In this tutorial, you're going to learn about odds, the odds in favor of an event or the odds against an event. Now, odds are often confused with probability. It's a different way to express likelihood that is different than probability. They're not the same. So when you say that there's a 1 in 5 probability, that's different than saying the odds in favor are 1 in 5.

So we'll explain the difference here using our trusty spinner, with three 1s, a 2, two 3s, and two 4s. So suppose that we call a 3 being a favorable outcome. Probability is the ratio of favorable outcomes to total outcomes. So there are two favorable outcomes out of eight total outcomes. And so it's 1/4 is the probability of 3.

Now we're going to contrast that with odds. The odds are the ratio of favorable outcomes to the unfavorable outcomes. So by contrast, the odds in favor of a 3, there are two favorable outcomes, whereas there are six unfavorable outcomes. And so the odds in favor of a 3 on the spinner are one to three.

For some reason odds are usually expressed this way with a colon, rather than a fraction bar, although both are accepted. And you should always reduce as if it was a fraction. Two to six versus one to three, one to three is preferred.

We can also express the odds against an event simply by reversing the numbers. Now, why is that? This says the odds in favor of a 3 are one to three. Now that means that for every one favorable outcome, there are three unfavorable outcomes.

And so the odds against are the unfavorable outcomes to the favorable outcomes, which means that there are three unfavorable to every one favorable. So the odds against a 3 are three to one. And when you see odds listed, say in the newspaper or in some kind of a contest, typically what they're reporting to you are the odds against winning, so the odds against say, a horse winning a particular race.

All right. So let's convert probability into odds. The probability of getting heads on a coin is 1/2, so determine the odds in favor of heads and the odds against heads.

The probability of a red on a roulette wheel is 18 to 38. Give me the odds in favor of red and odds against red.

And probability of rolling a 4 on a fair die is 1/6. Give me the odds in favor of a 4 and the odds against 4. Pause the video and scribble this off to the side.

What you should have come up with are these. On a coin, there's one favorable and one unfavorable outcome. On a roulette wheel, well, you might not have come up with this, 9 to 10. You might have said 18 to 20. But you do

have to remember to reduce.

And then on the die, it's one favorable outcome and five unfavorable outcomes. And then for the odds against, you simply switch the numbers around. Five unfavorable outcomes for every one time you get a 4.

So use the marble jar. Determine these values for me. Pause the video one more time and determine the odds in favor of red, using this marble jar, the probability of green, the odds against blue, and the probability of orange. Go ahead and pause the video.

What you should have come up with were these numbers, 7 to 11. There are 18 marbles in the jar. 7 of them are red. And 11 of them are not red.

The probability of green, there are 5 greens out of 18 total. The odds against blue, there are 4 blues and 14 that aren't. So we started by saying 14 unfavorable to 4 favorable, and reduced it. And the probability of orange, there's just the 1 lone orange marble out of 18.

So go ahead one more time, one more practice. Give me the probability of red, the odds in favor of green, the probability of blue, and the odds against orange. And you don't necessarily have to use the marble jar. Try and use your answers from the previous versions of the problem.

What you should have come up with this time were these numbers, 7 out of 18 marbles. You could realize this by saying there are 7 favorable outcomes and 11 unfavorable outcomes, therefore there are 18 total outcomes, 7 of which are favorable.

Using this probability, we can say there are 5 favorable outcomes, which are green. And the remainder of the 18, which are 13, are not favorable, as in not green. The probability of blue is 2, which was the reduced value of blue here, out of 9, which is the unfavorable and favorable added together. And then finally the odds against orange are 17 to 1, 17 not orange and 1 orange.

And so to recap, odds, not the same as probability. I cannot stress this enough. The two terms should not be used interchangeably, although in real life you will hear it often. And you can point it out to people. Odds are different than probability.

The odds in favor of an event are the favorable to unfavorable outcome ratio. The odds against an event are the unfavorable to favorable outcome ratio. Good luck. And we'll see you next time.