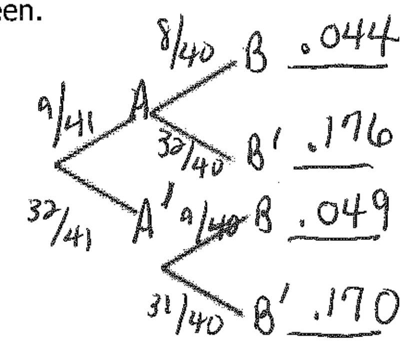
AP STAT Examples Section 6.3 Name Key

Slim is a professional poker player. At the moment he wishes very much to draw two diamonds in a row. As he sits at the table looking at his hand and at the upturned cards on the table, Slim looks at these 11 cards and sees that 4 of them are diamonds. The full deck contains 13 diamonds among the 52 cards in the deck, so 9 of the 41 unseen cards still in the deck are diamonds. The deck was shuffled, so each card Slim draws is equally likely to be any of the cards that he has not seen.

A = 1st draw is a diamond **B** = 2nd card is a diamond



Create a tree diagram to show the resulting probabilities of these two draws.

1. What is the probability that Slim draws a diamond on his **first card**?

P(1st draw is a diamond) = 9/41

2. Find the conditional probability that meets Slim's wish. That is, he draws a diamond on the first card and the second card.

Calculate this probability using the conditional probability multiplication formula

P(A∩B) = P(A) · P(B | A).

P(diamond and diamond) = 9/41 · 8/40 = .044

3. Would you assume these events to be independent? Justify your reason ***mathematically***. *Doesn't matter if A occurred or not

RECALL: What are the proofs we can use for ***independence***? Choose a method to determine independence.

Method I Formula : $P(B|A) \stackrel{?}{=} P(B|A')$

$8/40 \stackrel{?}{=} 9/40$

False These events are not independent.

Method II Formula: $P(A\cap B) \stackrel{?}{=} P(A)\cdot P(B)$

$.044 \stackrel{?}{=} \frac{9}{41}\cdot(.044+.049)$

$.044 \stackrel{?}{=} .0204$

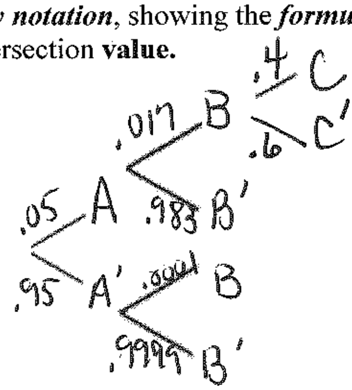
False

Only 5% of male high school basketball, baseball, and football players go on to play at the college level. Of these, only 1.7% play major league professional sports. Only 0.01% of professional athletes did not compete in college. About 40% of the HS athletes who compete in college and then reach the pros have a career of more than 3 years.

4. Construct a tree diagram to represent the following events. Use letter notation and percentages to define the parts of the tree. Find the resulting intersection probabilities using ***probability notation***, showing the ***formula (with values),*** and the final intersection **value.**

Let **A** = competes in college
Let **B** = competes professionally
Let **C** = pro career longer than 3 years

Male High School Student



$P(A\cap B) = P(A)\cdot P(B|A) = .00085$

$P(A\cap B') = P(A)\cdot P(B'|A) = .04915$

$P(A'\cap B) = P(A')\cdot P(B|A') = .000095$

$P(A'\cap B') = P(A')\cdot P(B'|A') = .949905$

Use the values on your tree diagram to answer these questions.

5. Find the following probabilities. Write the **verbal statements** for each. Show your **formula** (when needed) and **work** under each problem.

P(A) = P(competes in college) = .05 $\boxed{5\%}$

P(B | A) = P(competes proffession | competes in college) = .017 $\boxed{1.7\%}$

P(A ∩ B) = P(competes in college AND competes professionally) = .00085 $\boxed{0.085\%}$

$P(A) \cdot P(B|A) = (.05)(.017)$

P(B ∩ A^c) = P(competes proffessionally AND does not compete in college) = $\boxed{.0095\%}$

$P(A^c) \cdot P(B|A^c) = (.95)(.0001) = .000095$

P(B^c | A) = P(does not compete proffessionally | competes in college) = .983 $\boxed{98.3\%}$

P(B | A^c) = P(competes proffessionally | does not compete in college) = .0001 $\boxed{.01\%}$

P(B^c | A^c) = P(does not compete proffessionally | does not compete in college) = .9999 $\boxed{99.99\%}$

P(C | (A ∩ B)) = P(pro career longer than 3 yrs | competed in college and pros) = .4 $\boxed{40\%}$

6. What proportion athletes compete professionally?

P(B) = $P(A \cap B) + P(A' \cap B) = .00085 + .000095 = .000945 = \boxed{.0945\%}$

7. What is the probability that a high school athlete competes in college and then plays a professional sport for at least 3 years (that is P(A *and* B *and* C)) ?

P(A ∩ B ∩ C) = P(A) ·P(B|A) ·P(C | (A ∩ B)) = $(.05)(.017)(.4) = .00034 = \boxed{.034\%}$