

Note: Show sufficient details when you do the calculation for Problems from 2 and 3, otherwise no credit will be given. Partial credit will be given for the correct parts of your work.

Problem 1 (6 points, 1.5 points for each part)

This section consists of some true/false questions regarding concepts of statistical inference. Indicate if a statement is true or false and, **if false, indicate what is required to make the statement true**. One and half points will be deducted if you indicate a true statement as false. One and half points will be deducted if you state a false statement as true. Half point will be deducted if you indicate a false statement as false but fail to provide what is required to make the statement to be true.

- (1) If two events are mutually exclusive, then $\Pr(A \text{ or } B) = \Pr(A) + \Pr(B)$.
- (2) If A and B are two events, then $\Pr(A \text{ and } B) = \Pr(A) * \Pr(B)$, no matter what the relation between A and B .
- (3) The probability distribution function of a discrete random variable cannot have a value greater than 1.
- (4) The probability distribution function of a continuous random variable can take on any value, even negative ones.

Problem 2 (15 points, 5 points for each part)

From the weather channel, we find that the chance that there will be a snowstorm at Houghton this Wednesday is 70% while the chance that there will be a snowstorm at Yellowstone Park this Wednesday is 40%. Since the distance between these two cities, Houghton and Yellowstone, is long so we can assume the event that there will be a snowstorm at Houghton and the event that there will be a snowstorm at Yellowstone are independent. Find the probability of the following events.

- (1) There will be a snowstorm at Houghton this Wednesday and there will be a snowstorm at Yellowstone this Wednesday.
- (2) There will be a snowstorm at Houghton this Wednesday or there will be a snowstorm at Yellowstone this Wednesday.
- (3) There will be a snowstorm at Houghton this Wednesday but there will not be a snowstorm at Yellowstone this Wednesday.

Problem 3 (23 points)

Toss two defective dices D1 and D2. When you toss a die, you can get an integer number from 1 to 6. Suppose the probability distributions of the number from tossing these dices are given in the following table. We further assume that the number obtained from tossing D1 is independent of the number obtained from tossing D2. The following events are defined:

A - an odd number obtained from tossing D1

B – an even number obtained from tossing D2

C – either 1 or 2 obtained from tossing D2

D – the sum of two numbers obtained from tossing D1 and D2 is 6.

	1	2	3	4	5	6
Dice D1	0.2	0.1	0.1	0.2	0.2	0.2
Dice D2	0.1	0.1	0.2	0.3	0.2	0.1

- (1) **(8 points)** Calculate $\Pr(A)$, $\Pr(B)$, $\Pr(C)$, and $\Pr(D)$.
- (2) **(5 points)** Calculate $\Pr(A \text{ and } C)$ and $\Pr(A \text{ or } C)$.
- (3) **(5 points)** Calculate $\Pr(A \text{ and } D)$ and $\Pr(A \text{ or } D)$
- (4) **(5 points)** Let Y be the number obtained by tossing D1. Find its mean and variance.