

# Week in Review # 11

MATH 141

Drost-Spring 2010

Review for EXAM 3

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- Determine whether or not the following experiments are binomial.
  - Roll a pair of fair six-sided dice until the sum of the uppermost numbers is 7.
  - Roll a fair six-sided die 12 times and note the number rolled.
  - Roll a pair of fair six-sided dice 10 times and observe whether or not a sum of 7 is rolled.
  - Pick 3 marbles, in succession without replacement, from a box with 3 red and 6 blue marbles and observe the color of the marble picked.
  - Pick a marble from Box 1 containing 3 red and 5 blue, and observe the color of the marble picked. Then pick a marble from Box 2 containing 4 red and 2 blue marbles and observe the color of the marble picked.
- 18% of a given population is left-handed. A sample of 40 people from the population is selected at random. What is the probability that
  - Exactly 6 people are left-handed?
  - At most 4 people are left-handed?
  - More than 12 are left-handed?
  - Between 4 and 8 people are left-handed?
  - At least 1 person is left-handed?
- You roll a weighted six-sided die 200 times. The die is weighted such that the probability of the die showing a 1 is 0.4.
  - What's the probability that exactly 64 ones are rolled?
  - What's the probability that at least 125 ones are rolled?
  - What's the probability that fewer than 50 ones are rolled?
  - How many ones should you expect to roll?
  - What is the variance and standard deviation in the number of ones rolled?
- Calculate the following probabilities:
  - $P(-1 < Z < 1.25)$
  - $P(Z < 1.4)$
  - $P(Z > -0.45)$
- Find  $a$  such that
  - $P(Z < a) = 0.7250$
  - $P(Z > a) = 0.3275$
  - $P(-a < Z < a) = 0.6548$

6. Suppose weights of bags of potato chips are normally distributed with a mean of 12 ounces and a standard deviation of 0.5 ounces. What is the probability that a bag selected at random weighs
- Between 11 and 13.5 ounces?
  - At least 11 ounces?
  - Less than 10 ounces?
7. A study finds that the lifespan of watch batteries are normally distributed with a mean of 2 years and a standard deviation of 2.5 months.
- What is the probability that a phone battery will have a lifespan between 20 and 28 months?
  - What battery lifespan corresponds to the 95<sup>th</sup> percentile?
8. A baseball player has a record of hitting a single in 12 out of every 30 at-bats. During last season, this player was at-bat 140 times. Use an appropriate normal distribution to approximate the following binomial probabilities. What's the probability that during the season the player hit
- Between 50 and 60 singles inclusive?
  - At least 60 singles?
  - Fewer than 45 singles?
9. A box contains 25 candles: 12 white, 8 maroon, and 5 blue. You lose electricity and randomly select 5 candles from the box to use for light. What's the probability that you select
- Exactly 4 white candles?

b. At least 3 maroon candles?

c. Exactly 3 maroon or exactly 1 maroon candles?

10. The weather forecaster on Channel 5 is correct 95% of the time, and the forecaster on Channel 9 is correct 75% of the time. If the forecasters make their weather predictions independently of each other, what is the probability that on a given occasion

a. Exactly one of the forecasters is correct?

b. At least one of the forecasters is correct?

11. A vet school's freshman class is 65% female. Seventy-five percent of the males and sixty per-

cent of the females own a cat. A student of the school is selected at random.

a. Draw a tree diagram representing this situation.

b. What is the probability that the student is male or has a cat?

c. If the student owns a cat, what is the probability that the student is female?

d. What percentage of the students own a cat?

12. Let  $E$  and  $F$  be two events with  $P(E) = 0.25$ ,  $P(F) = 0.65$  and  $P(E \cap F^C) = 0.15$ . Answer the following questions.

a.  $P(E \cap F) =$

b.  $P(E | F) =$

c.  $P(E \cup F) =$

d. Compute the probability of exactly one of these events ( $E$  or  $F$ ) occurring.

e. Are  $E$  and  $F$  mutually exclusive? Why or why not?

f. Are  $E$  and  $F$  independent? Why or why not?

13. There are 150 boxes of Cheerios in a grocery store. The following table tells you how many boxes had a certain number of Cheerios in them.

# of Cheerios	500	490	480	475	510	525	512
# of boxes	22	35	28	12	30	35	8

a. Place an  $X$  in the row of the table which represents the variable being measured.

b. Find the mean, median, mode, standard deviation, and variance for  $X$ .

c. Find the probability distribution of  $X$ .

14. Suppose you pay \$10 to roll two fair six-sided dice and sum the numbers that are upper-most. You win twice what you paid if a 7 or 11 shows up. You lose what you paid if a 2, 3, or 12 shows up. For anything else that shows up, you win \$4. Let  $X$  be your net winnings.

a. What are your expected net winnings?

b. How much should be charged to make this a fair game?

d. The odds of drawing an Jack from a standard 52-card deck on the second draw, if cards are drawn without replacement, and it is known that the first card drawn was a Queen, are 4 to 47.

e. If the odd against an event E occurring are 3 to 19, then  $P(E) = \frac{19}{22}$

f. The total area of a probability histogram is equal to 1.

15. Determine whether the following statements are True or False.

g. A histogram is "balanced" at its median.

a. The number of minutes it takes you to use an ATM machine is an **infinite discrete random** variable.

h. A normal curve with a higher variance is taller than one with a lower variance.

b. An experiment consists of drawing cards, without replacement, from a standard 52-card deck until all 4 Aces have been drawn. Let  $X$  represent the number of draws needed.  $X$  can be any value in the set  $1, 2, 3, \dots, 52$ .

i. In a normal distribution, approximately 99.73% of the data lies further than 3 standard deviations from the mean.

c. The number of cadets in a class of 100 students is a **finite discrete random** variable.