FAST
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Assignment 2b

Q1. 1. [1, 3, 5, 7, 2, 4, 6, 8] for N=8

2. 20!

3. By counting the number of non-attacking pair which in this case should be $\frac{n(n-1)}{2}$

$\frac{20(20-1)}{2}$

$= 190$

		Proportionate	C. sum
100010111	6	0.3	0.3
100000001	1	0.05	0.35
01010010	0	0	0.35
010100110	5	0.25	0.6
001100111	0	0	0.6
110110110	8	0.4	1

Q2.

random number = 0.86

1. $\boxed{110110110}$

random number = 0.59

2. $\boxed{010100110}$

Single point crossover

$\lfloor 0.67 \times 9 \rfloor = 6$

this gives same answer, again.

$\lfloor 0.14 \times 9 \rfloor = 1$

| 1 1 | 0 110110 | → ③ | 110100110 |

| 0 1 | 0100110 | → ④ | 010110110 |

$0.34 > 0.1$

Mutation

$\lfloor 0.08 \times 9 \rfloor = 0$ same, again

$\lfloor 0.11 \times 9 \rfloor = 0$ same, again

$\lfloor 0.29 \times 9 \rfloor = 2$

| 11 ~~0~~1 100110 | → ⑤ | 111100110 |

$0.85 > 0.1$

Mutation

$\lfloor 0.76 \times 9 \rfloor = 6$

| 010110 ~~1~~ 10 | → ⑥ | 010110010 |

New Population

1. 110110110
2. 010100110
3. 110100110
4. 010110110
5. 111100110
6. 010110010

b). Use Random Restart. This will help in reaching a new local minima which may or may not be better than the current local minima.

Q3.

		Fitness	Rank	selection Probability	C.sum
C1	00001101	3	6	0.285	0.285
C2	11000000	2	2	0.095	0.380
C3	00000000	0	1	0.047	0.427
C4	10101000	3	5	0.238	0.665
C5	00111000	3	4	0.190	0.855
C6	01000011	3	3	0.145	1

random value = 0.12

C1

random value = 0.61

C4

Crossover random value = 0.5

crossover point 4

New C1 : 00001000

New C2 : 10101101

random value = 0.15

C1

random value = 0.34

C2

crossoverpoint 1 random value = 0.13

new C3 = 01000000
new C4 = 10001101

random value = 0.83
C5
random value = 0.9
C6

crossover point = 4 random value 0.51
New C5 = 00110011
Ne C6 = 01001000

New Population	Fitness
00001000	1
01001000	~~8~~ 2
10101101	5
01000000	1
10001101	4
00110011	4

2nd iteration	Fitness
01000011	3
00111000 ~~01000011~~	3
00001101	3
10101101	5
10001101	4
00110011	4

Q 4. a) $(n-1)!$ which will be $(5-1)! = 4! = 24$
starting at a location there are 4 different places. going at any one leave 3, then 2 then 1.
hence $4.3.2.1$.

b) excluding first city it would be
$$\frac{(n-1)(n-2)}{2} = \frac{(4)(3)}{2} = 6$$

[1, 3, 4, 2, 5]
swap possible [3, 4], [3, 2], [3, 5], [4, 2], [4, 5], [2, 5]

c) [1, 3, 4, 2, 5] $= 2 + 4 + 3 + \cancel{8}^{2} = \cancel{17}\ \boxed{11}$ selected
swap [3, 4]
[1, 4, 3, 2, 5] $= 3 + 4 + 1 + 2 = \boxed{10}$ selected
swap [3, 2]
[1, 4, 2, 3, 5] $= 3 + 3 + 1 + 2 = \boxed{9}$ selected
swap [3, 5]
[1, 4, 2, 5, 3] $= 3 + 3 + 2 + 2 = 10$ not selected
swap [4, 2]
[1, 2, 4, 3, 5] $= 5 + 3 + 4 + 2 = 14$ not selected
swap [4, 5]
[1, 5, 2, 3, 4] $= 1 + 2 + 1 + 4 = \boxed{8}$ selected
swap [2, 5]
[1, 2, 5, 3, 4] $= 5 + 2 + 2 + 4 = 13$ not selected

Final solution [1, 5, 2, 3, 4] with 8 as best.

Q5 1. The search space will be 2^{100}. The agent has two choices for each item. for example 3 items will have $8 = (2^3)$ combinations. Similarly 100 items will have 2^{100} combinations.

2. Max successors = n - numbers of items already picked ~~picked~~

3. Assuming it is a minimization it can be represented as

$$V_{total} = \sum_{i=1}^{n} v_i \cdot s_i$$

where v is the cost assigned to the item and s is whether it is picked or not. (0 or 1)