Answers to Tookitaki Interview Questions

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I. Q1A

The expected return of rolling the third dice is $(1+2+3+4+5+6)/6 = 3.5$. Thus, the third dice will be rolled if and only if the second dice has an outcome no bigger than 3.5. The expected return of rolling the second and third dices is

$$\Pr(\text{second dice outcome} \in \{4,5,6\}) \times \frac{4+5+6}{3} + \Pr(\text{second dice outcome} \in \{1,2,3\}) \times 3.5$$
$$= \frac{1}{2} \times 5 + \frac{1}{2} \times 3.5 = 4.25$$

Similarly, given the expected return of rolling the second and third dices, the first dice will be rolled if and only if the first dice has an outcome no bigger than 4.25. The expected return of playing this game will be calculated as

$$\Pr(\text{first dice outcome} \in \{5,6\}) \times \frac{5+6}{2} + \Pr(\text{first dice outcome} \in \{1,2,3,4\}) \times 4.25$$
$$= \frac{1}{3} \times 5.5 + \frac{2}{3} \times 4.25 = \frac{28}{6} \approx 4.67$$