Alice, Bob, and Charlie each toss a 6-sided die. What is the probability that exactly two of their dice values are equal?

**Solution:** The sample space consists of all $6^3 = 216$ possible triples of values for Alice's, Bob's, and Charlie's dice. The event $E$ of interest consists of those outcomes in which two of them take the same value $x$ but the third one takes a different value $y$. We calculate the size of $E$ using the product rule: There are 3 choices for the person that tosses the $y$-valued die, 6 choices for $y$, and 5 remaining choices for $x$. Therefore $|E| = 3 \cdot 6 \cdot 5$. By the equally likely outcomes formula, $\mathrm{P}(E) = 3 \cdot 6 \cdot 5/6^3 = 5/12 \approx 0.417$.