Quiz 3.

Q1. Time $\sim N(3.65, 0.004)$

① $P(X > 3.5) = P\left(Z > \frac{3.5 - 3.65}{\sqrt{0.004}}\right)$

$= P(Z > -2.37) = 0.9911$

② $\sum_{i=1}^{10} X_i \sim N(36.5, 0.04)$

$N(N\mu, n\sigma^2)$

③ $P(\Sigma X_i < 36.3) = P\left(Z < \frac{36.3 - 36.5}{\sqrt{0.04}}\right)$

$= P(Z < -1) = 0.1587$

Q2.

$X \sim Exp(\mu=10) \sim f(x) = \frac{1}{10} e^{-x/10}$ $x>0$

① $P(X>12 \mid X>9) = P(X>3) = \int_3^\infty \frac{1}{10} e^{-x/10} dx$

$= -e^{-x/10} \Big|_3^\infty = e^{-3/10} = 0.741$

② $p = P(X<4) = \int_0^4 \frac{1}{10} e^{-x/10} dx$

$= 1 - e^{-0.4} = 0.329$

$Y \sim Geo(p)$ $E(Y) = \frac{1}{p} \approx 3$

Quiz 4. (B/ne)

$\bar{X}$, S =

$\sim \mu = 1.5$, $\sigma^2 = 0.3$

b $n=64$, $\bar{X} \approx N(\mu, \frac{\sigma^2}{n}) = (1.5, \frac{0.3}{64})$

$P(\bar{X} > 1.53) = P(Z > \frac{1.53 - 1.5}{\sqrt{0.3/64}})$

$= P(Z > 0.44) \approx 0.33$

5 $n=64000$.

$$P\left(\sum_{i=1}^{64000} X_i > 95,800\right) = P\left(Z > \frac{95800 - 96000}{\sqrt{19200}}\right)$$

$$N(a\mu, n\sigma^2) = (64000*1.5, 64000*0.3)$$

$$= P\left(Z > \frac{-200}{80\sqrt{3}}\right)$$

$$= P\left(Z > \frac{-25}{\sqrt{3}}\right)$$

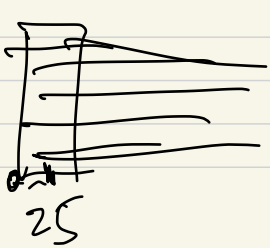
Q2. $Y \sim Bin(60, 0.47)$

$\sim N(28.2, 28.2*0.53)$

$P(Y \geq 25)$

$$= P\left(Z \geq \frac{24.5 - 28.2}{\sqrt{28.2*0.53}}\right)$$

$= \_\_$



WS 5. Q4.

$\sim N(\mu, 3^2)$

To est μ, $n = ?$ such that the error < 1 at 98%.

$$z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} \leq \varepsilon \qquad n \geq \frac{z_{\frac{\alpha}{2}}^2 \sigma^2}{\varepsilon^2}$$

$$= \frac{2.326^2 \cdot 9}{1}$$

Q8. $n = ?$ 96% $\varepsilon \leq 0.02$

if $\hat{p} = 0.57$

$$z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}} \leq \varepsilon \qquad z_{0.02} = 2.05$$

$$n \geq \frac{z_{\frac{\alpha}{2}}^2 \hat{p}\hat{q}}{\varepsilon^2} = \frac{2.05^2 \, 0.57 \cdot 0.43}{0.02^2}$$

Prob. 9.44

	taxi 1	2	3	4	5	6	7	8	
brand A	34,400	45,500							$\bar{x}$
B	36,700	46800							$\bar{y}$
diff	-1700	-700	-	-	-	-	-	-	

$\bar{d} =$ ⬭ $\quad s_d =$

$$\bar{d} \pm t_{\frac{\alpha}{2}}(7)\frac{s_d}{\sqrt{8}} = \text{-} \text{—}$$

9.10. $n=12 \quad \bar{x}=79.3 \quad s=7.8$

Assume normal. Find a 95% CI for μ

$$\bar{x} \pm t_{.025}(11)\frac{s}{\sqrt{12}}$$

Sample Ex 2.

Q2. $\sim f(x) = 3x^2 \quad 0<x<1.$

$$\mu = \int_0^1 x \cdot 3x^2\,dx = \frac{3}{4}$$

$$\sigma^2 = E(X^2) - \mu^2 = \int_0^1 x^2 \cdot 3x^2\,dx - \frac{9}{16}$$

$$= \frac{3}{5} - \frac{9}{16} = \frac{48-45}{80} = \frac{3}{80}$$

$$\sum_{i=1}^{80} X_i \overset{CLT}{\sim} N(n\mu, n\sigma^2)$$

$$= N(60, 3)$$

$$P(58 \le \Sigma X_i \le 64) = P\left(\frac{58-60}{\sqrt{3}} \le Z \le \frac{64-60}{\sqrt{3}}\right)$$

$$\bar{X} \sim N(\mu, \sigma^2/n)$$

$$\frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \sim Z.$$

$$\Sigma X_i \sim N(n\mu, n\sigma^2)$$

$$\frac{\Sigma X_i - n\mu}{\sqrt{n}\cdot\sigma} \sim Z$$

or:

$$P\left(\frac{58}{80} \le \bar{X} \le \frac{64}{80}\right) = P\left(\frac{\frac{58}{80} - \frac{3}{4}}{\sqrt{3/6400}} \le Z \le \frac{\frac{64}{80} - \frac{3}{4}}{\sqrt{3/6400}}\right)$$

$$\bar{X} \sim N\left(\frac{3}{4}, \frac{3/80}{80} = \frac{3}{6400}\right)$$