4. Two antibiotics are available as treatment for a common ear infection in children.

- Antibiotic A is known to effectively cure the infection 60 percent of the time. Treatment with antibiotic A costs $50.

- Antibiotic B is known to effectively cure the infection 90 percent of the time. Treatment with antibiotic B costs $80.

The antibiotics work independently of one another. Both antibiotics can be safely administered to children. A health insurance company intends to recommend one of the following two plans of treatment for children with this ear infection.

- Plan I: Treat with antibiotic A first. If it is not effective, then treat with antibiotic B.

- Plan II: Treat with antibiotic B first. If it is not effective, then treat with antibiotic A.

(a) If a doctor treats a child with an ear infection using plan I, what is the probability that the child will be cured?

$$p(cure) = p(A\ cures\ it) + p(B\ cures\ it) \cdot p(A\ didn't\ cure\ it)$$

$$p(cure) = .6 + (.9)(.4)$$

$$= .6 + .36$$

$$p(cure) = .96$$

If a doctor treats a child with an ear infection using plan II, what is the probability that the child will be cured?

$$p(cure) = p(B\ cures\ it) + p(A\ cures\ it) \cdot p(B\ didn't\ cure\ it)$$

$$= .9 + (.6)(.1)$$

$$= .9 + .06$$

$$p(cure) = .96$$

GO ON TO THE NEXT PAGE.

-12-

(b) Compute the expected cost per child when plan I is used for treatment.

expected cost = cost A + cost B · p (A doesn't cure it)

$$= \$50 + \$80(.4)$$
$$= \$50 + \$32$$
$$= \$82$$

Compute the expected cost per child when plan II is used for treatment.

expected cost = cost B + cost A · p (B doesn't cure it)

$$= \$80 + \$50(.1)$$
$$= \$80 + \$5$$
$$= \$85$$

(c) Based on the results in parts (a) and (b), which plan would you recommend?
Explain your recommendation.

I would reccomend plan I. The probability that the child will be cured is the same, so that does not effect the choice. However, on average, plan I will cost less than plan II. Each child will cost on average $82 on plan I, while costing $85 on plan II. Since the insurance companies normally end up paying for the medication, they would want to reccomend the plan that would cost them the least per child on average.

GO ON TO THE NEXT PAGE.