

**Normal Approximation to Binomial Distributions**

In a binomial distribution,  $n$  identical things (trials) occur. Each trial has 2 outcomes: yes or no. Each trial has the same probability of "yes" as the others.

Ex 1: You flip 20 coins. Each coin has the same probability of being a Head (0.50).

Ex 2: A team plays 162 games, with a probability of 0.59 of winning each game.

Ex 3: A bag of M & Ms contains 500 Ms. Each M has the same probability of being red, 20%.

Fact: If a binomial distribution is large enough ( ), it becomes a Normal distribution, with

$$\text{Mean } \mu = np$$

$$\text{Standard deviation } \sigma = \sqrt{np(1-p)}$$

Ex 2A: What is the probability that the team will win at least 90 games?

Ex 2B: Now suppose the winning probability were 0.50. What is the probability that the team will win at least 90 games?

Ex 3: What is the probability that the number of red Ms is between 95 and 120, inclusive?