MAT1830 - Discrete Mathematics for Computer Science
Assignment #8
To be handed in at the beginning of your support class in week 10 (8 – 12 May)

Fully explain your answers for all questions.

1. One side of a 6-sided die is marked "0", two sides are marked "2", and three sides are marked "3". Each side is equally likely to occur when the die is rolled. The die is rolled twice and the results are recorded.

   Let A be the event that the first roll is 0.
   Let B be the event that the second roll is 3.
   Let C be the event that the sum of the two rolls is 5.

   (a) Find $\Pr(A)$, $\Pr(B)$, and $\Pr(C)$.

   (b) Find $\Pr(A \cap B)$, $\Pr(A \cap C)$, and $\Pr(B \cap C)$.

   (c) Are A and C independent events? Are B and C independent events?

   (d) Find $\Pr(A \cup C)$ and $\Pr(B \cup C)$.

   (e) Find $\Pr(B|(B \cup C))$.

2. Blofeld captures James Bond and places him in a pit with 100 deadly scorpions, 60 of which are male and 40 of which are female. The male scorpions' bites are fatal 70% of the time and the female scorpions' bites are fatal 90% of the time. Bond escapes the pit, but is bitten once by one of the scorpions. Given that Bond survives, what is the probability that the scorpion that bit him was male?

   (Assume the scorpion that bit Bond was chosen uniformly at random from the 100 in the pit.)

3. A string consisting of As, Bs and Cs is chosen uniformly at random from the set

   $$\{\text{BBBBB}, \text{ABBBC}, \text{AACCC}, \text{ABBCC}, \text{BBBBC}\}.$$

   Let X be the number of As in the string. Give the probability distribution of X.