Answers to the in class probability worksheet of 9/13/02

1a) {(H1), (H2), (H3), (H4), (T1), (T2), (T3), (T4) }
b) 1/8
c) {(H1), (H3) }
d) Sample points are mutually exclusive, so 1/8+1/8= 2/8=1/4
e) P(H ∩ odd) = P(H) P(Odd) because they are independent = (1/2)(1/2) = 1/4

2a) 1/1,000 (since there are 1,000 sample points, each with the same probability)
b) same as in a
c) this would be the complement of the event in b, so 1-P(101 chosen on 1/1)=1-1/1,000=999/1,000
d) because these events are independent, we need to multiply the probabilities of the two separate ones each occuring.... (1/1,000)(1/1,000)=1/1,000,000=0.000001=0.0001%
e) using logic similar to c and d, this would be (999/1,000)(999/1,000) ≈ .998 = 99.8%
f) one way of doing this is to notice that the (at least one) is the complement of none... so this would simply be 1-P(not 101 on 1/1 and not 101 on 1/2) = 1-.998 = .002 = 0.2%
there are of course other ways to get the same answer
g) January=31 + February=28 + March=31 + April=30 + May=31 + June=30 + July=31 + August=31 + September=30 = 273
h) this is similar to e, except its now 273 times instead of just 2! $(999/1,000)^{273}\approx 0.761=76.1\%$
i) the complement would be ! $1-(999/1,000)^{273}\approx 1-0.761=0.239=23.9\%$

3) The obvious "answer" is either to stay with the same door (why else would he try and make you switch?) or that it doesn't matter (one door has the prize and there are two left). The real answer is that it you are twice as likely to win if you switch!! One way of verifying yourself is to play the game a bunch of times yourselves (or look at the results of other people playing) on one of the various web-sites that simulates it. Another way is to carefully make a tree diagram of the game. Part of the tree diagram is below. A + indicates a prize, a O indicates no prize, a circle around one of those symbols indicates the door you chose, and an S indicates the door that was shown to have no prize behind it. The tree below is simplified by skipping the first branch of the tree (we left out the possibilities O+O OO+).