Problem 1 (15 points)

Given the probability mass function \( P_V(v) = cv^2 \) for \( v = 1, 2, 3, 4 \) and \( P_V(v) = 0 \) for all other integer values of \( v \).

(a) Find the constant \( c \).

(b) Find the probability that random variable \( V \) is an even number.

(c) Find \( P_V(V > 2) \).
Problem 2 (25 points)

You have a single six-faced die with faces numbered 1 through 6. Each outcome possible with a roll of the die has equal probability and let the random variable $X$ represent the face up value of the die after it comes to rest upon being thrown. Therefore, the probability mass function is given by $P_X(x_k) = 1/6$ for $k = 1, 2, 3, 4, 5, 6$.

(a) Plot the probability mass function on the graph below. Be sure to label the abscissa and ordinate of the graph (with values indicated). Note: The PMF is a discrete distribution known as the UNIFORM distribution.

(b) Calculate the expectation value $E[X] = \mu_X$ for this uniform distribution. Remember that $E[X] = \sum_{k=1}^{6} x_k \cdot P_X(X = x_k)$ for all values of $k$. 
(c) Calculate the Variance $E[(X - \mu_x)^2] = \sigma_x^2$ for the uniform distribution. Remember that $E[(X - \mu_x)^2] = \sum_{k=1}^{k} x_k^2 \cdot P_X(X = x_k)$ for all values of $k$.

Problem 3 (15 points)

On the average, one computer out of 800 computers crashes during a severe thunderstorm. Company XYZ has 4,000 operational computers on site when a severe thunderstorm strikes. Find the following:

Compute the expected value and variance of the number of crashed computers from the thunderstorm.
Problem 4 (20 points)

50 students live in a dormitory. The parking lot has the capacity for 30 cars. If each student has a car with probability 1/2 (independently from other students); what is the probability that there won't be enough parking spaces for all the cars? DO NOT EVALUATE THE SERIES OF BINOMIAL COEFFICIENTS.
**Problem 5 (15 points)**

The number of adults living in homes on a randomly selected city district is described by the probability distribution in the table.

<table>
<thead>
<tr>
<th>Number of adults $x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability $P_X(x)$</td>
<td>0.20</td>
<td>0.43</td>
<td>0.20</td>
<td>0.09</td>
<td>0.05</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Find the standard deviation of the probability distribution.
Problem 6 (25 points)

The histogram of the final exam in a ES 101A class from 2014 is shown below. The total number of students taking the exam was 74 students. Estimate the mean value (expectation value) of this data distribution.