1.
  a) a statement about a population parameter
  b) a function of the sample data
  c) the set of all test statistic values for which H_0 will be rejected
  d) rejecting H_0 when H_0 is true
  e) fail to reject H_0 when H_0 is false (H_1 is true)
  f) the probability of a Type I error

2. $n = 24$ $\bar{X}_{24} = 18.68$ $S_x = 1.7$

$$\bar{x} \pm t_{n-1, \alpha/2} \frac{S_x}{\sqrt{n}} = 18.68 \pm t_{23, .05} \frac{1.7}{\sqrt{24}}$$

$$= 18.68 \pm 1.714 (.35) = 18.68 \pm .59$$

$$\Rightarrow \boxed{P(18.09 \leq \mu \leq 19.27) = .90}$$

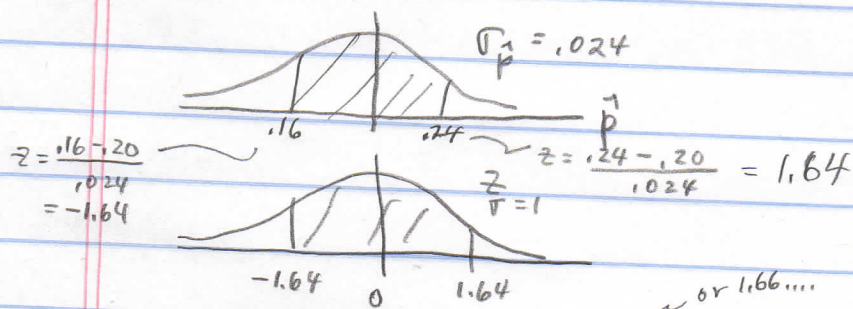3. $$E = Z_{\alpha/2} \sqrt{\frac{p(1-p)}{n}} \Rightarrow .01 = 2.33 \left(\sqrt{\frac{.5(1-.5)}{n}} \right)$$

$\frac{\alpha}{2} = .01$ use $p = .5$

$$\Rightarrow \boxed{n = 13,573}$$

4. $$\hat{p} \sim N\left(p, \sqrt{\frac{p(1-p)}{n}}\right) \Rightarrow \hat{p} \sim N\left(.20, \sqrt{\frac{.20(.80)}{270}}\right)$$

$$\Rightarrow \hat{p} \sim N(.20, .024)$$

FIND $P(.16 < \hat{p} < .24)$:

$\sigma_{\hat{p}} = .024$

$z = \frac{.16 - .20}{.024} = -1.64$

$z = \frac{.24 - .20}{.024} = 1.64$

$\sigma = 1$

$-1.64 \quad 0 \quad 1.64$ or $1.66....$

SO: $P(.16 < \hat{p} < .20) = P(-1.64 < Z < 1.64) = 2(.4495) = \boxed{.899}$

(5.) $E = Z_{\alpha/2} \frac{\sigma_x}{\sqrt{n}}$ $\qquad 0.5 = Z_{.005} \frac{1.8}{\sqrt{n}}$

$\qquad 0.5 = 2.57 \frac{1.8}{\sqrt{n}} \implies n = 85.6$ or $\boxed{n = 86}$
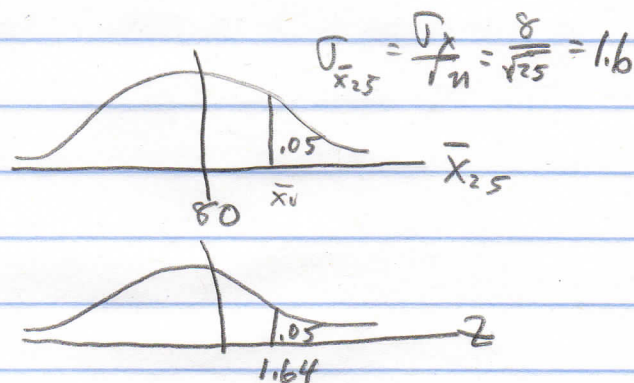

(6.) $E = Z_{\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$

$.02 = Z_{\frac{\alpha}{2}} \sqrt{\frac{.53(.47)}{1500}} \implies Z_{\frac{\alpha}{2}} = 1.55$

$\implies \frac{\alpha}{2} = .5 - .4394 \implies \alpha = .12 \implies 1-\alpha = .88 \implies \boxed{88\% \ C.I.}$

(7.) $\bar{X}_{25} = 83 \quad \sigma_x = 8 \quad \alpha = .05$ $\qquad\qquad \sigma_{\bar{X}_{25}} = \frac{\sigma_x}{\sqrt{n}} = \frac{8}{\sqrt{25}} = 1.6$

a) $H_0 : \mu \le 80$

$\quad H_1 : \mu > 80$

SO: C.R. for Z_{SAMPLE} is:

$Z_{SAMPLE} > 1.64$

OUR $Z_{SAMPLE} = \frac{83-80}{1.6} = 1.87$ WHICH IS IN THE C.R.

SO: REJECT H_0: The data do indicate a significant increase in production level (from 80)

b) $1.64 = \frac{\bar{X}_v - 80}{1.6} \implies \bar{X}_v = 82.6$

SO C.R. for $\bar{X}_{SAMPLE}$ is $\boxed{\bar{X}_{SAMPLE} > 82.6}$