What did we talk about last class?
Dealing with Insufficient Data

- Ask SMEs for what they think the bounds and the mean should be.
- Use triangle distribution to match those numbers.
- Find beta distribution that gives you the right shape.
Arrivals are often well modeled by a Poison process.

A Poison process is defined as having three characteristics.

- Events happen one at a time.
- The number of events between t and t+s is independent of the number of earlier events.
- The number of events between t and t+s is independent of t.
If $N(t)$ is a Poisson process then the following is true.

\[ P[N(t+s) - N(t) = k] = \frac{e^{-\lambda s} (\lambda s)^k}{k!} \]

- For $k=0,1,2,...$ and $t,s \geq 0$
- If $N(t)$ is a Poisson process with rate of $\lambda$ then the interarrival times, $A_1, A_2, ...$ are IID exponentials with mean of $1/\lambda$. 
Nonstationary Poisson Process

- Throw out the third requirement.
- Let $\Lambda(T) = \mathbb{E}[N(t)]$.

$$\lambda(t) = \frac{d}{dt} \Lambda(t)$$

Then

$$P[N(t+s) - N(t) = k] = \frac{e^{b(t,s)} [b(t,s)]^k}{k!}$$

$$b(t,s) = \Lambda(t+s) - \Lambda(t) = \int_t^{t+s} \lambda(y) dy$$
This discussion in the book was actually quite enlightening for an article I read in Physics Today recently.

The article was about light emission from nanoprocesses.

The distribution of illumination for these is not a exponential. That implies it is not a Poisson process, and that means there is a more complex mechanism involved.
The distribution of on and off times followed a power-law distribution. This is also a common distribution in many other areas, including planetary science.

Both differential and cumulative distributions have the same form of $x^{-q}$.

Particle sizes like to follow this with a differential $q$ of about 3.
The midterm is next class. Do you have any other suggestions for questions?

Feel free to bring a single sheet of paper cheat sheet. I don't know if it will help but it is a good way to study.