

Finite Math Section 8_2

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 8.2:

There are (at least) two things you must memorize from this section (one of which you already know):

1. The **average, or mean** of n numbers: $x_1, x_2, x_3, \dots, x_n$, is:

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

2. Let X denote a random variable that assumes the values $x_1, x_2, x_3, \dots, x_n$, with associated probabilities $p_1, p_2, p_3, \dots, p_n$, respectively. Then the **expected value** of X denoted $E(X)$ is given by:

$$E(X) = x_1 \cdot p_1 + x_2 \cdot p_2 + x_3 \cdot p_3 + \dots + x_n \cdot p_n .$$

$E(X)$ is sometimes denoted with the Greek character mu: μ .

You may also want to memorize the formulas on pages 458 and 459 – but they are not as important and you should be able to reason those in your head.

Some instructors also will illustrate the difference between mean, median and mode. These are all types of “averages”. you may wish to ask your instructor about them. Problem 39 also addresses this.

Problem 4:

Find the expected value of a random variable X having the following probability distribution:

x	0	1	2	3	4	5
P(X = x)	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{8}$

$$E(X) = (\frac{1}{8} + \frac{1}{4} + \frac{3}{16} + \frac{1}{4} + \frac{1}{16} + \frac{1}{8}) / 6 = \mathbf{1 / 6}.$$

Problem 16:

A man wishes to purchase a 5-yr-term-life insurance policy that will pay the beneficiary \$20,000 in the event that the man's death occurs during the next 5 years. Using life insurance tables he determines that the probability that he will live another 5 years is 0.96. What is the minimum amount he can expect to pay for his premium?

Hint: The minimum premium occurs when the insurance company's expected profit is zero.

Doing problem 17 before this one may help.

First we need to figure out what the company's average expected LOSS is.

There is a 0.96 chance the company pays nothing.

There is a 0.04 chance the company pays 20000.

So on average the expected loss is $0.96*0 + 0.04*20000 = 800$.

The companies expected profit = (income) – (expected loss).

From the hint we know we want to set the expected profit to be zero.

Notice the company's income is what the man would pay as a premium.

So we say:

$$0 = (\text{income}) - (\text{expected loss}) \quad \rightarrow 0 = (\text{income}) - 800$$

$$\rightarrow 800 = (\text{income})$$

So the man's **minimum premium over 5 yrs would be \$800.**

Problem 17:

A woman purchased a \$10,000 1-yr-term-life insurance policy for \$130. Assuming that the probability that she will live another year is 0.992, find the company's expected gain.

The company collects \$130.

So there is a 0.992 chance that the company pays nothing.

There is 0.008 chance the company must pay \$10,000.

$$\begin{aligned}\text{So on average the gain} &= 130 - (\text{average expected loss}). \\ &= 130 - 0.992*0 - 0.008*10000 \\ &= 130 - 80 \\ &= \mathbf{\$50}\end{aligned}$$

Problem 36:

If a sportscaster states that the odds of a certain boxer winning a match are 4 to 3, what is the (subjective) probability that the boxer will win the match?

Refer to page 459 to see the equation:

If the odds in favor of an event E occurring are a to b, the the probability of E occurring is: $P(E) = a / (a + b)$

So for this question $a = 4$ and $b = 3$. Thus the answer is $4 / (4+3) = \mathbf{4 / 7}$.

It might be worth memorizing this if it is not already straight in your head.