This homework runs from Thursday 2 November 2023 until 12 noon on Thursday 9 November 2023. Submission is to Gradescope Homework 4.

**Question 1**

(a) In how many ways can the integers 1 through 7 be permuted so that no odd integer will be in its natural position?

(b) If all the possibilities of part (a) are equally likely, what is the probability that exactly two of the seven integers are in their natural position?

[4 marks]

**Question 2**

A art box has in it 20 pencils: 5 red, 5 blue, and 10 green. You cannot distinguish between pencils of the same colour. You take out three pencils at random, one at a time, without replacement. Suppose X is the random variable ‘the total number of red pencils taken out’.

(a) Copy the following table and fill in the probability distribution for X.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(X = x)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Calculate the expected number of red pencils E(X).

(c) Calculate the standard deviation of X.

For each part include your working as well as the final answer.

[6 marks]