**Rules of Craps:** There are two six sided dice. For the dice thrower (shooter) the object of the game is to throw a 7 or an 11 on the first roll (a win) and avoid throwing a 2, 3 or 12 (a loss). If none of these numbers (2, 3, 7, 11 or 12) is thrown on the first throw (the Come-out roll) then a Point is established (the point is the number rolled) against which the shooter plays. The shooter continues to throw until one of two numbers is thrown, the Point number or a Seven. If the shooter rolls the Point before rolling a Seven he/she wins, however if the shooter throws a Seven before rolling the Point he/she loses. (http://mode.lanl.k12.nm.us/ chtmesqu/rules.html)

What is the probability that the shooter wins? The table below gives the probability for each value of the throw of two dice.

<table>
<thead>
<tr>
<th>value</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
</table>

The chart below models a craps game where the point is 6.

The probability of winning is thus,

\[
\frac{8}{36} + \frac{24}{36} \frac{5}{36} + \frac{24}{36} \frac{5}{36} + \frac{24}{36} \frac{5}{36} + \frac{25}{36} \frac{5}{36} + \frac{25}{36} \frac{5}{36} + \cdots
\]

or,

\[
\frac{8}{36} + \frac{24}{36} \left( \frac{5}{36} \right) \left( \frac{1}{36} \right) + \left( \frac{25}{36} \right)^2 + \left( \frac{25}{36} \right)^3 + \cdots
\]

which is,

\[
\frac{8}{36} + \frac{24}{36} \left( \frac{5}{36} \right) \left( \frac{\sum_{n=1}^{\infty} \left( \frac{25}{36} \right)^{n-1}}{36} \right)
\]

Thus, when the point is 6, the probability of winning is,

\[
\frac{8}{36} + \frac{24}{36} \left( \frac{1}{36} \frac{25}{36} \right) = \frac{208}{396} = 0.52
\]

**Extra Credit:** Find the probability of the shooter winning craps. Show your work. Due by Tuesday October 14. This will replace your lowest quiz grade.