

Some Questions About Probability

Here are questions which will help you practice the probability concepts you are learning.

[1] You play a game where you and an opponent each throw one die. You win if you roll a higher number, but lose if you roll a lower number, or if you tie. What is your probability of winning?

[2] You play a game where you throw one die and toss one coin. You win if you get heads on the coin *and* an even number of the die. What is your chance of winning?

[3] You play a game where you throw two dice and your opponent throws one. You win if the highest number you get on one of your dice is bigger than your opponent's. For example, if you throw a '4' and a '5', your highest number is '5'. You win if your opponent rolls a '1,2,3,' or '4', but lose if she throws a '5' or '6'. (Ties go to the person throwing only one die.) What is the probability you win? To figure the answer out, list all possible things that can happen and count the number of times you win. Ugh. There are a lot of possibilities. You may want to think of fast ways to do the listing.

[4] The symbol $N!$ (read as " N factorial") is short for the product of all the integers from 1 to N . Thus $3! = 1 \cdot 2 \cdot 3$ and $6! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6$, etc. The symbol $0!$ is defined to take the value $0! = 1$. Evaluate $5!$. Evaluate $7!$. Evaluate $10!$.

[5] The binomial coefficients are defined by

$$\binom{N}{n} = \frac{N!}{n!(N-n)!}$$

Evaluate $\binom{3}{2}$, $\binom{7}{4}$, and $\binom{5}{0}$. For the last one you will need to use $0! = 1$.

[6] Compute

$$\binom{2}{0} + \binom{2}{1} + \binom{2}{2}.$$

Compute

$$\binom{3}{0} + \binom{3}{1} + \binom{3}{2} + \binom{3}{3}.$$

Compute

$$\binom{4}{0} + \binom{4}{1} + \binom{4}{2} + \binom{4}{3} + \binom{4}{4}.$$

What pattern do you notice?