1.) (Ω , A, P) is not a probability space since its current A is given as A = {0, Ω , {1,2}. {3,4,5,6}} which is only four possible outcomes. With the equation A = 2^n with 'n' being the possible outcomes in the probability space. We get six as 'n' since Ω = {1,2,3,4,5,6}, substituting six in for 'n' we get A = 2^6 = 64. Since the A given does not satisfy this property, (Ω , A, P) is not a probability space, the correct A will be A = { 0, Ω , {1}, {2}, {3}, {4}, {5}, {6}, {1,2}, {1,3} ,{1,4}, {1,5}, {1,6}, . . . {1,2,3,4,5,6}}.

2.) a.) Probability the outcome is divisible by three, given that it is black.
The black colored numbers are : 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35. This gives us a probability of 16/37. If we divide these numbers that do not give a remainder, we are left with 3, 9, 15, 21, 27, 33
Which gives us answer of $\frac{6}{37}$.
b.) Probability that the outcome is divisible by three or four, given that a number is in the range 1 to 12.
This range gives us the number: 1, 2, 3, 4, 5, 6 , 7, 8, 9 , 10, 11, 12. Then we divide all these numbers with three and four, and if these numbers are divided with no remainder then it complies with these rules. This gives us : 3, 4, 6, 8, 9, 12.
Which gives us the answer of a probability of $\frac{6}{37}$.

3.) We are looking for P(A|B) using the Bayes rules we get P(A|B) = $\frac{P(B|A)P(A)}{P(B)}$, we don't have P(B|A), or P(B). P(A) and P(A^C) is given with both equaling 0.5, since the door can either be closed or not. Using the theorem to find P(B|A), since we have P(B^C | A), P(B|A) = 1 - P(B^C | A). Substituting the values we get P(B|A) = 0.9. To solve P(B) we will use the theorem P(B) = P(B|A) * P(A) + P(B| A^C) * P(A^C) which will result in P(B) = 0.55. Having all the values to solve for P(A|B) = $\frac{P(B|A)P(A)}{P(B)}$.
The final probability is P(A|B) = 0.8181818182.