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(8) for a 8-queen problem, in the final Goal State, 8 queens are arranged in the 8×8 chess board in such a way (i.e One queen per each column) that no queen attack each other.

Proceed to Solve the 8-queen problem as an optimization problem.

Maximize F where,

F = objective or fitness function

= "Number of non-attacking pairs".

Soln) Step 1:- To use a GA, we must first code the decision variables of our problem as some finite length string / Array. for this problem, we will code the Variable Simply as integers of length 8. This will be the chromosome. we are using the Arrays to repent individuals of a population.

Index : Column

Value : Row.

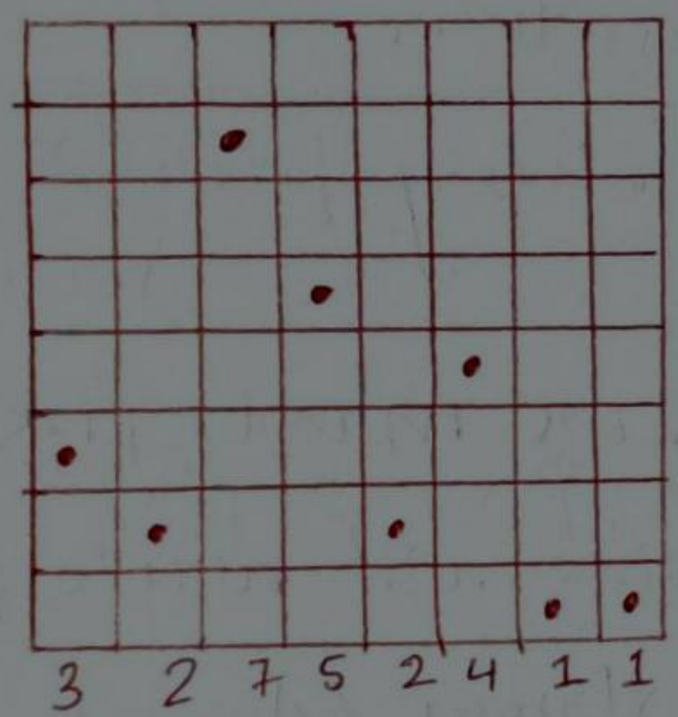
Step 2:- To start off, we select an initial population of random. we select the population of 4.

3 2 7 5 2 4 1 1 → String No. 1
2 4 7 4 8 5 5 2 → String No. 2
3 2 5 4 3 2 1 3 → String No. 3
2 4 4 1 5 1 2 4 → String No. 4

Step 3 :- Apply fitness function.

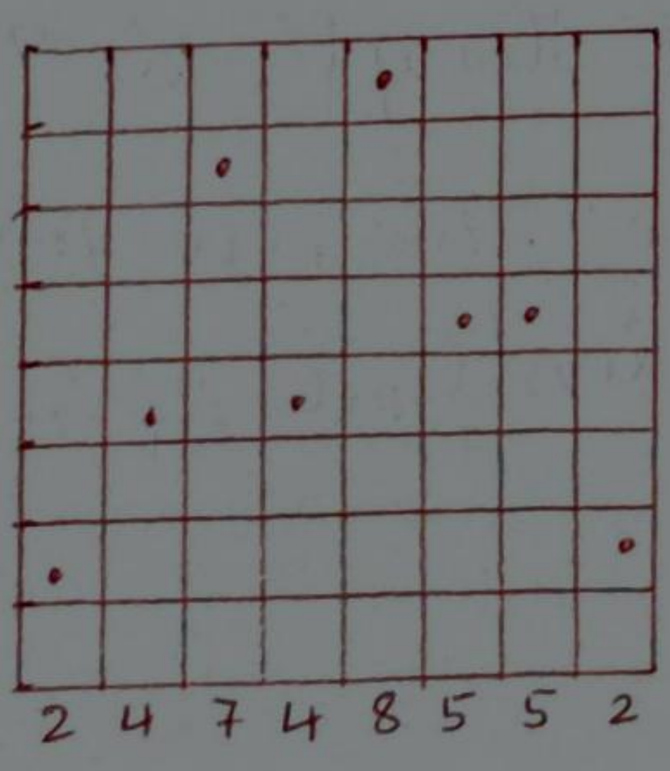
Here, [fitness = No. of non-attacking pairs]

(1)



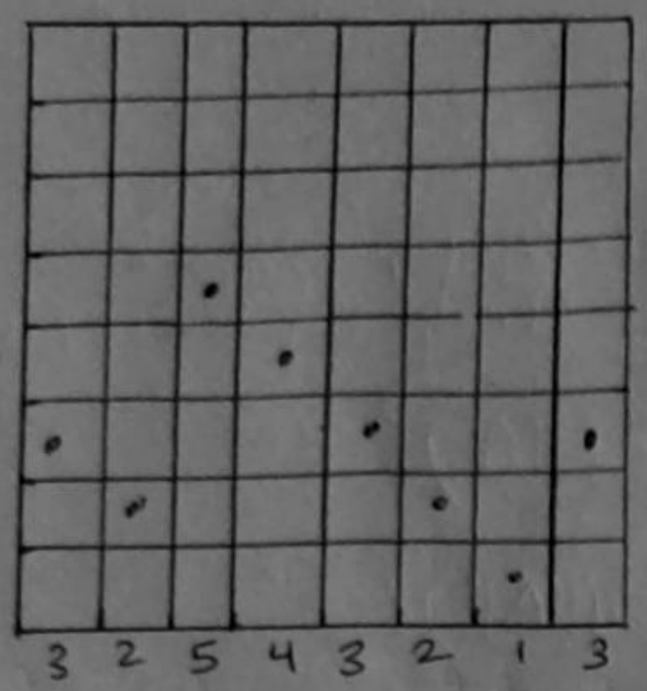
Fitness = 23

(2)

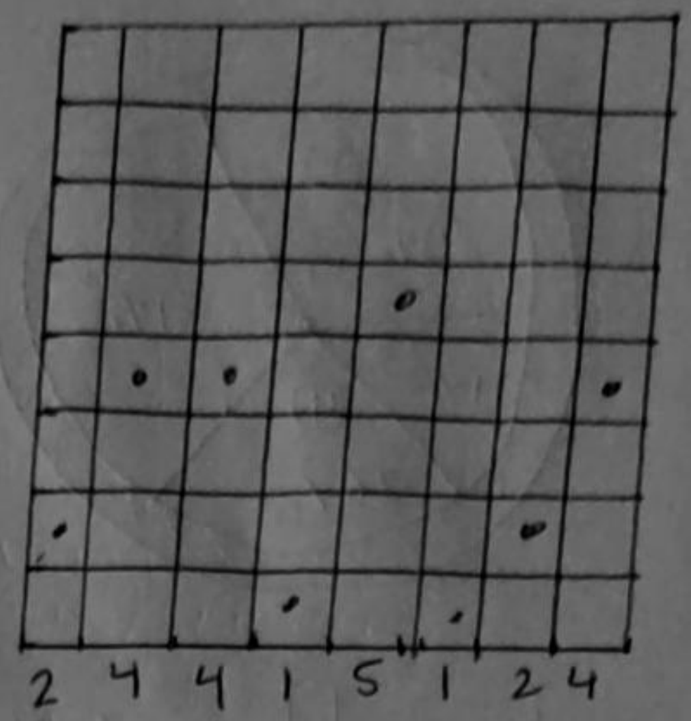


fitness = 24

(3) fitness = 11



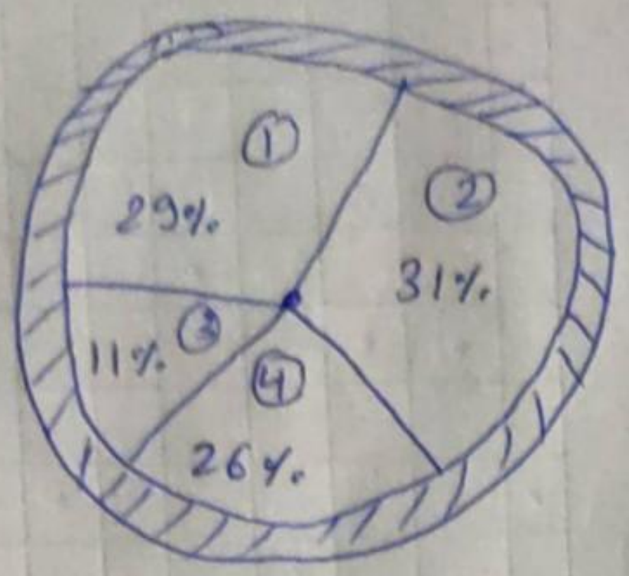
(4) fitness = 20



Step 4 :- looking at this population. following initial table must be prepared to select 4 fit parents for further process of reproduction.

String No.	Initial Population	fitness Value	% of total	Actual Count from (Roulette wheel)
1	3 2 7 5 2 4 1 1	23	29	1
2	2 4 7 4 8 5 5 2	24	31	2
3	3 2 5 4 3 2 1 3	11	14	0
4	2 4 4 1 5 1 2 4	20	26	1
Sum		78	100	4
Avg		19.5	25	1
Max		24	31	2

Step 5 :- we select the mating pool of the next generation by spinning the weighted Roulette wheel four times.



Through the weighted Roulette wheel method following three strings were selected as fit parents for the mating pool.

P_1: 3 2 7 5 2 4 1 1

P_2: 2 4 7 4 8 5 5 2

P_3: 2 4 4 1 5 1 2 4

The parent pairs can be chosen randomly as well as crossover sites among these pairs also be chosen randomly in the mating pool.

Accordingly, we choose parents P_1 & P_2 as one parent pair, and P_1 & P_4 as another.