

ECS 315: In-Class Exercise # 10

Instructions

1. Separate into groups of no more than three persons. **The group cannot be the same as any of your former groups.**
2. **Write down all the steps** that you have done to obtain your answers. You may not get full credit even when your answer is correct without showing how you get your answer.
3. **Do not panic.**

Date: 09 / 10 / 2018		
Name	ID (last 3 digits)	
Prapun	5	5

1. Consider a random experiment in which you roll a fair dice (whose faces are numbered 1-6). We define the following random variables from the outcomes of this experiment:

$$X(\omega) = \omega \quad \text{and} \quad Y(\omega) = 1 + ((\omega - 2)(\omega - 3)(\omega - 5)(\omega - 8)).$$

- a. Find $P[X = 5]$.

$$X(\omega) = 5 \quad \text{when} \quad \omega = 5 \quad \Rightarrow \quad P[X = 5] = P(\{5\}) = \frac{1}{6}$$

- b. Find $P[Y = 1]$.

$$Y(\omega) = 1 \quad \text{when} \quad 1 + ((\omega - 2)(\omega - 3)(\omega - 5)(\omega - 8)) = 1$$

$\omega = 2, 3, 5, 8$ not in Ω

$$\Rightarrow P[Y = 1] = P(\{2\}) + P(\{3\}) + P(\{5\}) = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{1}{2}$$

2. Consider a random experiment in which you roll a 10-sided fair dice (whose faces are numbered 0-9). Define a random variable Z from the outcomes of this experiment by

$$Z(\omega) = (\omega - 7)^2.$$



- a. Find $P[Z = 4]$.

$$Z(\omega) = 4 \quad \text{when} \quad (\omega - 7)^2 = 4$$

$$\omega = 7 + (\pm 2) = 5 \quad \text{or} \quad 9$$

$$\Rightarrow P[Z = 4] = P(\{5\}) + P(\{9\}) = \frac{1}{10} + \frac{1}{10} = \frac{1}{5}$$

- b. Find $P[Z > 20]$.

Method 1:

$$Z(\omega) > 20 \quad \text{when} \quad (\omega - 7)^2 > 20$$

$$\omega > 7 + \sqrt{20} \quad \text{or} \quad \omega < 7 - \sqrt{20}$$

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none of the ω in Ω satisfies this condition $\omega = 0, 1, 2$

$$\Rightarrow P[Z > 20] = P(\{0\}) + P(\{1\}) + P(\{2\}) = \frac{3}{10}$$

Method 2: $X(\omega)$ for all ω .
Because Ω is not large, it is possible to find

ω	$\omega - 7$	$(\omega - 7)^2$
0	-7	49
1	-6	36
2	-5	25
3	-4	16
4	-3	9
5	-2	4
6	-1	1
7	0	0
8	1	1
9	2	4

> 20