

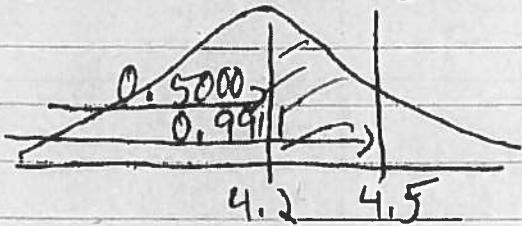
# Chapter 9: Sampling Distribution Answer Key by Michael Reimer

①

a)  $\mu = 4.2$   $\sigma = 0.8$   $n = 40$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{0.8}{\sqrt{40}} = \frac{0.8}{6.32455532} = 0.126491106$$

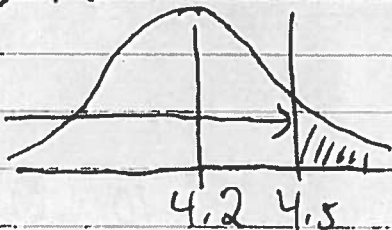
b)  $P(4.2 < \bar{x} < 4.5)$



$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{4.5 - 4.2}{\frac{0.8}{\sqrt{40}}} = \frac{0.3}{0.126491106} = 2.371708245 \approx 2.37 = 0.9911$$

$$0.9911 - 0.5000 = 0.4911$$

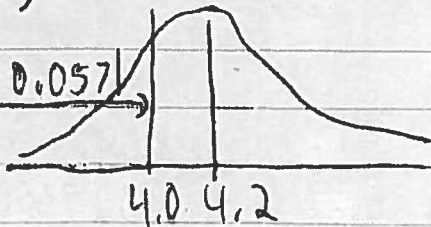
c)  $P(\bar{x} > 4.5)$



$$z = \frac{4.5 - 4.2}{\frac{0.8}{\sqrt{40}}} = \frac{0.3}{0.126491106} = 2.371708245 \approx 2.37 = 0.9911$$

$$1 - 0.9911 = 0.0089$$

d)  $P(\bar{x} < 4)$



$$z = \frac{4.0 - 4.2}{\frac{0.8}{\sqrt{40}}} = \frac{-0.2}{0.126491106} = -1.58113883 \approx -1.58 = 0.0571$$

e)  $\mu = 4.2$   $\sigma = 0.8$   $n = 40$   $N = 400$

Use Finite Population Correction Factor, because the population is  $\frac{400}{40} = 10$  times as large as the sample

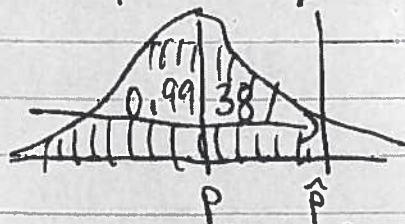
$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}} = \frac{0.8}{\sqrt{40}} \sqrt{\frac{400-40}{400-1}} = 0.126491106 \sqrt{\frac{360}{399}} \Rightarrow$$

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(2)

1)  $0.126491106 \times \sqrt{0.902255639} = 0.126491106 \times 0.94981138 = \underline{\underline{0.12015028}}$

2)  $P(\hat{p} < 25\%) \quad \hat{p} = 25\% = 0.25 \quad p = 20\% = 0.20 \quad n = 400$



$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.25 - 0.20}{\sqrt{\frac{0.20(1-0.20)}{400}}}$$

$$= \frac{0.05}{\sqrt{\frac{0.16}{400}}} = \frac{0.05}{\sqrt{0.0004}} = \frac{0.05}{0.02} = 2.50 = \underline{\underline{0.9938}}$$

$\hat{p}$  = Sample Proportion  
 $p$  = Population Proportion

3) Group 1	Group 2	$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$
Toronto	Hamilton	
$n_1 = 52$	$n_2 = 63$	
$\mu_1 = 280$	$\mu_2 = 290$	
$\sigma_1 = 30$	$\sigma_2 = 26$	

$$Z = \frac{0 - (280 - 290)}{\sqrt{\frac{30^2}{52} + \frac{26^2}{63}}} = \frac{0 - (-10)}{\sqrt{\frac{900}{52} + \frac{676}{63}}}$$

$$Z = \frac{-10}{\sqrt{17.30769231 + 10.73015873}} = \frac{-10}{\sqrt{28.03785104}} = \frac{10}{5.295078001} = \frac{1.888540306}{1.89} = 0.9706$$

$1 - 0.9706 = \underline{\underline{0.0294}}$