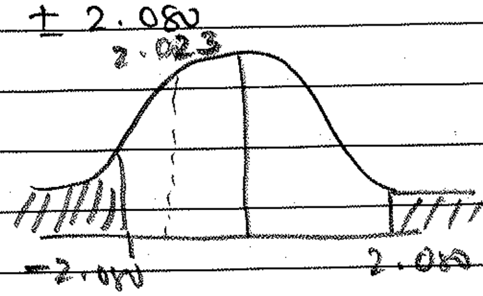
$$= \frac{1031.318 - 1135}{240.37/\sqrt{22}}$$

$$= -2.023$$

$\alpha = 0.05$

$df = n-1 = 22-1 = 21$

$t_{critical} = \pm 2.080$



t value doesn't fall under rejection region
So we don't reject null hypothesis (H_0).
This concludes on an average a family of 4 in US spends about $1135 annually on dental expenditure.

Soln: Problem Statement 5

Given:

So:

$H_0: \mu = 48432$

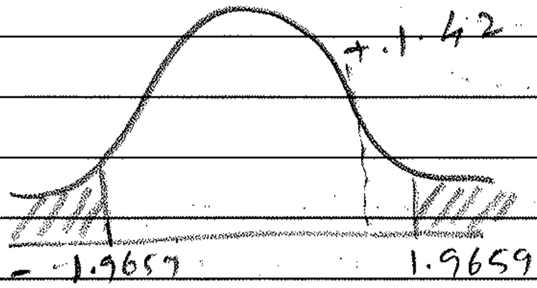
$H_1: \mu \neq 48432$

$t = 1.42$

Assuming $\alpha = 0.05$

$df = n - 1 = 400 - 1 = 399$

$t_{critical} = \pm 1.9659$



t value doesn't fall under rejection region.

So we don't reject null hypothesis (H_0)

So we conclude the average annual family income of Metropolin is \$48,432.

Soln: Problem Statement 6

Given:

$\mu = 32.28$

$n = 19$

$\bar{x} = 31.67$

$s = 1.29$

$\alpha = 0.05$

So:

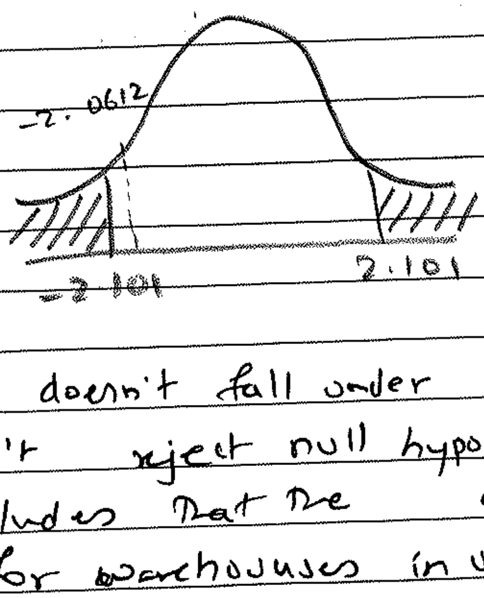
$H_0: \mu = 32.28$

$H_1: \mu \neq 32.28$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{31.67 - 32.28}{1.29/\sqrt{19}} = -2.0612$$

$df = n - 1 = 19 - 1 = 18$

$t_{critical} = t_{0.05} = \pm 2.101$



tvalue doesn't fall under rejection region

So we don't reject null hypothesis (H_0)

This concludes that the average price per sq. ft for warehouses in US is \$32.28.

Soln: Problem statement 7

Given:

$\sigma = 2.5$

a) Acceptance region $(B) = 48.5 < \bar{x} < 51.5$

(i) Calculate B value when $\mu = 52$

$B = P(48.5 < \bar{x} < 51.5)$ $\qquad z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$= P(z_1 < z < z_2)$

$= P\left(\dfrac{48.5 - 52}{2.5/\sqrt{10}} < z < \dfrac{51.5 - 52}{2.5/\sqrt{10}}\right)$

$= P(-4.4276 < z < -0.6325)$

$= P(-4.43 < z < -0.63)$

$= P(z < -0.63) - P(z < -4.43)$

$= 0.2643 - 0$

$\beta = 0.2643$

(ii) Calculate β when $\mu = 50.5$

$B = P(48.5 < \bar{x} < 51.5)$

$= P(z_1 < z < z_2)$ $\qquad z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$= P\left(\dfrac{48.5 - 50.5}{2.5\sqrt{10}} < z < \dfrac{51.5 - 50.5}{2.5/\sqrt{10}}\right)$

$= P(-2.53 < z < 1.2650)$

$= P(z < 1.265) - P(z < -2.53)$

$= 0.8980 - 0.0057$

$\beta = 0.8923$

(iii) Calculate α when real mean $\mu = 50$

$$\alpha = P(\bar{x} < 48.5) + P(\bar{x} > 51.5)$$

$$= P\left(\frac{48.5 - 50}{2.5\sqrt{10}}\right) + P\left(\frac{51.5 - 50}{2.5\sqrt{10}}\right)$$

$$= P(z < -1.90) + P(z > 1.90)$$

$$= P(z < -1.90) + [1 - P(z < 1.90)]$$

$$= 0.0287 + [1 - 0.9713]$$

$$= 0.0287 + 0.0287$$

$$\alpha = 0.0574$$

Below are the complete results

Acceptance region	Sample size	α at $\mu = 50$	β at $\mu = 52$	β at $\mu = 50.5$
$48.5 < \bar{x} < 51.5$	10	0.0574	0.2643	0.8923
$48 < \bar{x}$ 52	10	0.0114	0.5	0.9705
$48.81 < \bar{x} < 51.9$	16	0.0299	0.4364	0.9892
$48.42 < \bar{x} < 51.58$	16	0.0114	0.2514	0.9576

Sol^n. Problem Statement 8

$\mu_{hyp} = 10$

$\bar{x} = 12$

$n = 16$

$S_{\bar{x}} = 1.5$

$$t = \frac{\bar{x} - \mu_{hyp}}{S_{\bar{x}}/\sqrt{n}} = \frac{12-10}{1.5/\sqrt{16}} = \frac{2}{1.5/4} = 5.33$$

So, $t_{score} = 5.33$

Sol^n. Problem Statement 9

$n = 16$

$\alpha = 1\% = 0.01$

$df = n - 1 = 16 - 1 = 15$

Using tscore table,

$t = 2.602$ at $\alpha = 0.01$ and $df = 15$

Soln: Problem statement 10

Given $n = 25$

$\bar{x} = 60$

$S_{\bar{x}} = 4$

$\alpha = 100\% - 95\% = 5\% = 0.05$

$df = n-1 = 25-1 = 24$

$t = \pm 2.064$

P/V H-A

$P(-t_{0.05} < t < t_{0.10})$

Since the value of $-t_{0.05}$ leaves an area of 0.05 on its left and that of $t_{0.10}$ leaves an area of 0.10 on its Right, the remaining area in $1-(0.05+0.10) = 1-0.15 = 0.985$ that falls between $P-t_{0.05}$ and $t_{0.10}$

so $P(-t_{0.05} < t < t_{0.10}) = 0.985$