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

$H_0: \sigma > 10$, $H_1: \sigma = 10$, Not correct, as it should be $\sigma <= 10$

$H_0: \bar{x} = 50$, $H_1: \bar{x} \neq 50$, → Correct

$H_0: p = 0.2$, $H_1: p = 0.5$ → Not correct.

$H_0: S = 30$, $H_1: S > 30$ → Not correct.

$\mu = 52$ $\quad \bar{x} = 52.80$ $\quad H_0: \mu = 50$

$\sigma = 4.50$ $\quad \alpha = 0.05$ $\quad H_a: \mu > 50$

$n = 100$

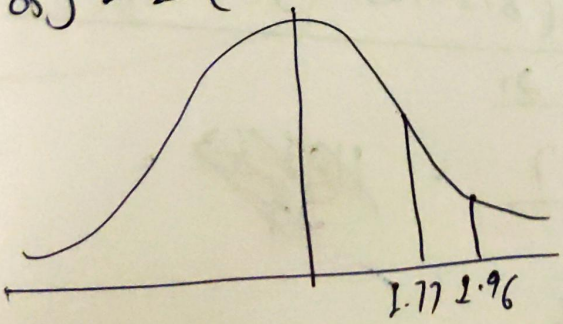
~~t test~~

z test: $\dfrac{\bar{x} - \mu}{SE}$

$SE = \dfrac{\sigma}{\sqrt{n}} = \dfrac{4.50}{\sqrt{100}} = \dfrac{4.50}{10} = 0.45$

$z\ test = \dfrac{52.80 - 52}{0.45} = \dfrac{0.80}{0.45} = 1.777$

$z(0.05) = z(0.025) = 1.96$



we have to accept $H_0: \mu = 50$

Avg. cost is ~~higher~~ Rs 52

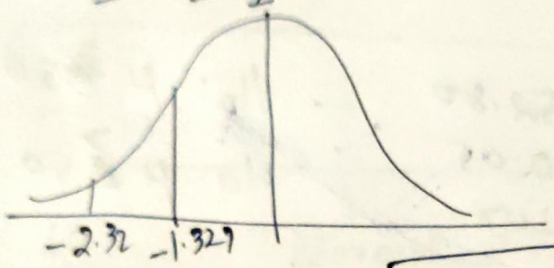
③ $\mu = 34$ $\alpha = 0.01$ $H_0 : \mu = 34$

$\sigma = 8$ $n = 50$ $H_a : \mu < 34$

$\bar{x} = 32.5$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{32.5 - 34}{8/\sqrt{50}} = \frac{-1.5}{1.13}$$

$$= -1.327 \qquad 2(0.01) = -2.32$$



we have to accept H_0 : $\boxed{\mu = 34}$

---

④ $\mu = 1135$

$$\bar{x} = \frac{1008 + 812 + 1117 + \ldots\ldots 1003 + 994}{22}$$

$$\bar{x} = 1031.31$$

$$s = \frac{(1008 - 1031.31)^2 + (812 - 1031.31)^2 + \ldots\ldots}{21}$$

sample std. $s = \sqrt{\frac{\sum_{i=1}^{n}(x - \bar{x})^2}{n-1}}$

$$= \sqrt{\frac{1213378.77}{21}} = \frac{\cancel{1101.53}}{24} =$$

$$= \sqrt{57779.94}$$

$$s = 240.37$$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{1031.31 - 1135}{240.37/\sqrt{22}}$$

$$= \frac{-103.69}{51.25}$$

$$= -2.023$$

$t(0.05) = 1.7207$

Alternative Hypothesis H_a is accepted $\mu \neq 1135$

$\mu = 48432$

$n = 400$

$\bar{x} = 48574$

$\sigma = 2000$

$$Z = \frac{48574 - 48432}{2000/\sqrt{400}}$$

$$= \frac{142}{100}$$

$$= 1.42$$

$Z(0.01) = 2.32$

H_0 is accepted.

Avg family income = 48432

(6)

$\mu = 32.28$
$n = 19$
$\bar{x} = 31.67$
$\sigma = 1.29$

Normally distributed.
$\alpha = 0.05$

$H_0 : \mu \neq 32.28$
$H_a : \mu = 32.28$

$$t = \frac{\bar{x} - \mu}{1.29/\sqrt{19}} = \frac{31.67 - 32.28}{1.29/\sqrt{19}} = \frac{-0.61}{0.296}$$

$$t = -2.060$$

$t(0.05)_{df:18} = 1.734$

H_0 is rejected

Price is not changed

---

(8)

$\mu = 10$
$n = 16$
$\bar{x} = 12$
$\sigma = 1.5$

$$t = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$= \frac{12 - 10}{1.5/\sqrt{16}}$$

$$t = \frac{2}{1.5/4} = \frac{2}{0.375} = 5.333$$

---

(9)

$n = 16$

$t = 2.947$

(10) $n = 25$
$\bar{x} = 60$
$\sigma = 4$

---

(11) $n_1 = 1200$ $n_2 = 800$ $H_0 : \mu_1 = \mu_2$
$x_1 = 452$ $x_2 = 523$ $H_a : \mu_1 \neq \mu_2$
$s_1 = 212$ $s_2 = 185$

$$z = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{452 - 523}{\sqrt{\frac{(212)^2}{1200} + \frac{(185)^2}{800}}}$$

$$= \frac{-71}{\sqrt{37.45 + 42.78}} = \frac{-71}{\sqrt{80.23}} = \frac{-71}{8.95}$$

$$= 7.932$$

$z(0.01) = 2.326$

H_0 is rejected

(12) $H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$n_1 = 100 \quad n_2 = 100$

$x_1 = 308 \quad x_2 = 254$

$s_1 = 84 \quad s_2 = 67$

$$z = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{308 - 254}{\sqrt{\frac{(84)^2}{100} + \frac{(67)^2}{100}}}$$

$$= \frac{54}{\sqrt{\frac{7056}{100} + \frac{4489}{100}}} = \frac{54}{\sqrt{70.56 + 44.89}}$$

$$= \frac{54}{\sqrt{115.45}} = \frac{54}{10.744} = 5.026$$

$z(0.01) = 2.326$

H_0 is rejected

---

(13) $H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$n_1 = 14 \quad n_2 = 9$

$x_1 = 0.317 \quad x_2 = 0.21$

$s_1 = 0.12 \quad s_2 = 0.11$

$$t = \frac{0.317 - 0.21}{\sqrt{\frac{(0.12)^2}{14} + \frac{(0.11)^2}{9}}} = \frac{0.107}{\sqrt{0.001 + 0.001}} = \frac{0.107}{0.044} = 2.431$$

$t_{df=21}(0.05) = 1.721$

H_0 is rejected

$n_1 = 15$ $\quad n_2 = 12$

$\bar{x}_1 = 6598$ $\quad \bar{x}_2 = 6870$

$s_1 = 844$ $\quad s_2 = 669$

H_0 : Sales >

H_a : Sales ▷

$$t = \frac{6598 - 6870}{\sqrt{\frac{(844)^2}{15} + \frac{(669)^2}{12}}} = \frac{-272}{\sqrt{47489.06 + 37296.75}}$$

$$= \frac{-272}{\sqrt{84785.81}} = 0.934$$

$t_{df=25}^{(0.05)} = ~~1.708~~ \; 2.060$

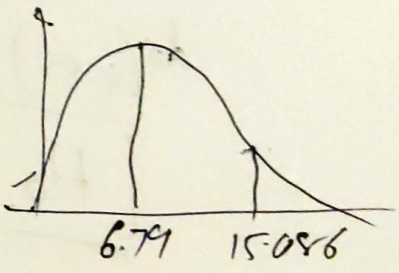
H_0 is accepted

H_0 : Die is unbiased

H_a : Die is biased

	OV	EV	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	16	22	-6	36	1.63
2	20	22	-2	4	0.18
3	25	22	3	9	0.41
4	14	22	-8	16	0.72
5	29	22	7	49	2.22
6	28	22	6	36	1.63

Chisquare $\chi^2 = 6.79$



H_0 is accepted

Die is unbiased

from table $\alpha_{(0.01)} = 15.086$

$df = 5$

(18)

M(O)	W(O)	T
2792	3591	6383
1486	2131	3617
4278	5722	10000

E

$\frac{4278 \times 6383}{10000}$ $\frac{5722 \times 6383}{10000}$

$\frac{4278 \times 3617}{10000}$ $\frac{5722 \times 3617}{10000}$

~~Diff~~

E

2730.64	3652.35
1547.35	2069.64

Observed value (O)	Expected value (E)	(O-E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
2792	2730.64	61.36	3765.04	1.37
3591	3652.35	-61.35	3763.82	1.03
1486	1547.35	-61.35	3763.82	2.43
2131	2069.64	61.36	3765.04	1.82
			χ^2	6.65

$df = (2-1) \times (2-1)$

$= 1$

$df(0.05) = 3.841$

H_0 is rejected

H_0: gender & voting independent

H_a: gender & voting dependent

(19)

O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
41	25	16	256	10.24
19	25	-6	36	1.44
24	25	-1	1	0.04
16	25	-9	81	3.24
				14.96

H_0: equally popular

H_a: not equally popular

$\chi^2_{tabular} = 7.815$

H_0 is rejected

---

(20) Chi square = 29.6

Chi square table = 9.488

H_0 is rejected