(1) $\mu = 120 \quad \sigma = 8 \quad n = 36$

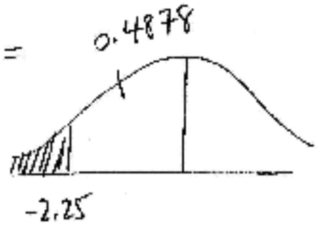
$n \geq 30$

$P(\bar{x} < 117)$

$= P(z < -2.25)$

$$z = \frac{\bar{x} - \mu}{(\sigma/\sqrt{n})} = \frac{117 - 120}{(8/\sqrt{36})} = -2.25$$

$=$



$= 0.5 - 0.4878$

$= 0.0122$

(2) $\mu = 56 \quad \sigma = 7 \quad n = 10$

normal population

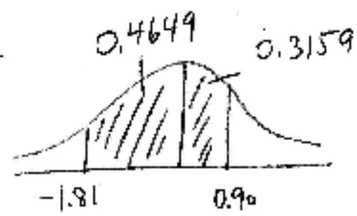
$P(52 \leq \bar{x} \leq 58)$

$$z = \frac{\bar{x} - \mu}{(\sigma/\sqrt{n})}$$

$= P(-1.81 \leq z \leq 0.90)$

$$z_1 = \frac{52 - 56}{(7/\sqrt{10})} \approx -1.81 \qquad z_2 = \frac{58 - 56}{(7/\sqrt{10})} \approx 0.90$$

$=$



$= 0.7808$

(3) $p = 0.015$ $\quad n = 3000$

$q = 0.985$

$\hat{p}$ = sample proportion

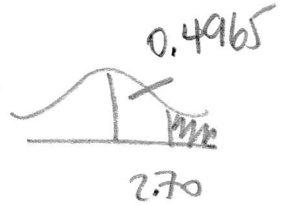
$np, nq > 5$ ✓

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{\frac{63}{3000} - 0.015}{\sqrt{\left(\frac{0.015 \times 0.985}{3000}\right)}} \approx 2.70$$

$P(\#\text{defective} > 63)$

$= P\left(\hat{p} > \frac{63}{3000}\right)$

$= P(z > 2.70)$

$=$ 

$= 0.5 - 0.4965$

$= 0.0035$

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(4) $\mu = 7.1$ $\quad \sigma = 5.2$ $\quad n = 60$

$n > 30$ ✓

The distribution of $\bar{x}$ values is approximately normal with mean 7.1 and standard error $\frac{5.2}{\sqrt{60}} \approx 0.7$

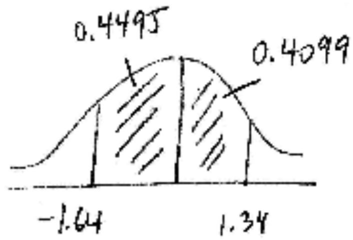
(5) a) $P(6 \le \bar{x} \le 8)$

$$z = \frac{\bar{x} - \mu}{(\sigma/\sqrt{n})} \quad \underline{(n \geq 30)}$$

$= P(-1.64 \le z \le 1.34)$

$$z_1 = \frac{6 - 7.1}{(5.2/\sqrt{60})} \simeq -1.64 \qquad z_2 = \frac{8 - 7.1}{(5.2/\sqrt{60})} \simeq 1.34$$

=



$= 0.4495 + 0.4099$

$= 0.8594$

b) Need $n \geq 30$ or a normal population.

(6) $\mu = 45.5 \quad \sigma = 6 \quad n = 16$ (normal population) ✓

$\bar{x}$ values are normally distributed with:

mean $\mu = 45.5$

standard error $\frac{\sigma}{\sqrt{n}} = 1.5$

(standard deviation of the $\bar{x}$ values)

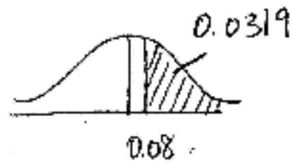
(7) a) $P(\text{total} > 730)$

$= P\left(\bar{x} > \frac{730}{16}\right)$

$= P(\bar{x} > 45.625)$

$= P(z > 0.08)$

$=$



$= 0.5 - 0.0319$

$= 0.4681$

$z = \dfrac{\bar{x} - \mu}{(\sigma/\sqrt{n})}$ (normal population) ✓

$= \dfrac{45.625 - 45.5}{(6/\sqrt{16})}$

≈ 0.08

b) $n \geq 30$ or population is normal.

(8) $p = 0.8$ $n = 100$ $q = 1 - p = 0.2$

($np > 5$ and $nq > 5$) ✓

$\hat{p}$ values are approximately normally distributed with

mean $p = 0.8$

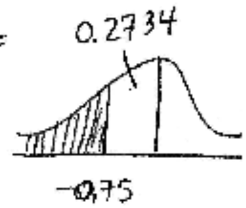
standard error $\sqrt{\frac{pq}{n}} = 0.04$

(standard deviation of the $\hat{p}$ values)

(9) a) $P(\hat{p} < 0.77)$

$= P(z < -0.75)$

$=$



$= 0.5 - 0.2734$

$= 0.2266$

$z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$ ← (np>5 and nq>5) ✓

$= \dfrac{0.77 - 0.8}{\sqrt{\left(\frac{0.8 \times 0.2}{100}\right)}}$

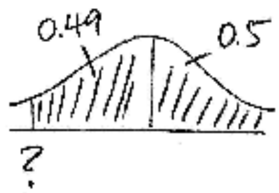
$= -0.75$

b) Need np>5 and nq>5.

(10) $\sigma = 1.9$ $n = 12$ $P(\bar{x} > 355) = 0.99$

$\mu = ?$

Work backwards :



$P(z > ?) = 0.99$

Reverse look-up 0.49 :

$z = 2.33$

Use $\boxed{z = -2.33}$ from diagram

Now $z = \dfrac{\bar{x} - \mu}{(\sigma/\sqrt{n})}$ (normal population)

Plug in $z = -2.33$ $\bar{x} = 355$ $\sigma = 1.9$ $n = 12$:

$$-2.33 = \frac{355 - \mu}{(1.9/\sqrt{12})}$$

$$-2.33\left(\frac{1.9}{\sqrt{12}}\right) = 355 - \mu$$

$$\mu = 355 + 2.33\left(\frac{1.9}{\sqrt{12}}\right)$$

$$\simeq 356.28 \text{ mL}$$