1. Draw a picture that best matches the definition of Bayes' Theorem. Use different shadings to highlight the different pieces of the equation. Ask.

2. State College is playing Backwater A&M for the conference football championship. If Backwater's first-string quarterback is healthy, A&M has a 75% chance of winning. If they have to start their backup quarterback, their chances of winning drop to 40%. The team physician says that there is a 70% chance that the first-string quarterback will play. What is the probability that Backwater wins the game?

$$P(W) = P(W \cap Q_1) + P(W \cap Q_2) = P(W|Q_1)P(Q_1) + P(W|Q_2)P(Q_2) = 0.75*.7 + 0.4*.3$$

3. A test indicates the presence of a particular disease 90% of the time when the disease is present and the presence of the disease 2% of the time when the disease is not present. If 0.5% of the population has the disease, calculate the conditional probability that a person selected at random has the disease if the test indicates the presence of the diease?

$$P(D|T^+) = \frac{P(T^+|D)P(D)}{P(T^+|D)P(D) + P(T^-|D)P(D)} = \frac{.9*.005}{.9*.005 + .02*.995}$$

4. A store sells four brands of DVD players. The least expensive brand $B_1$ accounts for 40% of the sales. The other brands (in order of their price) have the following percentages of sales: $B_2$ 30%, $B_3$ 20%, and $B_4$ 10%. The respective probabilities of needing repair during warranty are 0.10 for $B_1$, 0.05 for $B_2$, 0.03 for $B_3$, and 0.02 for $B_4$. A randomly selected customer has a DVD player that needs repair under warranty, what are the four conditional probabilities of brand $B_i$ for $i = 1, 2, 3, 4$?

   (a) $P(R|B_1) = \frac{0.4*0.1}{0.4*0.1 + 0.3*.05 + 0.2*0.03*0.1*0.02}$

   (b) $P(R|B_2) = \frac{0.3*0.05}{0.4*0.1 + 0.3*.05 + 0.2*0.03*0.1*0.02}$

   (c) $P(R|B_3) = \frac{0.2*0.03}{0.4*0.1 + 0.3*.05 + 0.2*0.03*0.1*0.02}$

   (d) $P(R|B_4) = \frac{0.1*0.02}{0.4*0.1 + 0.3*.05 + 0.2*0.03*0.1*0.02}$