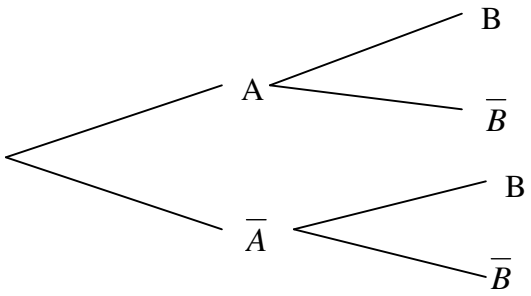
Rearranging the last formula, we have CONDITIONAL PROBABILITY of Event B (or Event A):

$$P(B|A) = \frac{P(AandB)}{P(A)} \quad \text{or} \quad P(A|B) = \frac{P(BandA)}{P(B)}$$




**Example 1:** Since $P(A|B) = \frac{P(BandA)}{P(B)}$

a) If P(A and B) = 0.22 and P(B) = 0.79, P(A|B) = 0.28

$P(A|B) = \frac{0.22}{0.79} = 0.28$

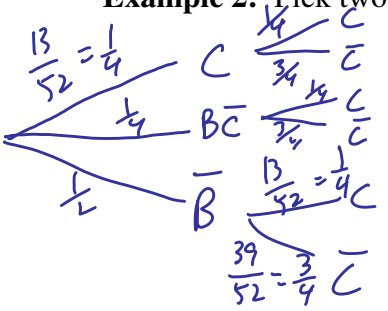
b) If P(A|B) = 0.59, and P(B) = 0.75, P(A and B) = _____

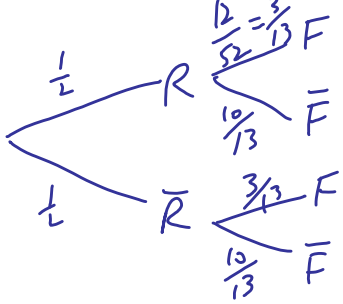
$(0.75)\,0.59 = \frac{x}{0.75}(0.75)$ $\quad x = 0.44$

c) If P(A|B) = 0.4, and P(A and B) = 0.14, P(B) = 0.35

$0.4 = \frac{0.14}{x}$ $\quad \frac{0.4x}{0.4} = \frac{0.14}{0.4}$

**Example 2:** Pick two cards, with replacement, from a standard 52 card deck.



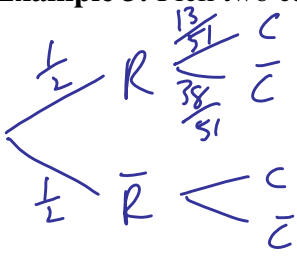

a) What is the probability that the first card is black and the second card is a club?

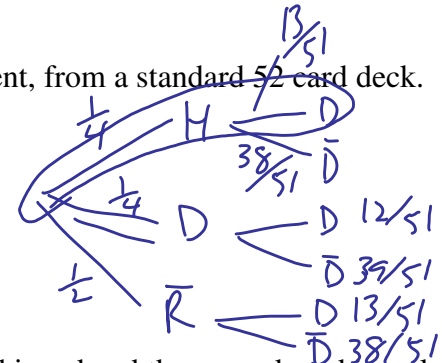
$(\frac{1}{2})(\frac{1}{4}) = \frac{1}{8}$

b) What is the probability that the first card is red and the second card is a face card?

$(\frac{1}{2})(\frac{3}{13}) = \frac{3}{26}$

**Example 3:** Pick two cards, without replacement, from a standard ~~52~~ card deck.



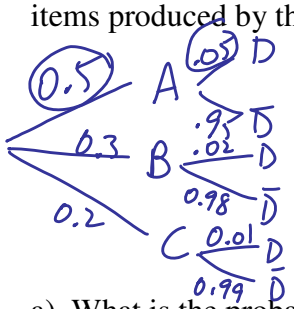

a) What is the probability that the first card is red and the second card is a club?

$$\left(\frac{1}{2}\right)\left(\frac{13}{51}\right) = \frac{13}{102}$$

b) What is the probability that the first card is red and the second card is a diamond?

$$\left(\frac{1}{4}\right)\left(\frac{13}{51}\right) + \left(\frac{1}{4}\right)\left(\frac{12}{51}\right) = \frac{25}{204} \text{ or } 0.1225$$

**Example 4:** Three machines A, B, and C produce respectively 50%, 30%, and 20% of the items produced daily by a manufacturing company. The percentages of defective items produced by the machines are respectively 5%, 2%, and 1%.




a) What is the probability that an item selected at random from the daily output is defective?

$$(0.5)(0.05) + (0.3)(0.02) + (0.2)(0.01) = 0.033$$

b) What is the probability that an item came from machine C given that it is defective?

$$P(C|D) = \frac{P(C \text{ and } D)}{P(D)} = \frac{(0.2)(0.01)}{0.033} = 0.0606$$