

## RL EXPERIMENT 1 (E0123030)

1 a)

```
[2] import random as rn

class Environment:
    def __init__(self):
        self.state = 0

    def reset(self):
        self.state = 0
        return self.state

    def step(self, action):
        self.state += action
        if self.state == 5:
            reward = 10
            done = True
        else:
            reward = 0
            done = False
        return self.state, reward, done

class Agent:
    def __init__(self):
        self.action = [-1, 1]

    def select_action(self):
        return rn.choice(self.action)

env = Environment()
agent = Agent()

state = env.reset()
done = False
step_count = 0

print("Starting Episode...")

while not done:
    action = agent.select_action()
    next_state, reward, done = env.step(action)
    print(f"Step {step_count} State: {state}, Reward: {reward}, Done: {done}")
    state = next_state
    step_count += 1
```

```
➡ Starting Episode...
Step 0 State: 0, Reward: 0, Done: False
Step 1 State: 1, Reward: 0, Done: False
Step 2 State: 2, Reward: 0, Done: False
Step 3 State: 1, Reward: 0, Done: False
Step 4 State: 2, Reward: 0, Done: False
Step 5 State: 3, Reward: 0, Done: False
Step 6 State: 2, Reward: 0, Done: False
Step 7 State: 1, Reward: 0, Done: False
Step 8 State: 0, Reward: 0, Done: False
Step 9 State: 1, Reward: 0, Done: False
Step 10 State: 0, Reward: 0, Done: False
Step 11 State: -1, Reward: 0, Done: False
Step 12 State: -2, Reward: 0, Done: False
Step 13 State: -3, Reward: 0, Done: False
Step 14 State: -4, Reward: 0, Done: False
Step 15 State: -3, Reward: 0, Done: False
Step 16 State: -4, Reward: 0, Done: False
Step 17 State: -5, Reward: 0, Done: False
Step 18 State: -6, Reward: 0, Done: False
Step 19 State: -5, Reward: 0, Done: False
Step 20 State: -6, Reward: 0, Done: False
Step 21 State: -7, Reward: 0, Done: False
Step 22 State: -6, Reward: 0, Done: False
Step 23 State: -5, Reward: 0, Done: False
Step 24 State: -6, Reward: 0, Done: False
```

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Step 309 State: -3, Reward: 0, Done: False
Step 310 State: -2, Reward: 0, Done: False
Step 311 State: -1, Reward: 0, Done: False
Step 312 State: 0, Reward: 0, Done: False
Step 313 State: 1, Reward: 0, Done: False
Step 314 State: 2, Reward: 0, Done: False
Step 315 State: 1, Reward: 0, Done: False
Step 316 State: 2, Reward: 0, Done: False
Step 317 State: 1, Reward: 0, Done: False
Step 318 State: 0, Reward: 0, Done: False
Step 319 State: 1, Reward: 0, Done: False
Step 320 State: 2, Reward: 0, Done: False
Step 321 State: 1, Reward: 0, Done: False
Step 322 State: 2, Reward: 0, Done: False
Step 323 State: 3, Reward: 0, Done: False
Step 324 State: 4, Reward: -5, Done: False
Step 325 State: 5, Reward: 0, Done: False
Step 326 State: 4, Reward: -5, Done: False
Step 327 State: 5, Reward: 0, Done: False
Step 328 State: 6, Reward: 0, Done: False
Step 329 State: 7, Reward: 0, Done: False
Step 330 State: 8, Reward: 0, Done: False
Step 331 State: 9, Reward: 20, Done: True
Episode Finished!
```

1 b)

```
import random as rn

class Environment:
    def __init__(self):
        self.state = 0

    def reset(self):
        self.state = 0
        return self.state

    def step(self, action):
        self.state += action
        if self.state == 10:
            reward = 20
            done = True
        elif self.state == 5:
            reward = -5
            done = False
        else:
            reward = 0
            done = False
        return self.state, reward, done

class Agent:
    def __init__(self):
        self.action = [-1, 1]

    def select_action(self):
        return rn.choice(self.action)
```

```
class Agent:
    def __init__(self):
        self.action = [-1, 1]

    def select_action(self):
        return rn.choice(self.action)

env = Environment()
agent = Agent()

state = env.reset()
done = False
step_count = 0

print("Starting Episode...")

while not done:
    action = agent.select_action()
    next_state, reward, done = env.step(action)
    print(f"Step {step_count} State: {state}, Reward: {reward}, Done: {done}")
    state = next_state
    step_count += 1

print("Episode Finished!")
```

```
Starting Episode...
Step 0 State: 0, Reward: 0, Done: False
Step 1 State: -1, Reward: 0, Done: False
Step 2 State: 0, Reward: 0, Done: False
Step 3 State: -1, Reward: 0, Done: False
Step 4 State: 0, Reward: 0, Done: False
Step 5 State: 1, Reward: 0, Done: False
Step 6 State: 2, Reward: 0, Done: False
Step 7 State: 3, Reward: 0, Done: False
Step 8 State: 4, Reward: 0, Done: False
Step 9 State: 3, Reward: 0, Done: False
Step 10 State: 2, Reward: 0, Done: False
Step 11 State: 3, Reward: 0, Done: False
Step 12 State: 2, Reward: 0, Done: False
Step 13 State: 3, Reward: 0, Done: False
Step 14 State: 4, Reward: 0, Done: False
Step 15 State: 3, Reward: 0, Done: False
Step 16 State: 4, Reward: 0, Done: False
Step 17 State: 3, Reward: 0, Done: False
Step 18 State: 2, Reward: 0, Done: False
Step 19 State: 1, Reward: 0, Done: False
Step 20 State: 2, Reward: 0, Done: False
Step 21 State: 1, Reward: 0, Done: False
Step 22 State: 2, Reward: 0, Done: False
Step 23 State: 1, Reward: 0, Done: False
Step 24 State: 2, Reward: 0, Done: False
Step 25 State: 1, Reward: 0, Done: False
Step 26 State: 2, Reward: 0, Done: False
Step 27 State: 1, Reward: 0, Done: False
Step 28 State: 0, Reward: 0, Done: False
Step 29 State: -1, Reward: 0, Done: False
Step 30 State: 0, Reward: 0, Done: False
Step 31 State: -1, Reward: 0, Done: False
Step 32 State: -2, Reward: 0, Done: False
```

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Step 174 State: 4, Reward: -5, Done: False
Step 175 State: 5, Reward: 0, Done: False
Step 176 State: 4, Reward: 0, Done: False
Step 177 State: 3, Reward: 0, Done: False
Step 178 State: 2, Reward: 0, Done: False
Step 179 State: 3, Reward: 0, Done: False
Step 180 State: 4, Reward: -5, Done: False
Step 181 State: 5, Reward: 0, Done: False
Step 182 State: 6, Reward: -5, Done: False
Step 183 State: 5, Reward: 0, Done: False
Step 184 State: 4, Reward: 0, Done: False
Step 185 State: 3, Reward: 0, Done: False
Step 186 State: 4, Reward: -5, Done: False
Step 187 State: 5, Reward: 0, Done: False
Step 188 State: 6, Reward: -5, Done: False
Step 189 State: 5, Reward: 0, Done: False
Step 190 State: 4, Reward: 0, Done: False
Step 191 State: 3, Reward: 0, Done: False
Step 192 State: 2, Reward: 0, Done: False
Step 193 State: 3, Reward: 0, Done: False
Step 194 State: 4, Reward: -5, Done: False
Step 195 State: 5, Reward: 0, Done: False
Step 196 State: 6, Reward: -5, Done: False
Step 197 State: 5, Reward: 0, Done: False
Step 198 State: 6, Reward: 0, Done: False
Step 199 State: 7, Reward: 0, Done: False
Step 200 State: 8, Reward: 0, Done: False
Step 201 State: 9, Reward: 20, Done: True
Episode Finished!
```