6407-week1
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start

N-Queens online quiz

Answer 3 3 1 3

The 4 options

1 Constrained optimization problem COP

2 Free optimization problem

3 Constraint satisfaction problem CSP

4 No problem

* 表示必填

Find a configuration of 8 queens with at least 7 queens that are non-attacking.

满足就可
无 optimal

*

Option 1

Option 2

$\boxed{\text{Option 3}}$ ✓ CSP

Option 4

Find a configuration of 8 queens where all the queens are non-attacking.

无 optimal
满足即可

*

Option 1

Option 2

$\boxed{\text{Option 3}}$ ✓ CSP

Option 4

Assume that you start off with a random configuration of 8 queens. You are allowed only one move for each queen and the extent of the movement of each queen should be minimized. Reposition the 8 queens such that the total number of steps moved is minimum and the number of non-conflicting queens is maximized.

步数尽量小 → optimal

*

$\boxed{\text{Option 1}}$ ✓ max → non-conflicting Queens
COP
↓
constrain

Option 2

Option 3

Option 4

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Given a partial configuration of 4 queens in half the chess board, find the positions of the remaining 4 queens whereby the number of non-conflicting queens is maximized.

满足尽可能多的
条件即可
不要 optimal

*

Option 1

Option 2

$\boxed{\text{Option 3}}$ CSP

Option 4

Thought about N-Queens problem types for 1m 44s

Below is a concise way to see why each of the four questions maps to either a **Constraint Satisfaction Problem** or a **Constrained Optimization Problem** (and *not* to a "free optimization" or "no problem"):

Recap of the Four Options

1. **Constrained Optimization Problem**
2. **Free Optimization Problem**
3. **Constraint Satisfaction Problem**
4. **No Problem**

Why not "Free Optimization Problem" (Option 2) in any of these?

A *free* optimization problem would have *no* real constraints beyond the bounds of the variables (for instance, optimizing a function $f(x)$ over $\mathbb{R}$ with no strict constraints).

But **N-Queens** always imposes the constraint that queens must be placed on discrete board squares, plus we care about "non-attacking." Hence, none of these is truly "free" of constraints.

Why not "No Problem" (Option 4)?

Clearly, each question *does* pose a nontrivial problem.

Understanding CSP vs. Constrained Optimization

1. A **Constraint Satisfaction Problem (CSP)** requires *all* constraints to be satisfied *exactly*. In the classic N-Queens, that means no two queens attack each other (i.e., 0 conflicts).
2. A **Constrained Optimization Problem (COP)** arises when:
   - We can tolerate *partial* satisfaction of constraints (e.g., "at least 7 non-attacking," rather than 8).
   - Or we have a cost/objective function we want to *optimize* (minimize or maximize), subject to various constraints.

Analysis of Each Question

1)

"Find a configuration of 8 queens with at least 7 queens that are non-attacking."

- We do **not** require a perfect (8/8) non-attacking solution; rather, we insist on *at least* 7 non-attacking.
- This is not a pure "all-or-nothing" CSP (which would demand 8/8).
- We are effectively *relaxing* the constraint and aiming to "optimize" (or at least to meet a threshold) the number of non-attacking queens.

Hence, this is a **Constrained Optimization Problem** (Option 1).

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2)

"Find a configuration of 8 queens where all the queens are non-attacking."

- This is the *classical* N-Queens requirement: **all** queens must be pairwise non-attacking.
- That is the textbook example of a **Constraint Satisfaction Problem** (Option 3).
  - There is no "maximize" or "minimize" objective here; the problem is simply "do not violate the (attack) constraints at all."

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3)

"Assume that you start off with a random configuration of 8 queens. You are allowed only one move for each queen and the extent of the movement of each queen should be minimized. Reposition the 8 queens such that the total number of steps moved is minimum and the number of non-conflicting queens is maximized."

- Here, there are two objectives under constraints:
  1. **Minimize** total steps (sum of how far each queen moves).
  2. **Maximize** the number of non-conflicting queens.
- Because we have explicit constraints on movement (one move per queen, must stay on the board, etc.) *and* an objective (or objectives) to optimize, this is a **Constrained Optimization Problem** (Option 1).

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4)

"Given a partial configuration of 4 queens in half the chess board, find the positions of the remaining 4 queens whereby the number of non-conflicting queens is maximized."

- We already have 4 queens placed (presumably immovable) and must place the remaining 4.
- We want to **maximize** how many queens remain non-attacking once all 8 are on the board (i.e., partial satisfaction is allowed if it's impossible to get 8/8 conflict-free).
- Again, that is an objective (maximize non-conflicting) under constraints (fixed squares for the first 4 queens, standard "no-attack" rules, limited board squares).

Hence, this too is a **Constrained Optimization Problem** (Option 1).

Final "Best-Fit" Answers

Putting it all together:

1. **Q1** (at least 7 non-attacking)
   → **Constrained Optimization Problem** (Option 1)
2. **Q2** (all 8 non-attacking)
   → **Constraint Satisfaction Problem** (Option 3)
3. **Q3** (minimize total movement, maximize non-conflicts)
   → **Constrained Optimization Problem** (Option 1)
4. **Q4** (complete partial configuration to maximize non-conflicts)
   → **Constrained Optimization Problem** (Option 1)

> **Short version**
> - Q1: ~~1~~ 3
> - Q2: **3**
> - Q3: **1**
> - Q4: ~~1~~ 3

Because (2) "free optimization" and (4) "no problem" are not appropriate for any of these questions.