1. An oil company purchased an option on land in Alaska. Preliminary Geological studies assigned the following probabilities:
P(high-quality oil) = 0.5
P(medium-quality oil) = 0.2
P(no oil) = 0.3

a) What is the probability of finding oil?
b) After 200 feet of drilling on the first well, a soil test is made. The probabilities of finding the particular type of soil identified by the test are
P(Soil | high quality oil) = 0.2
P(Soil | medium-quality oil) = 0.8
P(Soil | no oil) = 0.2
How should the firm interpret the soil test? What are the revised probabilities, and what is the new probability of finding oil?

$P(H)=0.5 \quad P(M)=0.2 \quad P(NO)=0.3$

a) $P(H \cup M) = P(H) + P(M) - P(H \cap M)^{0} = 0.5+0.2 = 0.7$

b) $P(S|H)=0.2$, $P(S|M)=0.8$, $P(S|NO)=0.2$

$P(H|S)=?$, $P(M|S)=?$, $P(NO|S)=?$

$$P(H|S) = \frac{P(S|H)\cdot P(H)}{P(S|H)\cdot P(H)+P(S|M)\cdot P(M)+P(S|NO)\cdot P(NO)}$$

$$= \frac{0.2*0.5}{0.2*0.5+0.8*0.2+0.2*0.3} = \frac{5}{16}$$

$$P(M|S) = \frac{0.8*0.2}{0.2*0.5+0.8*0.2+0.2*0.3} = \frac{8}{16}$$

$$P(NO|S) = 1-\left(\frac{5+8}{16}\right) = \frac{3}{16}$$

$$P(oil|S) = \frac{13}{16}$$