CONDITIONAL PROBABILITY

Probability of an event occuring given another event has already occured.

Lesson Six: Conditional Probability

Goal: Determine the probability of an event given the occurrence of a previous event.

Sometimes, probability comes with conditions attached to it. Such questions often use the word "given". They assume that some condition must be met before the probability is calculated.

$$P(B|A) = \textbf{Probability of Event } B \textbf{ given that } \textbf{Event } A \textbf{ has already happened}$$

Example 1

Using the information given below, determine the probability that the team scored more than 30 points, *given that* they won.

~~Game 1: Won, scored 43 points~~
~~Game 2: Won, scored 27 points~~
~~Game 3: Lost, scored 15 points~~
Game 4: Won: Scored 36 points
~~Game 5: Lost, scored 32 points~~
Game 6: Won, scored 53 points

3 (scores over 30 pts)
4 (games won)

$P(W/\text{Loss}) = \frac{3}{4}$ (with) → scores over 30 pts)

If you know the sample space, conditional probability can be determined by simply eliminating outcomes that did not happen.

Example 2

Find the probability that you rolled a 3 given that you rolled an odd number using one roll of a six sided die.

$P(3/\text{odd}) = \frac{1}{3}$ rolling a 3

Example 3

You have ten red cards numbered 1 to 10 and ten black cards numbered 1 to 10.

a) Find the probability that you select an odd numbered card given that the card you selected is red.

$P(\text{odd}|\text{Red}) = \frac{5}{10}$ (red card) — given

b) Find P(black card is selected | a 2 is selected)

$P(\text{Black}/2) = \frac{1}{2}$ (1 Black, 1 red)

given