

Practice Exam

Name:

- There are 5 problems, each worth between 15 and 25 points.
- Before you start, make sure your exam is not missing any page.
- You may do the problems in any order you like.
- You can earn lots of partial credits if you show your work.
- You are allowed two pages of notes (both sides) and a calculator.

For instructor's use only

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

1. Choose an American household at random and let the random variable X be the number of persons living in the household. The probability distribution of X is as follows:

Inhabitants	1	2	3	4	5	6	7 or more
Probability	0.245	0.323	0.173	0.155	?	0.023	0.014

- (a) What must be the proportion of single-person households, $P(X = 5)$, in order for this to be a legitimate probability distribution ?
- (b) What is $P(2 \leq X < 5)$?
- (c) What is the mean size of an American household ?
- (d) What is the standard deviation of the size of an American household?
- (e) What percentage of households is within one standard deviation of the mean household size ?

2. An assembler of electric fans uses motors from three sources. Company A supplies 90% of the motors while Companies B and C each supplies 5% of the motors. Suppose that 3% of the motors produced by Company A are defective, while the percentages for Companies B and C are 5% and 6% respectively.

(a) If we pick a motor from a mixed lot as above what is the probability that the motor is defective?

(b) If we pick a motor at random and it's defective what is the probability it was supplied by Company B?

(c) Now suppose we look to this entire lot and we pick 5 motors at random. What is the probability that exactly 2 of the 5 picked are defective. (To solve this point assume that the lot is very large so the probabilities for consecutive engines do not change)

4. On a lake in Romania there are only 10 frogs. Of them 3 have a severe disease which is fatal to humans. One day, a boy comes to that lake hoping to catch some frogs and sell them to a local restaurant. If he catches 4 frogs in total from that lake what is the probability that at least one of the frogs that he caught was diseased?

5. A group of 10 romanians are trying to enter Hungary. Unfortunately two of them have outdated passports. It is known that customs inspectors check the passports of 20% of the people in any group passing their desks. The group can go as a whole (all ten) to one desk or can split into two groups of five and use two different desks. How should members of the group arrange themselves to maximize the probability of getting by the inspectors without having the outdated passports be detected.