Machine, Data and Learning
Assignment 5
Part B

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Question 1

If the target is at (1, 1) and the observation is o6, then the agent may be at:
(0,0), (2,0), (0,2), (2,2)
with equal probability.

In each case, the target may or may be on call, hence a total 8 possible initial states, each with an equal probability of:

0.125

Initial States (non-zero)

```
[
     ((0,0),(1,1),0),
     ((0,0),(1,1),1),
     ((0,2),(1,1),0),
     ((0,2),(1,1),1),
     ((2,0),(1,1),0),
     ((2,0),(1,1),1),
     ((2,2),(1,1),0),
     ((2,2),(1,1),1)
]
```

Question 2

If the agent is at (0, 1) and the target is in neighborhood, then the target may be at:
(0,0), (1,1), (0,2)
with equal probability.

Given that the target is not on call, there are 4 possible initial states, each with an equal probability of:

0.25

Initial States (non-zero)

```
[
    ((0,1),(0,0),0),
    ((0,1),(0,1),0),
    ((0,1),(1,1),0),
    ((0,1),(0,2),0)
]
```

Question 3

Question 1

#Simulations	Exp Total Reward	95% Confidence Interval
100	5.93348	(5.22762, 6.63935)

Question 2

#Simulations	Exp Total Reward	95% Confidence Interval
100	11.8663	(11.376, 12.3566)

Question 4

Agent at (0,1) [p=0.6]:

o3 is observed when target at (0,0)
o5 is observed when target at (0,2)
o6 is observed when target at (2,0), (2,2)

$$P(o3) = 0.25$$
$$P(o5) = 0.25$$
$$P(o6) = 0.50$$

Agent at (2,1) [p=0.4]:

o3 is observed when target at (0,2)
o5 is observed when target at (2,2)
o6 is observed when target at (0,0), (0,2)

$$P(o3) = 0.25$$
$$P(o5) = 0.25$$
$$P(o6) = 0.50$$

Therefore,

$$\begin{aligned} P(o3) &= 0.6 * 0.25 + 0.4 * 0.25 \\ &= 0.25 \\ P(o5) &= 0.6 * 0.25 + 0.4 * 0.25 \\ &= 0.25 \\ P(o6) &= 0.6 * 0.50 + 0.4 * 0.50 \\ &= 0.5 \end{aligned}$$

Observation **o6** is most likely to be observed.

Question 5

Number of possible policy trees is given by:

$$|A|^N$$

Where,

$$N = \frac{|O|^T - 1}{O - 1}$$

$O = 6$
$A = 5$

Hence,

$$\text{Total no. of policy trees} = 5^{\frac{|6|^T - 1}{5}}$$