CMPU2012 Assignment

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1: (15 marks) A four-sided die is rolled, with the possible outcomes being 1, 2, 3 or 4. Assume the die is biased so that $P(4) = \frac{1}{2}$. The remaining three outcomes are all equally likely. Defining the random variable X as the result when we roll the die:

1. Summarise the probability distribution of X in an appropriate table
2. Find the expected value of X, $E(X)$
3. Find the variance of X, $Var(X)$

2: (20 marks) A bag contains three yellow discs, two green discs and six blue discs. Three discs are drawn at random, without replacement.

1. What is the probability that the three discs are yellow?
2. What is the probability that one disc is yellow, one is green and the other is blue?
3. What is the probability of getting at least one blue disc?
4. What is the probability of getting three green discs?

3: (20 marks) The probability that Tom scores on a three-point basketball shot is $p = 0.4$. He shoots $n = 5$ times.
Write down an appropriate probability distribution to model the number of times Tom scores, assuming that each attempt is independent, and that p is constant each time.

Using this distribution, find the probability that Tom:

1. scores exactly two times
2. scores two or three times
3. scores at least one time

4: (15 marks) Given the following predicates: *B(x) = 'x is a boy'*, *G(x) = 'x is a girl'* and *S(x) = 'x is a student'*, write the following statements symbolically:

1. Every student is either a boy or a girl
2. Some students are boys and some are girls
3. A student that is not a boy, is a girl

5: (15 marks) Given the following predicates: *B(x) = 'x is a book', E(x) = 'x is expensive'* and *G(x) = 'x is good'*, write the following statements symbolically:

1. No books are expensive
2. All expensive books are good
3. Some good books are expensive

6: (15 marks) For the graph below, state whether it has the following properties or not, **explaining the reason for your answer**.

1. Is it connected?
2. Is it complete?
3. Is it bipartite?