Problem 1

```
(venv) PS D:\fighting\COMP3270\a2> python .\p1.py
Grading Problem 1 :
----------> Test case 1 PASSED <----------
----------> Test case 2 PASSED <----------
----------> Test case 3 PASSED <----------
----------> Test case 4 PASSED <----------
----------> Test case 5 PASSED <----------
----------> Test case 6 PASSED <----------
```

A good start, it means out program is on the right way, we have the basic configuration to finish the left journey.

Problem 2

We can have the following runtime shortcuts to have the following table of the executing time consumption.

Problem index	Win rate(%)	Execution time(m)	Parameters
Q1	100	0.5256	1 100 0
Q2	100	0.0100	2 100 0
Q3	100	0.1352	3 100 0
Q4	90	4.6363	4 100 0
Q5	100	934.1662	5 10 0

```
(venv) PS D:\fighting\COMP3270\a2> python .\p2.py 1 100 0
test_case_id: 1
num_trials: 100
verbose: False
time: 0.5256783962249756
win % 100.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p2.py 2 100 0
test_case_id: 2
num_trials: 100
verbose: False
time: 0.010000228881835938
win % 100.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p2.py 3 100 0
test_case_id: 3
num_trials: 100
verbose: False
time: 0.1352708339691162
win % 90.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p2.py 4 100 0
test_case_id: 4
num_trials: 100
verbose: False
time: 4.636326789855957
win % 100.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p2.py 5 10 0
test_case_id: 5
num_trials: 10
verbose: False
time: 934.1662218570709
win % 100.0
```

Problem 3

Now, we take multiple ghosts case into consideration, first of all, make the working formally.

```
(venv) PS D:\fighting\COMP3270\a2> python .\p3.py
Grading Problem 3 :
----------> Test case 1 PASSED <----------
----------> Test case 2 PASSED <----------
----------> Test case 3 PASSED <----------
----------> Test case 4 PASSED <----------
----------> Test case 5 PASSED <----------
----------> Test case 6 PASSED <----------
----------> Test case 7 PASSED <----------
```

Problem 4

We can have the following runtime shortcuts to have the following table of the executing time consumption.

Problem index	Win rate(%)	Execution time(m)	Parameters
Q1	38	0.343	1 100 0

Q2	75	0.007	2 100 0
Q3	28	0.024	3 100 0
Q4	72	14.014	4 100 0
Q5	34	0.050	5 100 0
Q6	37	0.128	6 100 0
Q7	31	0.124	7 100 0
Q8	60	434.596	8 50 0
Q9	30	259.334	9 50 0

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 1 100 0
test_case_id: 1
num_trials: 100
verbose: False
time:  0.3432464599609375
win % 38.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 2 100 0
test_case_id: 2
num_trials: 100
verbose: False
time:  0.006997823715209961
win % 75.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 3 100 0
test_case_id: 3
num_trials: 100
verbose: False
time:  0.02444624900817871
win % 28.999999999999996
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 4 100 0
test_case_id: 4
num_trials: 100
verbose: False
time:  14.025920867919922
win % 72.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 5 100 0
test_case_id: 5
num_trials: 100
verbose: False
time:  0.04963088035583496
win % 34.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 6 100 0
test_case_id: 6
num_trials: 100
verbose: False
time:  0.1276693344116211
win % 37.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 7 100 0
test_case_id: 7
num_trials: 100
verbose: False
time:  0.12447309494018555
win % 31.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 8 50 0
test_case_id: 8
num_trials: 50
verbose: False
time:  434.59564685821533
win % 60.0
```

```
(venv) PS D:\fighting\COMP3270\a2> python .\p4.py 9 50 0
test_case_id: 9
num_trials: 50
verbose: False
time:  259.33353543281555
win % 32.0
```

Problem 5

Due to the page limits, we only show the table for the left.

Problem index	Win rate(%)	Execution time(m)	Parameters
Q1	100	0.101	1 3 100 0
Q2	100	1.036	2 3 100 0
Q3	89	0.164	3 3 100 0
Q4	77	0.243	4 3 100 0
Q5	89	7.437	5 3 100 0
Q6	100	3.257	6 3 100 0
Q7	100	30.258	7 3 100 0
Q8	85	782.596	8 3 100 0

```
(venv) PS D:\fighting\COMP3270\a2> python .\p5.py 8 3 100 0
test_case_id: 8
k: 3
num_trials: 100
verbose: False
time:  782.2187745571136
win % 85.0
```

Problem 6

Problem index	Win rate(%)	Execution time(m)	Parameters
Q1	38	0.543	1 3 100 0
Q2	77	0.004	2 3 100 0
Q3	34	0.134	3 3 100 0
Q4	68	12.014	4 3 100 0
Q5	37	0.450	5 3 100 0
Q6	41	0.297	6 3 100 0
Q7	38	0.224	7 3 100 0
Q8	72	645.597	8 3 50 0
Q9	34	499.314	9 3 50 0

Each task taking time(include debug time)

Problem index	Time taken(h)
P1	6
P2	3
P3	4
P4	5
P5	2.5
P6	2.5