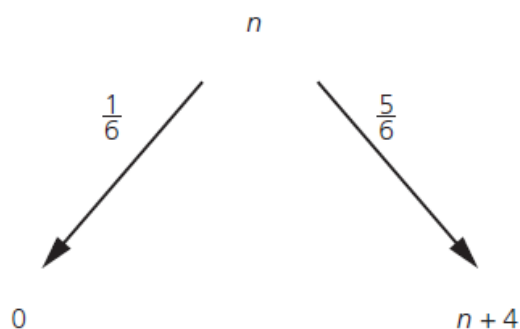


Proof

What happens on any roll is shown in the tree diagram below.



Can you explain what each number means? Where does the $n + 4$ come from?

If you start with 5 before a roll, what are your chances of getting nothing after the roll? What are your chances of getting 9 after it?

Now start with zero. Using the tree diagram, what are your chances of getting 0 after two rolls? What are your chances of getting 8 after two rolls?

Repeat this with 3, 4, 5, 6, 7 and 8 rolls.

After how many rolls does it look a good time to stop? _____

Another way to look at the diagram is to say that you might gain 4 with a probability of $\frac{5}{6}$, or lose n with a probability of $\frac{1}{6}$. The net gain is therefore $4\left(\frac{5}{6}\right) - n\left(\frac{1}{6}\right)$. Explain this.

You should stop rolling before the net gain is negative. For what n does that occur?

Armed with these two strategies, play the game again.

Do these strategies improve your chances of winning? How?
