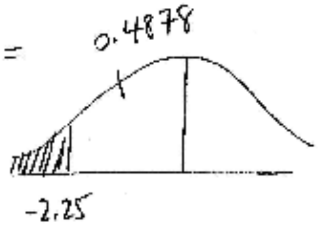
(1) $\mu = 120 \quad \sigma = 8 \quad n = 36$

$n \geq 30$

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

$$= P(z < -2.25)$$

=



$$= 0.5 - 0.4878$$

$$= 0.0122$$

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

$$= \frac{117 - 120}{(8 / \sqrt{36})}$$

$$= -2.25$$

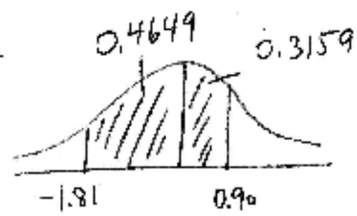
(2) $\mu = 56 \quad \sigma = 7 \quad n = 10$

normal population

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

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

=



$$= 0.7808$$

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

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

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

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

$q = 0.985$

$\hat{p}$ = sample proportion

$P(\#\text{defective} \geq 64)$ binomial

$\approx P(\#\text{defective} \geq 63.5)$ normal approx. to binomial

$\approx P\left(\hat{p} \geq \frac{63.5}{3000}\right)$

$np, nq \geq 5$ ✓

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{\frac{63.5}{3000} - 0.015}{\sqrt{\left(\frac{0.015 \times 0.985}{3000}\right)}} \approx 2.78$$

$= P(z \geq 2.78)$

$= 0.5 - 0.4973$

$= 0.0027$

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

$n \geq 30$ ✓

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

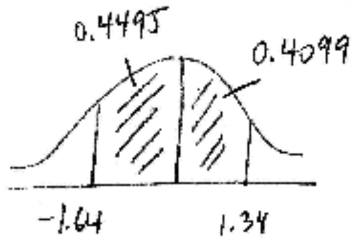
(5) a) $P(6 \le \bar{x} \le 8)$

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

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

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

=



$= 0.4495 + 0.4099$

$= 0.8594$

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

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

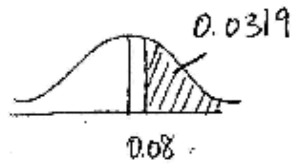
$= P(\bar{x} > 45.625)$

$= P(z > 0.08)$

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

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

≈ 0.08

=


$= 0.5 - 0.0319$

$= 0.4681$

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 $p = 0.8$

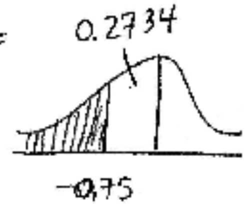
standard error $\sqrt{\frac{pq}{n}} = 0.04$

(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 $nq > 5$) ✓

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

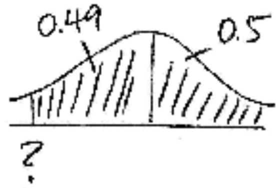
$= -0.75$

b) Need $np > 5$ and $nq > 5$.

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

$\mu = ?$

<u>Work backwards :</u>



$P(z > ?) = 0.99$

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

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

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

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

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