Drill set 1

1. Each of these outcomes has a 1/16 chance to occur. P = ½ * ½ *½ *½

2. The chance is 24/45, or reduced, 8/15. P = (45-21) / 45

3. P (A) (plane crash) = 0.00005
   P (B) (Bernice travels) = 0.1
   P (A n B) = 0.00005 * 0.1 = 0.000005 = 0.0005% = 1/200000 (seems too high?)

4. The problem is the assumption that the sample is representative of the entire population. It may be the case that those that choose to fill out the survey are likely to spend more time on the website than those who choose not to fill out the survey.

Drill set 2

`Bayes' rule: P(A | B) = P(B | A) * P(A) / P(B)`

1. Estimation: slightly under 10.5%, as 10% of a 100% healthy population will test positive, and 0.5% of the population is affected, hence 10.5%.
   Calculation: 0.98*0.005 (true positives) + 0.1*0.995 (false positives) = 0.1044 = 10.44%

2. This probability is given: 98%

3. Estimate: 90%
   Calculation: P (false positive) = 0.1 P(true negative) = 1-.1 = 0.9 = 90%

4. Estimate: Around 10% exactly
   Calculation: P (False positive | non-sufferer) = 0.1 P (non-sufferer) = 0.995
   0.1 * 0.995 = 0.0995
   P (False negative | sufferer) = 1-0.98 = 0.02
   0.02 * P (sufferer) = 0.02 * 0.005 = 0.0001
   P (misdiagnosis) = P (false negative | sufferer) + P (false positive | non-sufferer) =
   0.0995 + 0.0001 = 0.0996 = 9.96%
   While my estimate appears close, a much better estimate would have been ‘slightly over 9.95%’ as opposed to estimating it to be around 10%