

Math 141 Key Topics: 8.4-8.6

Section 8.4

- A **binomial experiment** has the following properties:
 1. The number of trials is fixed.
 2. There are two outcomes which we can define to be “success” and “failure.”
 3. The probability of success in each trial is the same.
 4. The trials are independent of each other.
- For binomial experiments, the random variable X represents the number of successes. The probability distribution of X is called a **binomial distribution** and X is called a **binomial random variable**.
- To find binomial probabilities, you need to know the number of trials (n), the probability of success (p) and the number of successes you want (x). Then, to find the probability of exactly x successes, we can use the formula:

$$P(X = x) = C(n, x)p^xq^{n-x}$$

or we can use the calculator command *binompdf*:

$$P(X = x) = \text{binompdf}(n, p, x)$$

- To find the probability of at most (less than or equal to) x successes, you can use the calculator command *binomcdf*. This command sums up the probabilities of 0 successes through x successes:

$$P(X \leq x) = \text{binomcdf}(n, p, x)$$

- To find the probability of at least (greater than or equal to) x successes, use the complement principle to change this into a probability that can be solved using *binomcdf*. For example,

$$P(X \geq 5) = 1 - P(X \leq 4) = 1 - \text{binomcdf}(n, p, 4)$$

- For any binomial random variable X :
 1. $E(X) = np$
 2. $Var(X) = np(1 - p)$
 3. $\sigma = \sqrt{np(1 - p)}$

Section 8.5

- For continuous random variables, it is not possible write down the probability distribution in a table, so a function is used to define the distribution. Such a function is called a **probability density function**. The graph will always lie above the x -axis and the total area under the graph is always equal to 1.

- The graph of a **normal distribution** is a bell-shaped curve, called the **normal curve**. This curve has a peak at $x = \mu$ (μ is mean) and is symmetric about a vertical line through the mean. The standard deviation (σ) determines the flatness of the curve. The larger σ is, the flatter the curve is.
- The **standard normal curve** is a specific type of normal curve where $\mu = 0$ and $\sigma = 1$. Usually, we use Z to represent the standard normal distribution.
- To find a probability for a normal distribution, we are finding the area under the curve between the given boundaries. You can use the calculator command *normalcdf*:

$$\text{normalcdf}(\text{lower bound, upper bound, } \mu, \sigma)$$

Note: If the given problem does not have a lower or upper bound, we use $-1E99$ and $1E99$ instead, respectively.

- If you are given a probability (area under curve) and asked to find the boundary that will give this area, use the calculator command *invNorm*:

$$\text{invNorm}(\text{area to the left of bound, } \mu, \sigma)$$

Section 8.6

- We can sometimes use normal distributions to approximate a binomial distribution. If you are asked to approximate a given binomial probability with n trials and probability of success p , you will use a normal distribution with $\mu = np$ and $\sigma = \sqrt{np(1-p)}$.

To determine what boundaries to use for the normal curve, identify which rectangles in the binomial histogram would be included. Then, adjust the boundaries by 0.5 to move to the left or right endpoint of a rectangle.

Finally, use *normalcdf* with these new boundaries, μ , and σ to find the area of the desired region.