

Test 3

Dusty Wilson

Math 107

No work = no credit

Name: KEYTelevision is something the Russians invented
to destroy American education. \leftarrow Paul Erdős (1913 - 1996)
Hungarian mathematician

Warm-ups (1 pt each):

$$\frac{100!}{99!} = 100$$

$${}_{12}C_7 = 792$$

$${}_{12}P_7 = 3991680$$

1. (16 pts) The city of Des Moines has 14,307 active registered voters. There is an election for the mayor of Des Moines, and there are three candidates for the position: Smith, Jones, and Brown. The day before the election, a surveyor asks 775 people exiting the Marina who they planned to vote for. This produced the following results: 350 people surveyed indicated that they would vote for Smith, 300 indicated that they would vote for Jones, and 125 indicated that they would vote for Brown.

a.) Describe the population for this survey.

active registered voters in Des Moines

b.) Describe the sampling frame for this survey.

People that go to the Marina.

c.) Name the sampling method used.

convenience sampling

d.) What is N for this survey?

14307

e.) Give the sample statistic estimating the *percentage* of people voting for Jones.

38.7%

f.) Given that in the actual election Jones received 42% of the vote, find the sampling error in the survey expressed as a percentage.

$$\frac{42 - 38.7}{42} = 7.8\% \text{ error.}$$

g.) What do we call the value 42% given in part (f)? (Hint: Remember, these are the actual results of the election.)

parameter.

h.) Do you think the sampling error in this situation is due primarily to chance error or to sample bias? Explain your answer and be specific.

sampling bias — This shows serious selection bias as we only talk to folks that frequent the waterfront. Not only that — most of these aren't active registered voters from Des Moines.

Quote
question

2. (10 pts) Dusty has a theory that a dose of about 500 milligrams of caffeine a day can actually improve students' performance in their college courses. To test his theory, he chooses the 13 students in his Math 107 classes who failed the first midterm and asks them to come to his office three times a week for individual tutoring. When the students come to his office, he engages them in friendly conversation while at the same time pouring them several cups of strong coffee (a total of 500 milligrams of caffeine per student). After a month of doing this, he observes that of the 13 students, 8 show significant improvement on their second exam, 3 show some improvement, and 2 show no improvement at all. Based on this, he concludes that his theory about caffeine is correct.

a.) Which of the following terms best describes Dusty's study:

(i) randomized controlled experiment

(ii) double-blind experiment

(iii) controlled placebo experiment

(iv) clinical study

Explain your choice and explain why you ruled out the other three choices (each one specifically).

(i) not random - all were F's.

(ii) not 2x blind - Dusty knew

(iii) not controlled - no decaf. :)

(iv) yes - looking for cause & effect.

b.) List three possible causes other than caffeine that could have confounded the results of this poorly done study.

(1) frequent use of office hour.

(2) exams aren't warned.

(3) other coffee drinking.

3. (10 pts) The Washington Department of Fish and Wildlife tracks the number of trout in Lake Roosevelt each year. Suppose that 2,000 fish were tagged and then released. After a few weeks, 3200 fish are recaptured, of these 150 had tags. Find an estimate the N -value of the trout population in Lake Roosevelt rounded to the nearest hundred.

$$\frac{2000}{N} = \frac{150}{3200} \Rightarrow N = \frac{2000(3200)}{150}$$

$$\approx 426700 \text{ trout}$$

4. (10 pts) A gumball machine has gumballs of five different flavors: apricot (A), blackberry (B), chocolate (C), Dutch apple (D), ^{2/3}eclair (E). The gumballs are well mixed and when you drop a quarter in the machine you get *two* random gumballs. to equal numbers.

a.) Write out the sample space for this random experiment. (Hint: $N = \overset{15}{10}$)

$$S = \{ \textcircled{AB}, \textcircled{AC}, \textcircled{AD}, A\textcircled{E}, \textcircled{BC}, \textcircled{BD}, \textcircled{BE}, \textcircled{CD}, \textcircled{CE}, \textcircled{DE}, AA, BB, CC, DD, EE \}$$

b.) What is the probability that you will *not* have an eclair gumball (use the sample space in (a)).

$$P_n(\text{no } \leftarrow) = \frac{10}{15}$$

5. (10 pts) A computer password consists of three letters (A through Z) followed by two digits (0 through 9). Assume *no* letter can be used twice but that numbers may be repeated. Furthermore, the passwords are not case sensitive (uppercase and lowercase doesn't matter).

a.) How many different passwords are possible?

$$ABC33$$

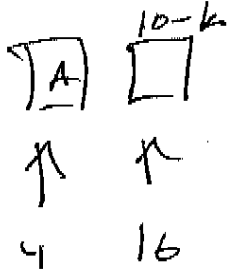
$$26 \cdot 25 \cdot 24 \cdot 10 \cdot 10 = 1560000$$

b.) How many different passwords do not *start* with a Z?

$$A Z Q 33$$

$$25 \cdot 25 \cdot 24 \cdot 10 \cdot 10 = 1500000$$

6. (10 pts) For the random experiment of drawing 2 cards out of a well-shuffled, honest deck of 52 cards, find the probability that one card is an Ace and the other is either 10, J, Q, or K. (That is, if an ace and one other card (10 - K) are drawn, you win.) *in any order*



$$\text{Pr}(\text{Black Jack}) = \frac{64}{52C_2} \approx 0.048$$

7. (10 pts) Five players are entered in a chess tournament. According to an expert handicapper, P_1 has a probability of 0.20 of winning, P_2 has a probability of 0.17, P_3 a probability of 0.09, and P_4 and P_5 have an equal probability of winning.

a.) P_4 and P_5 are actually brothers, what is the probability that their parents will be proud for the victory of one of their sons? (That is, what is the probability that P_4 or P_5 will win the tournament?)

$$\text{Pr}(P_1, P_2, \text{ or } P_3 \text{ wins}) = .46$$

$$\text{Pr}(P_4 \text{ or } P_5 \text{ wins}) = .54$$

b.) What are the odds that P_1 will win the tournament?

Odds for P_1 winning are 1 to 4