

## Section 2.8 Probability and Odds

### Probability

The probability of an event occurring can be found by dividing the number of favorable outcomes by the total number of possible outcomes.

$$\text{Probability} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

The number of favorable outcomes is the number of ways you can get the result you were looking for.

The number of possible outcomes is the total number of outcomes that could occur.

**Example:** What is the probability of rolling an odd number on a 6 sided die?

Number of favorable outcomes: 3 -> 1, 3, 5

Number of possible outcomes: 6 -> 1, 2, 3, 4, 5, 6

$$\text{Probability of odd} = \frac{3}{6}$$

This can be reduced to  $\frac{1}{2}$  but I prefer to leave it unreduced so we can tell more about the situation.

### Odds

The odds of an event occurring are found by dividing the number of favorable outcomes by the number of unfavorable outcomes.

$$\text{Odds} = \frac{\text{number of favorable outcomes}}{\text{number of unfavorable outcomes}}$$

**Example:** What are the odds of randomly selecting a face card from a standard 52 card deck?

Number of favorable outcomes: 4 Jacks, 4 Queens, 4 Kings = 12 cards

Number of unfavorable outcomes: 52 - 12 = 40

$$\text{Probability of odd} = \frac{12}{40} = \frac{3}{10} = 3 \text{ to } 10$$

## Probability and Odds

**Example:** Given the probability of an event is  $\frac{4}{11}$ , find the odds of that event.

$$\text{Probability} = \frac{4}{11} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

$$\text{Odds} = \frac{\text{number of favorable outcomes}}{\text{number of unfavorable outcomes}}$$

We can find the number of unfavorable outcomes by subtracting the number of favorable outcomes from the total.

$$\begin{aligned} \text{favorable outcomes} + \text{unfavorable outcomes} &= \text{total outcomes} \\ \text{total outcomes} - \text{favorable outcomes} &= \text{unfavorable outcomes} \end{aligned}$$

$$\text{Odds} = \frac{4}{17} \text{ or } 4 \text{ to } 7.$$