ECE560 Extra-Credit Question (L#5)

A factory production line is manufacturing bolts using three machines, A, B and C. Of the total output, machine A is responsible for 20%, machine B for 30% and machine C for the remaining 50%. It is known from previous testing data that 3% of the output from machine A, 5% from machine B and 2% from machine C is defective.

a) What is the probability that a randomly chosen bolt is defective?

b) A bolt is chosen at random from the production line and found to be defective. What is the probability that this bolt came from machine B?

$P(A) = 0.2 \quad P(B) = 0.3 \quad P(C) = 0.5$

$P(D|A) = 0.03 \quad P(D|B) = 0.05 \quad P(D|C) = 0.02$

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

$= 0.2 * 0.03 + 0.3 * 0.05 + 0.5 * 0.02$

$= 0.031 = 3.1\%$

b) $P(B|D) = \dfrac{P(D|B)P(B)}{P(D)} = \dfrac{0.05 * 0.3}{0.031} = 0.48387$