

CSE 505 Problem Set 5

Date: Friday, November 7th, 2003

Due date: Monday, November 17th, 2003

• Problem 1

The number of “leads” (contacts) available to a salesman on any given day is a Poisson random variable with probability mass function

$$p_k(k_0) = \frac{\mu^{k_0} e^{-\mu}}{k_0!}, \quad k_0 = 0, 1, 2, \dots$$

The probability that any particular lead will result in a sale is 0.5. If your answers contain any series, they must be summed.

- a. What is the probability that the salesman will make exactly one sale on any given day?
- b. If we randomly select a sales receipt from his file, what is the probability that it represents a sale made on a day when he had a total of R leads?
- c. What fraction of all his leads comes on days when he has exactly one sale?
- d. What is the probability that he has no sales on a given day?

• Problem 2

Random variable x has the PDF $f_x(x_0)$, and we define the *Mellin transform* $f_x^M(s)$ to be

$$f_x^M(s) = E(x^s)$$

- a. Determine $E(x)$ and σ_x^2 in terms of $f_x^M(s)$.
- b. Let y be a random variable with

$$f_y(y_0) = K y_0 f_x(y_0)$$

i Determine K .

ii Determine $f_y^M(s)$ in terms of $f_x^M(s)$.

iii Evaluate $f_x^M(s)$ and $f_y^M(s)$ for

$$f_x(x_0) = u(x_0) - u(x_0 - 1)$$

where $u(x_0)$ is the unit step function. Use your results to determine $E(y)$ and σ_y .

c Let w and r be independent random variables with PDF's $f_w(w_0)$ and $f_r(r_0)$ and Mellin transforms $f_w^M(s)$ and $f_r^M(s)$. If we define $l = wr$, find $f_l^M(s)$ in terms of the Mellin transforms for w and r .