

201-AS-389-01(Actuarial Sci. Problem Lab II)

Final Exam

Total Points: 100

Total Weight: 25%

**Question 1**

A company prices its hurricane insurance using the following assumptions:

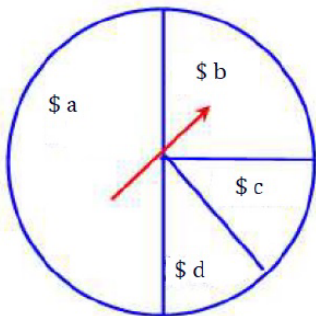
1. In any calendar year, there can be at most one hurricane.
2. In any calendar year, the probability of a hurricane is 0.067.
3. The number of hurricanes in any calendar year is independent of the number of hurricanes in any other calendar year.

Using the company's assumptions, calculate the probability that there are more than 1 hurricanes in a 19-year period. Round your answer to 4 decimal points.

Correct Answer:  0.3669 ± 0.001

**Question 2**

Consider the spinner in the following figure, with the payoff in each sector of the circle:



where  $a = 0.74$ ,  $b = 1.46$ ,  $c = 2.46$  and  $d = 3.66$ . How much should the owner of this spinner expect to make money over an extended period of time if the charge is \$ 2.89 per spin? Round your answer to 4 decimal points.

Note: There is a picture attached with this question. If the picture is not visible to you, please contact the instructor.

Correct Answer:  1.3900 ± 0.001

### Question 3

The final exam for a certain math class is graded pass/fail. A randomly chosen student from a probability class has a 69% chance of knowing the material well. If he knows the material well, he has an 83% chance of passing the final. If he doesn't know the material well, he has a 57% chance of passing the final anyway. If a student passes, what is the probability that he knows the material? Round your answer to 4 decimal points.

Correct Answer:  0.7642 ± 0.001

### Question 4

A portfolio of independent one-year insurance policies has three classes of policies:

Class	No. of Claims in Class	Probability Claim per Policy	Amount
1	1,011	0.013	0.9
2	2,042	0.027	1.3
3	507	0.05	1.8

Find the standard deviation of the aggregate one-year claims distribution. Round your answer to 4 decimal points.

Correct Answer:  13.3864 ± 0.01


### Question 5

The probability that a visit to a primary care physician's (PCP) office results in neither lab work nor referral to a specialist is 42%. Of those coming to a PCP's office, 32% are referred to specialists and 62% do not require lab work. Determine the probability that a visit to a PCP's office results in lab work but not referral to a specialist.

Correct Answer:  0.260 ± 0.001

### Question 6

A motorist makes 6 driving errors, each independently resulting in an accident with probability 0.25. Each accident results in a loss that is exponentially distributed with mean 0.8. Losses are mutually independent and independent of the number of accidents. The motorist's insurer reimburses 70% of each loss due to an accident. Calculate the variance of the total unreimbursed loss the motorist experiences due to accident resulting from these driving errors.

Correct Answer:  0.1512

### Question 7

A supplier faces a daily demand with the following density function  $f(x) = \begin{cases} 2(1-x) & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$ . His profit is given by  $Y = 10X - 2$ . Find  $P(Y^2 < 1.71)$  rounded to 4 decimal points.

Correct Answer:  0.4185 ± 0.001

### Question 8

A company offers earthquake insurance. Annual premiums are modeled by an exponential random variable with mean 3.8. Annual claims are modeled by an exponential random variable with mean 1.2. Premiums and claims are independent. Let  $X$  denote the ration of claims to premiums i.e.  $X = \frac{\text{Claims}}{\text{Premiums}}$ . Find  $P(X < 0.08)$  correct up to 4 decimal points.

Correct Answer:  0.2021 ± 0.005


### Question 9

An insurance company sells a one-year automobile policy with a deductible of 5. The probability that the insured will incur a loss is 0.048. If there is a loss, the probability of a loss of amount  $N$  is  $\frac{c}{N}$ , for  $N = 3, 4, \dots, 7$  and  $c$  a constant. These are the only possible loss amounts and no more than one loss can occur. Determine the net premium for this policy. Round your answer to 4 decimal points.

Correct Answer:  0.0199 ± 0.002

### Question 10

A company wants to buy boards of length 1.5 meters and is willing to accept lengths that are off by as much as 0.05 meters. The board manufacturer produces boards of length normally distributed with mean 1.519 meters. If the probability that a board is too long is 0.1469 what is standard deviation of board lengths? Round up to 4 decimal points.

Correct Answer:  0.0295  
Answer range +/- 0.001 (0.0285 - 0.0305)