Binomial Distribution for Discrete Random Variables

The Binomial Distribution with parameters n and p is the discrete probability distribution of the number of successes in a sequence of n independent experiments.

A random variable that follows the binomial distribution can only take on two outcomes: success or failure (1 or 0). A single success/failure experiment is called a Bernoulli trial (Recall the Bernoulli distribution that we talked about previously!).

> **For a single trial (n=1), the binomial distribution is a Bernoulli distribution.**

The binomial distribution is the sum of n independent Bernoulli variables where p is the probability of success. Hence our random variable is binomial(n,p).

For all binomial distributions B(n, p):	
$\mu_{B(n,\,p)} \;=\; E(B(n,p)) \;=\; np$ Mean and EV of any binomial distribution, B(n,p).	$\sigma_{B(n,\,p)} = \sqrt{np(1-p)}$ Standard Error of any binomial distribution, B(n,p).

Puzzle #1: A die is rolled 20 times, and the number of 2's appearing is counted. What are the expected value (EV) and standard error (SE) of the number of 2's?

Puzzle #2: You play roulette 100 times in a row and count how many times you win. If the ball lands on red, you win and if it lands on another color, you lose. What is the expected value and standard error of the number of wins?
Remember: There are 18 reds, 18 blacks, and 2 greens on a roulette wheel.

Puzzle #3: A multiple-choice test has 25 questions. Each question has 5 choices. If you guess at random on all 25 questions, what are the expected value (EV) and standard error (SE) of the number of correct answers on your test?