ECS 315: In-Class Exercise # 11

Date: 16 / 10 / 2018	
Name	ID (last 3 digits)
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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.**

1. Consider a random experiment in which you roll a six-sided fair dice (whose faces are numbered 1-6). We define a random variable *X* by:

$$X(\omega) = (\omega - 3)(\omega - 5).$$

a. Find all possible values of the random variable *X*.

ω	$\omega - 3$	$\omega - 5$	$X(\omega)$
1	-2	-4	8
2	-1	-3	3
3	0	-2	0
4	1	-1	-1
5	2	0	0
6	3	1	3

The possible values of X are

$\underbrace{-1, 0, 3, 8}$

Remark: This forms the "default" support of X.

b. Find its probability mass function $p_X(x)$. $\equiv P[X = x]$

From part (a), we know that $p_X(x) = 0$ when $x \notin \{-1, 0, 3, 8\}$.
So we only need to find $p_X(x)$ when $x = -1, 0, 3, 8$

$p_X(-1) \equiv P[X = -1] = P(\{4\}) = 1/6$

$p_X(0) \equiv P[X = 0] = P(\{3, 5\}) = 2/6 = 1/3$

$p_X(3) \equiv P[X = 3] = P(\{2, 6\}) = 2/6 = 1/3$

$p_X(8) \equiv P[X = 8] = P(\{1\}) = 1/6$

$$p_X(x) = \begin{cases} 1/6, & x = -1, 8 \\ 1/3, & x = 0, 3 \\ 0, & \text{otherwise} \end{cases}$$

c. $P[X \le 1]$

X can be $-1, 0, 3, 8$.

Among these values, those that are "≤ 1" are -1 and 0.

Therefore, $P[X \le 1] = p_X(-1) + p_X(0) = \frac{1}{6} + \frac{1}{3} = \frac{3}{6} = \frac{1}{2}$

d. (optional) Plot the function $g(x) = P[X \le x]$.