

5-12. The XYZ Company plans to visit potential customers until a substantial sale is made. Each sales presentation costs \$1000. It costs \$4000 to travel to the next customer and set up a new presentation.

- (a) What is the expected cost of making a sale if the probability of making a sale after any presentation is 0.10?
- (b) If the expected profit from each sale is \$15,000, should the trips be undertaken?
- (c) If the budget for advertising is only \$100,000, what is the probability that this sum will be spent without getting an order?

Let the RV X be the number of presentations before a sale is made. Clearly, X is a geometric RV [See Kinney p. 124].

$$\text{Let the RV } C \text{ be } C = \$1000 \cdot X + \$4000(X-1) \\ = \$5000X - \$4000$$

a) Find $E(C)$

$$E(C) = \$5000 \overset{1/p}{E(X)} - \$4000$$

$$= \$5000 \cdot \frac{1}{0.10} - \$4000 = \$46000$$

b) No, we expect to spend \$46,000 just to make \$15,000. I don't think so!

c) We are asked to find $P(C \geq \$100,000)$

$$P(C \geq \$100,000) \\ = P(\$5000X - \$4000 \geq \$100,000) \\ = P(X \geq \frac{\$104,000}{\$5000}) \\ = P(X \geq 19.2) = \sum_{x=20}^{\infty} (0.9)^{x-1} (0.1) = 1 - \sum_{x=0}^{19} (0.9)^{x-1} (0.1)$$

$$= 0.0240$$