

Finite Math Section 8_1

Solutions and Hints

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for the book:
Finite Mathematics, 7th Edition
by S. T. Tan.

DO NOT PRINT THIS OUT AND TURN IT IN !!!!!!!!
This is designed to assist you in the event you get stuck.
If you do not do the work you will NOT pass the tests.

Section 8.1:

A **random variable** is a rule that assigns a number to each outcome (singular event) of an experiment. I would advise reading the books examples to get a feel for what random variables really are and how to use them.

Notice that they introduce a notation where CAPITAL LETTERS are random variables and lowercase letters are numeric values. So $P(X = x)$ means what is the probability that the random variable X has a value of x . Or a more concrete example: $P(X = 3)$ means what is the probability that the random variable X has a value of 3.

You also will need to know how to read and create histograms (a fancy name for bar graph). Notice that the sum of all the bars in the histogram will always equal 1. This is because all possible outcomes must be represented and the sum of those probabilities must be 1.

Anyway most of this chapter is just calculating and adding up probabilities to satisfy a particular description.

Problem 2:

A coin is tossed four times. Let the random variable X denote the number of tails that occur.

2a. List the outcomes (singular events) of the experiment.

Four coin tosses – each resulting in a head (H) or a tail (T) gives the possible results of:

HHHH,	<i>0 tails</i>
HHHT, HHTH, HTHH, THHH,	<i>1 tail</i>
HHTT, HTHT, THHT,	<i>2 tails</i>
HTTH, THTH,	<i>2 tails</i>
TTHH,	<i>2 tails</i>
TTTH, TTHT, THTT, HTTT,	<i>3 tails</i>
TTTT	<i>4 tails</i>

Note there are $2^4 = 16$ possible results.

2b. Find the value assigned to each outcome of the experiment by the random variable X.

HHHH gets assigned a zero (for zero tails)
HHHT, HHTH, HTHH, THHH each get assigned 1 (for 1 tail)
HHTT, HTHT, THHT,
HTTH, THTH, TTHH each get assigned a value of 2 (for 2 tails)
TTTH, TTHT, THTT, HTTT each get assigned a value of 3 (for 3 tails)
TTTT gets assigned a value of 4 (for 4 tails)

2c. Find the event comprising the outcomes to which a value of 2 has been assigned by X.

This is the event, E, (set of outcomes) where each outcome was assigned a value of 2:

$E = \{ \text{HHTT, HTHT, THHT, HTTH, THTH, TTHH} \}$

Problem 18:

A survey was conducted by the Public Housing Authority in a certain community among 1000 families to determine the distribution of families by size. The result follows:

Family Size	2	3	4	5	6	7	8
Frequency of Occurrence	350	200	245	125	66	10	4

18a. Find the probability distribution of the random variable X, where X denotes the number of persons in a randomly chosen family.

This is actually easy – you’ve created these tables before. Now instead of saying you are finding the probability of family size = 2 (which is just 350 / 1000) and then finding the probability of the family size = 3 (which is 200 / 1000) and then finding the probability of the family size ... you are just going to do it all in one table under the heading $P(X=x)$ where $x = 2, 3, 4, \dots, 8$. And X means “family size.”

Family Size (x)	Frequency of Occurrence	P(X = x)
2	350	350 / 1000
3	200	200 / 1000
4	245	245 / 1000
5	125	125 / 1000
6	66	66 / 1000
7	10	10 / 1000
8	4	4 / 1000

18b. Draw the histogram corresponding to the probability distribution found in part (a)

