Hw 5

1 $X \sim N(43, (4.5)^2)$

a. $P(X \leq 40) = P\left(Z \leq \frac{40-43}{4.5}\right) = P(Z \leq -0.66) = 0.2546$

b. $P(X \leq x) = .75$

$P(Z \geq z) = 0.75 \Rightarrow P(Z \leq z) = 0.25$

$-0.67 = \frac{x - 43}{4.5} \Rightarrow x = 43 - (0.67)(4.5)$

c. $P(36.25 \leq X \leq 49.75) =$

$P\left(\frac{36.25 - 43}{4.5} \leq Z \leq \frac{49.75 - 43}{4.5}\right) =$

2 $X \sim Bin(35, 0.05) \Rightarrow X \approx N(1.75, 1.6625)$

$\Rightarrow X \approx Poi(1.75)$

a. $P(X \leq 2) = P\left(Z \leq \frac{2 - 1.75}{\sqrt{1.6625}}\right)$

b. $P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$

c. $P(1 \leq X \leq 3) = P\left(\frac{1 - 1.75}{\sqrt{1.6625}} \leq Z \leq \frac{3 - 1.75}{\sqrt{1.6625}}\right)$

d. $p(1 \le x \le 3) = p(x=1) + p(x=2) + p(x=3)$

[3] $p(X \ge 3) = 0.1 \quad p(X \le -2) = 0.1$

$p(-0.5 \le X \le 0.5) = ? \quad p(-1 \le X \le 1) = ?$

$0.1 = p(X \ge 3) = 1 - p(X \le 3) \Rightarrow p(X \le 3) = 0.9 \Rightarrow z = 1.29$

$p(X \le -2) = 0.1 \Rightarrow z \Rightarrow -1.295$

$1.29 = \frac{3-M}{\sigma} \Rightarrow 3 - 1.29\sigma = M$

$-1.29 = \frac{-2-M}{\sigma} \Rightarrow -1.29\sigma = -2 - 3 + 1.29\sigma$

$-1.29\sigma = -5 + 1.29\sigma$

$\Rightarrow \sigma = \frac{5}{2.58} \simeq 1.94$

$\Rightarrow M = 3 - (1.29)(1.94) \simeq 0.5$

$\Rightarrow p\left(\frac{-0.5-0.5}{1.94} \le z \le \frac{0.5-0.5}{1.94}\right)$

$\Rightarrow p\left(\frac{-1-0.5}{1.94} \le z \le \frac{1-0.5}{1.94}\right)$

[5] $X \sim \exp(\frac{3}{10})$ $\Rightarrow$

- For 10 buckets $\Rightarrow \lambda = 10^4$, p(some contamination detected) $= p(X \ge 10^{-4}) \; ; \; X \sim \exp(10^4)$

- p(detected contamination at least 3 Times) $; Y \sim Bin(10, p(X \ge 10^{-4}))$

$p(Y \ge 3) = 1 - p(y=0) - p(y=1) - p(y=2)$