THREE OR MORE DEPENDENT EVENTS The formula for finding probabilities of dependent events can be extended to three or more events, as shown below.

EXAMPLE 6 Find probability of three dependent events

COSTUME PARTY You and two friends go to the same store at different times to buy costumes for a costume party. There are 15 different costumes at the store, and the store has at least 3 duplicates of each costume. What is the probability that you each choose different costumes?

ANOTHER WAY

You can also use the fundamental counting principle.

$P(\text{all different})$

$= \dfrac{\text{different costumes}}{\text{possible costumes}}$

$= \dfrac{15 \cdot 14 \cdot 13}{15 \cdot 15 \cdot 15} \approx 0.809$

Solution

Let event A be that you choose a costume, let event B be that one friend chooses a different costume, and let event C be that your other friend chooses a third costume. These events are dependent. So, the probability is:

$$P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B|A) \cdot P(C|A \text{ and } B)$$

$$= \frac{15}{15} \cdot \frac{14}{15} \cdot \frac{13}{15} = \frac{182}{225} \approx 0.809$$

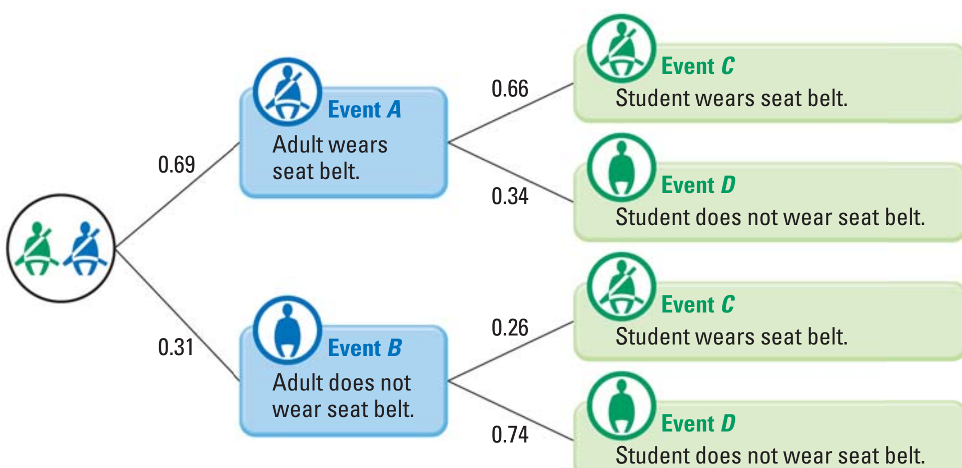
TAKS

EXAMPLE 7 TAKS REASONING: Multi-Step Problem

SAFETY Using observations made of drivers arriving at a certain high school, a study reports that 69% of adults wear seat belts while driving. A high school student also in the car wears a seat belt 66% of the time when the adult wears a seat belt, and 26% of the time when the adult does not wear a seat belt. What is the probability that a high school student in the study wears a seat belt?

Solution

A probability tree diagram, where the probabilities are given along the branches, can help you solve the problem. Notice that the probabilities for all branches from the same point must sum to 1.



So, the probability that a high school student wears a seat belt is:

$$P(C) = P(A \text{ and } C) + P(B \text{ and } C)$$

$$= P(A) \cdot P(C|A) + P(B) \cdot P(C|B)$$

$$= (0.69)(0.66) + (0.31)(0.26) = 0.536$$