

## MATH 474 Homework 2

### Due on Sept 9, 2015, Total=40 pts

Homework submission:

1. MATH 474-01 students must submit homework in class except for reasons approved by the Instructor.
2. MATH 474-02 students must email your homework to the TA Zinovia Drakou (zdrakou@hawk.iit.edu) before the end of the due date, i.e., 11:59 pm Sept 9, 2015. Don't email them to me. Don't submit them to Blackboard.

**Problem 1** (10 points: 1, 1, 2, 2, 2, 2) Exercise 2.15 from Textbook

Consider the sample space  $S = \{\text{copper, sodium, nitrogen, potassium, uranium, oxygen, zinc}\}$ , and the events

$$A = \{\text{copper, sodium, zinc}\},$$

$$B = \{\text{sodium, nitrogen, potassium}\},$$

$$C = \{\text{oxygen}\}.$$

List the elements of the sets corresponding to the following events:

- (a)  $A'$ ;
- (b)  $A \cup C$ ;
- (c)  $(A \cap B') \cup C'$ ;
- (d)  $B' \cap C'$ ;
- (e)  $A \cap B \cap C$ ;
- (f)  $(A' \cup B') \cap (A' \cap C)$ .

**Problem 2** (6 points: 3, 3) Exercise 2.31 from Textbook

If a multiple-choice test consists of 5 questions each with 4 possible answers of which only 1 is correct,

- (a) In how many different ways can a student check off one answer to each question?

- (b) In how many ways can a student check off one answer to each question and get all the answers wrong?

**Problem 3** (5 points) Exercise 2.59 from Textbook

If each coded item in a catalog begins with 3 distinct letters followed by 4 distinct nonzero digits, find the probability of randomly selecting one of these coded items with the first letter a vowel and the last digit even.

**Problem 4** (7 Points: 2, 2, 3) Exercise 2.73 from Textbook

It is common in many industrial areas to use a filling machine to fill boxes full of product. This occurs in the food industry as well as other areas in which the product is used in the home, for example, detergent. These machines are not perfect, and, indeed they may  $A$ , fill to specification,  $B$ , underfill, and  $C$ , overfill. Generally, the practice of underfilling is that which one hopes to avoid. Let  $P(B) = 0.001$  while  $P(A) = 0.990$ .

- (a) Give  $P(C)$ .
- (b) What is the probability that the machine does not underfill?
- (c) What is the probability that the machine either overfills or underfills?

**Problem 5** (8 Points: 2 pts/question) Exercise 2.83 from Textbook

In *USA Today* (Sept. 5, 1996) the results of a survey involving the use of sleepwear while traveling were listed as follows:

	Male	Female	Total
Underwear	0.220	0.024	0.244
Nightgown	0.002	0.180	0.182
Nothing	0.160	0.018	0.178
Pajamas	0.102	0.073	0.175
T-shirt	0.046	0.088	0.134
Other	0.084	0.003	0.087

- (a) What is the probability that a traveler is a female who sleeps in the nude?
- (b) What is the probability that a traveler is male?
- (c) Assuming the traveler is a male, what is the probability that he sleeps in pajamas?

- (d) What is the probability that a traveler is male if he sleeps in pajamas or T-shirt?

**Problem 6** (4 Points: 2, 2) Exercise 2.93 from Textbook

A town has 2 fire engines operating independently. The probability that a specific engine is available when needed is 0.96.

- (a) What is the probability that neither is available when needed?
- (b) What is the probability that a fire engine is available when needed?