Quiz 6

Game of craps:
If sum is:
- 2, 3      shooter loses
- 11, 12    shooter wins
- i, 4≤i≤10 : wins if shooter makes same point;
  Loses if he gets 2, 3, 11, 12
  Repeat otherwise

a) What is the conditional probability that shooter gets 11 if he wins the first round?
   \[ p(\text{shooter gets 11 | wins the first round}) = \frac{2}{3} \]

b) Find probability of winning?
   \[ p(\text{win}) = p(\text{win|11, 12}) p(11, 12) + p(\text{win| 4≤i≤10}) p(i) \]
   \[ p(\text{win}) = 1 (\frac{2}{36}) + p(\text{win| 4≤i≤10}) p(i) \]
   \[ p(\text{win| i}) = \sum_{k=0}^{\infty} p(\text{not(2,3,11,12) and not(i)|i}^k p(i) = \]
   \[ p(i) \cdot \frac{1}{1 - p(\text{not(2,3,11,12) and not(i)})} = \]
   \[ p(i) \cdot \frac{1}{p(\text{(2,3,11,12) or i})} = \]
   \[ p(i) \cdot \frac{1}{p(2,3,11,12) + p(i)} \]
   Hence,
   \[ p(\text{win}) = \frac{1}{12} + p(\text{win| i}.p(i) = \frac{1}{12} + \sum_{i=4}^{10} \frac{p(i).p(i)}{p(2,3,11,12) + p(i)} \]
   \[ p(i) = \frac{6 - |i - 7|}{36} \]

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<tr>
<th></th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<td>p(win</td>
<td>i)</td>
<td>1/3</td>
<td>2/5</td>
<td>5/11</td>
<td>1/2</td>
<td>5/11</td>
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<tr>
<td>p(win</td>
<td>i) p(i)</td>
<td>1/36</td>
<td>2/45</td>
<td>6/95</td>
<td>1/12</td>
<td>6/95</td>
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\[ p(\text{win}) = \frac{1}{12} + \frac{17}{48} = \frac{7}{16} = 0.44 \]