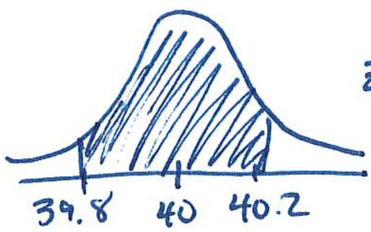
Ch. 6 Review Sheet Key

1. Let X = number of cans sold per day, where $\mu_x = 125\ cans\ and\ \sigma_x = 15\ cans.$
   Let Y = daily revenue of soft drinks per day.
   So, $\mu_Y = 1.25\mu_x = \$156.25\ and\ \sigma_Y = 1.25\sigma_Y = \$18.75$

2. Let X = Length of each piece of lumber where N_x(8ft, .05ft.)
   Let T = Total length of the deck with 5 pieces of lumber
   So T = $X_1 + X_2 + X_3 + X_4 + X_5$, Find $P(39.8 \leq T \leq 40.2)$
   So $\mu_T = 5(8) = 40$ and $\sigma_T^2 = 5(.05)^2 = .0125\ so\ \sigma_T = .1118$
   $N_T(40, .1118)$

   $$z = \frac{39.8 - 40}{.1118} = -1.79 \longrightarrow .0367$$



   $$z = \frac{40.2 - 40}{.1118} = 1.79 \longrightarrow .9633$$

   $$.9633 - .0367 = \boxed{.9266}$$

   There is about a 92.66% chance that the total deck length will be within the required length of 39.8 and 40.2 feet given 5 randomly selected pieces of lumber.

3. Let X = Winnings of Red and Let Y = Winnings of Green

X	-$1	$1
P(X)	19/37	18/37

E(X) = (-1)(19/37) + (1)(18/37) = -$.03

Y	-$1	$34
P(Y)	36/37	1/37

E(Y) = (-1)(36/37) + (34)(1/37) = -$.05

Betting on Red is best as you will only lose $.03 on average, rather than $.05 on Green on average.

4. Binary – "Success" = greets dog before spouse.
   Independent – 12 dog owners is les than 10% of all dog owners, so we can consider trials independent (or) each dog owner greeting is not affected by another dog owners greeting, so we can consider trials independent.
   Fixed Trials – 12 dog owners selected at random.
   Same Probability – probability that dog owner greets dog first is .66

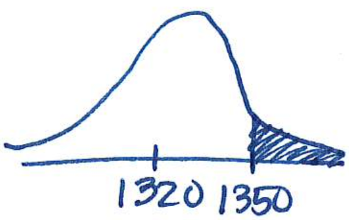
So, Binomial Setting, where X = number of dog owners who greet the dog first when n=12 and p= .66.

5. P(X=7) = ${}_{12}C_7\ (.66)^7(.34)^5$ = Binompdf (12, .66, 7) = .1963

6. P(X less than or equal to 5) = Binomcdf (12, .66, 5) = .0734

7. E(X) = np = 12(.66) = 7.92 dog owners. We would expect about 7.92 randomly selected dog owners out of 12 to greet their dog first, on average.
$\sigma_X = \sqrt{np(1-p)} = \sqrt{(12)(.66)(.34)}$ = 1.641 dog owners. We would expect the number of randomly selected dog owners out of 12 that greet their dog first to vary from the mean (7.92 dog owners) by about 1.641 dog owners, on average.

8. Conditions:
10n = 10(2000) = 20,000 which is less than all dog owners.
np = (2000)(.66) = 1320 greater than 10.
n(1-p) = (2000)(.34) = 680 greater than 10.
Let X = number of dog owners who greet dog first.
$\mu_X = np = 1320$ *and* $\sigma_X = \sqrt{np(1-p)} = 21.1849$
so $N_X(1320, 21.1849)$, find $P(X \geq 1350)$.



$z = \frac{1350-1320}{21.1849} = 1.42 \xrightarrow[\text{z-table}]{} .9222$

$1 - .9222 = \boxed{.0778}$

There is about a 7.78% chance that more than 1350 randomly selected dog owners out of 2000 will greet their dog first.

9. $P(X > 1350) = 1 - P(X \leq 1350) = 1 - Binomcdf(2000, .66, 1350) = 1 - .9254 = .0746$
There is about a 7.46% chance that more than 1350 randomly selected dog owners out of 2000 will greet their dog first.

Binomial Distributions are more accurate, as normal approximations get closer to a normal distribution as the sample size increases, so it is still an approximation.

10. $P(X = 4) = (.95)^3(.05)^1 = .0429$, where X = geometric random variable where is number of trials until winning cereal box when p = .05

11. P(10 failures) = $(.95)^{10}$ = .5987

12. $\mu_X = {}^1/_p = {}^1/_{.05} = 20$ boxes.