6.3 Binomial Distributions

Read 382-385

What are the conditions for a binomial setting?

What is a binomial random variable? What are the possible values of a binomial random variable?

What are the parameters of a binomial distribution?

What is the most common mistake students make on binomial distribution questions?

Alternate Example: Dice, Cars, and Hoops
Determine whether the random variables below have a binomial distribution. Justify your answer.
(a) Roll a fair die 10 times and let X = the number of sixes.

(b) Shoot a basketball 20 times from various distances on the court. Let Y = number of shots made.

(c) Observe the next 100 cars that go by and let C = color.
Note: The following 2 pages in the notes correspond to pages 385-389.

Alternate Example: Rolling Sixes
In many games involving dice, rolling a 6 is desirable. The probability of rolling a six when rolling a fair die is 1/6. If X = the number of sixes in 4 rolls of a fair die, then X is binomial with $n = 4$ and $p = 1/6$.

What is $P(X = 0)$? That is, what is the probability that all 4 rolls are *not* sixes?

What is $P(X = 1)$?

What about $P(X = 2)$, $P(X = 3)$, $P(X = 4)$

In general, how can we calculate binomial probabilities? Is the formula on the formula sheet?

Alternate Example: Roulette
In Roulette, 18 of the 38 spaces on the wheel are black. Suppose you observe the next 10 spins of a roulette wheel.
(a) What is the probability that exactly 4 of the spins land on black?

(b) What is the probability that at least 8 of the spins land on black?

HW: page 403 (69–79 odd)

6.3 More about the Binomial Distribution

How can you calculate binomial probabilities on the calculator?

Is it OK to use the binompdf and binomcdf commands on the AP exam?

Note: The following page of notes corresponds to pages 390-393.

How can you calculate the mean and SD of a binomial distribution? Are these on the formula sheet?

Alternate example: Roulette
Let X = the number of the next 10 spins of a roulette wheel that land on black.
(a) Calculate and interpret the mean and standard deviation of X.

(b) How often will the number of spins that land on black be within one standard deviation of the mean?

Read 393-395 *Note: we are skipping the Normal approximation to the binomial distribution*

When is it OK to use the binomial distribution when sampling without replacement? Why is this an issue?

Alternate Example: In the NASCAR Cards and Cereal Boxes example from Section 5.1, we read about a cereal company that put one of 5 different cards into each box of cereal. Each card featured a different driver: Jeff Gordon, Dale Earnhardt, Jr., Tony Stewart, Danica Patrick, or Jimmie Johnson. Suppose that the company printed 20,000 of each card, so there were 100,000 total boxes of cereal with a card inside. If a person bought 6 boxes at random, what is the probability of getting 2 Danica Patrick cards?

HW page 403 (72–80 even, 81–89 odd)

6.3 The Geometric Distribution

Read 397–398

What are the conditions for a geometric setting?

What is a geometric random variable? What are the possible values of a geometric random variable?

What are the parameters of a geometric distribution?

Alternate Example: Monopoly
In the board game Monopoly, one way to get out of jail is to roll doubles. Suppose that a player has to stay in jail until he or she rolls doubles. The probability of rolling doubles is 1/6.
(a) Explain why this is a geometric setting.
(b) Define the geometric random variable and state its distribution.

(c) Find the probability that it takes exactly three rolls to get out of jail.

(d) Find the probability that it takes at most three rolls to get out of jail.

In general, how can you calculate geometric probabilities? Is this formula on the formula sheet?

On average, how many rolls should it take to escape jail in Monopoly?

In general, how do you calculate the mean of a geometric distribution? Is the formula on the formula sheet?

What is the probability it takes longer than average to escape jail? What does this probability tell you about the shape of the distribution?

HW: page 405 (93, 95, 97, 99, 101–103)