1)

a) The proportion of student's that Kronk does better than is equivalent to the area to the left of his score in a Gaussian distribution. If we convert his score to a standard normal form, Kronk's Z-score is$\frac{23-20.8}{4.8} = .458$. If we look this up in the Z-Table, we see that he did better than roughly 67% of all other students.

b) The proportion of student's that performed better than Yzma is the proportion of student's to the right of Yzma's score in a Gaussian distribution. If we convert her score to a standard normal, we see a value of $\frac{1700-1500}{250} = .4$. This corresponds to her score being greater than .655% of students, and thus worse than .345 percent of students.

c) Here we want to do the process in reverse; we want to find the z-score associated with scoring higher than 90% of the students, and see what that corresponds to in the context of a SAT. If we find the table entry for .90, we see its z-score is about 1.28. So we need to find: $1.28 = \frac{x-1500}{250}$, and x equals: 1820.

2)

a) We use the cumulative distribution to find: $\frac{40-30}{40-25} = \frac{10}{15} = \frac{2}{3}$

b) If Simba shows up after 11:40, he has a 0 percent chance of arriving before Pubmaa. As we saw before, if he were to show up at 11:30, he would have a 30% chance of arriving before Pumbaa. We need to calculate the probability he arrives before Pumbaa for every time interval in the region of 11:30 to 11:40, and integrate over that:

$$\int_{30}^{40} \frac{1}{15} * \left(\frac{40-x}{40-25}\right) = .222222$$

3)

a) To be a valid pdf, $c(100-x)$ needs to integrate to 1:

$$\int_0^{100} c\,(100-x) = 1$$

$$c\left(100x - \frac{x^2}{2}\right)\Bigg|\begin{matrix}100\\0\end{matrix} = 1$$

$$c\left(\left(100 * 100 - \frac{100^2}{2}\right) - \left(100 * 0 - \frac{0^2}{2}\right)\right) = 1$$

$$c(10000 - 5000) = 1$$

$$c = 1/5000$$

b)$\int_0^x \frac{1}{5000}(100-x) = \frac{1}{5000}\left(100x - \frac{x^2}{2}\right)\Big|\begin{matrix}x\\0\end{matrix} = \frac{1}{5000}\left(100x - \frac{x^2}{2}\right)$

c) If we plug in 50 to the above, we see a value of .75.

d) Although the probability that x = 50 is 0, we can find the probability that x falls within a small range around 50 and 75 in order to get the ratio:

$$\frac{P(50+\epsilon > x > 50+\epsilon)}{P(75+\epsilon > x > 75+\epsilon)} = \frac{\epsilon P(x=50)}{\epsilon P(x=75)} = \frac{P(x=50)}{P(x=75)} = \frac{100-50}{100-75} = 2$$

Twice as likely.

4)

a) Probability of getting at least 450 calories from mangos:

We need at least 3 mangos. We take 1-P(0 mangos)-P(1 mango)-P(2 mangos)

=$1-\frac{4^0e^{-4}}{0!}-\frac{4^1e^{-4}}{1!}$=.76

b) Probability of getting at least 450 calories from oranges:

We need at least 9 oranges

=$1-\sum_{i=0}^{8}\frac{15^ie^{-15}}{i!}$=.96

b)

We set this up with bayes formula:

P(oranges | 600 calories) = $\frac{P(600\ calories\ |oranges)P(oranges)}{P(600\ calories|oranges)P(oranges)+P(600\ calories|mangos)P(mangos)}$

= $\frac{\frac{15^{12}e^{-15}}{12!}*.6}{\frac{15^{12}e^{-15}}{12!}*.6+\frac{4^3e^{-4}}{3!}*.4} = .3888$

5)

a)

The probability of them stopping on a roll is 1/6. We sum up the probabilities of them rolling the dice less than or equal to 4 times before stopping on the next roll.

$$\sum_{i=0}^{4}\frac{5}{6}^i\frac{1}{6}$$

b) The expectation of a geometric random variable is 1/p, so when p = 1/6, the expectation is 6.

6)

We model this as a binomial with the sum representing the number of questions we get right. We have a 25% chance of getting a question correct.

$$\sum_{i=7}^{10}\binom{10}{i}(.75)^{10-i}(.25)^i$$