Probability

3.7 Probability of At Least One

1. In 2008, the US Census bureau conducted a survey to study the educational attainment of the population. They reported that 29.4% of the 25+ population completed four years of college or more. If you were to randomly sample six Americans who are 25+ years old, what would the probability be of selecting at least one college graduate?

2. In South Africa approximately 18.1% (2007 figures) of the adult (15 to 49 yrs old) population is living with HIV/AIDS. What is the probability that among ten randomly selected adult individuals in South Africa there is at least one living with HIV/AIDS?

3. A photo journalist is planning a cross country trip on an old motor bike which has 7 vital engine components that cannot fail without causing a major, costly repair to the bike. If the journalist's mechanic gave each individual part a 15% chance of failure, what is the probability that the journalist will have to pay for a major, costly repair to the bike during the journey? Should he worry about the possibility of needing to make a major repair?

Answers:

1. 29.4% have college degrees, so 70.6% do not have college degrees. P(at least one college grad) = 1 – P(no college grads) = 1 - 0.706^6 = 0.876 = 87.6%

2. 18.1% live with HIV/AIDS, so 81.9% do not. P(at least one has HIV/AIDS) = 1 – P(none have HIV/AIDS) = 1 - 0.819^{10} = 0.864 = 86.4%.

3. 15% is the chance an individual part fails, so 85% is the chance a part does not fail. P(of a costly repair) = P(at least one part fails) = 1 – P(no part fails) = 1 - 0.85^7 = 0.679 = 67.9%. Yes, a major repair is definitely a real possibility since he has approximately a 68% chance of it occurring.