

Problem solving technique: Do not be afraid to apply pencil to paper with no end in sight!

1. Let A and B be events such that $P(A \cap B) = 1/6$, $P(A^c) = 2/3$ and $P(B) = 1/4$. What is $P(A \cup B)$? What is $P(B - A)$?
2. You roll a fair die twice (six sided, as usual). What is the probability that the first roll is higher than the second roll?
3. (a) How many words of length 5 can you write using the digits 0 and 1? These are called *binary words*; 10010 and 01010 are binary words of length 5.
(b) How many binary words are there of length n ?
4. (a) Let Ω be set with 5 elements; we can take $\Omega = \{1, 2, 3, 4, 5\}$. Show that if we count the empty set and Ω as subsets (which they are), there are 2^5 subsets of Ω .
(b) Let Ω be a set with n elements. Show that there are 2^n subsets of Ω . Write a sentence for how this question similar to Question 3. What could 0 and 1 represent in this case?
5. On a True/False quiz with 5 questions, a student guesses every answer.
(a) Describe in words the outcome space and list a few possible outcomes. How many possible outcomes are there?
(b) What is the probability that the student scores an 80 percent or higher on the quiz? *Hint:* Each set of answers is equally likely.
6. Let X be a random variable with distribution function $m_X(x)$ defined by $m_X(0) = 1/4$, $m_X(1) = 1/6$, $m_X(2) = 1/4$, and $m_X(3) = 1/3$, with outcome space $\Omega_X = \{0, 1, 2, 3\}$.
Let Y be the random variable defined by the equation $Y = X + 2$. Write down the outcome space, Ω_Y , and the distribution function $m_Y(y)$ of Y .