event "A"

$$P(A) = \frac{\# \text{ of times "A" occurs}}{\# \text{ of total outcomes}}$$

probability of ...

Basic probability rules

Complement

$$P(A') \text{ or } P(A^c)$$

Complement means the opposite event

$$P(A') = P(A^c) = 1 - P(A)$$

"and"

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

"or"

$$P(A \text{ or } B) = P(A) + P(B)$$

Probability distribution function "PDF"

()

X	P(X)

Lists all possible outcomes

the probabilities of all outcomes

all ways add to <u>1</u> or 100%

Expected Value is the average of the PDF. Expected value represents the total winnings/losses, if you were to see this experiment performed an infinite number of times.

Example -
The probability of being born a male is not 50% as many think. It's actually closer to 51.2%. Let's answer a few questions...

A. Write out the outcome of being born a male, in a probability talk.

B. Write out and solve for the complement of being born a male.

C. You are going to have 2 children. What is the probability of having a male "and" a male.

D. You are going to have one child. What is the probability of having a Male "or" Not a male.

E. Create a PDF of the different birth outcomes, using the information provided.

Example - Your doctors said that since you've given up smoking, you should pick up another addictive practice. So, gambling is what you both decided on.

Your doctor said that he has a patient that is giving birth soon. You bet $10 that it will be a boy. If it's a boy, you win $10. If it's not a boy, you loose $10.

A. Write out a PDF for the winnings/losses and their probabilities.
B. What is the expected value?
C. If you were to play this game 100 times ($1000), how much would you win/lose?

Example - In Roulette, the wheel has 18 red, 18 black, and 2 green colors. You have an equal probability of landing on any spot. If you bet $1, then you get $1 back. If you lose, then you get nothing.

A. Write out a PDF for this game.
B. If you go to Vegas and play this game, what is the expected value of your winnings/losses.
C. You play this game 100 times. How much do you win or lose?

Roulette- You play the same game, but you bet on landing on green. If you land on green, you win 17 times the amount. So, if you bet $1, you win $17.

A. Write out a PDF
B. Solve for expected value.

Super lotto - The CA super lotto has the odds of 1 in 41,416,353 to win the jackpot. The price to play is $1 per number. The current jackpot is at $11 million. If the numbers were to stay this way, what would your expected value be?

Is there a point when the lotto becomes a "good" game to play?