

Lab-4

```
from itertools import product

def attacks(state):
    """Calculate number of pairs of queens attacking each other."""
    attacks = 0
    n = len(state)
    for i in range(n):
        for j in range(i + 1, n):
            # Same row
            if state[i] == state[j]:
                attacks += 1
            # Same diagonal
            elif abs(state[i] - state[j]) == abs(i - j):
                attacks += 1
    return attacks

def all_states(n):
    """Generate all possible states for n queens (one per column)."""
    # Each state is a tuple with queen rows in columns 0 to n-1
    return product(range(n), repeat=n)

n = 4
all_possible_states = list(all_states(n))

print(f"Total possible states: {len(all_possible_states)}\n")

for state in all_possible_states:
    print(f"State: {state}, Attacks: {attacks(state)}")
```

## Output

```
State: (3, 1, 3, 0), Attacks: 2
State: (3, 1, 3, 1), Attacks: 2
State: (3, 1, 3, 2), Attacks: 2
State: (3, 1, 3, 3), Attacks: 4
State: (3, 2, 0, 0), Attacks: 4
State: (3, 2, 0, 1), Attacks: 2
State: (3, 2, 0, 2), Attacks: 2
State: (3, 2, 0, 3), Attacks: 2
State: (3, 2, 1, 0), Attacks: 6
State: (3, 2, 1, 1), Attacks: 4
State: (3, 2, 1, 2), Attacks: 5
State: (3, 2, 1, 3), Attacks: 4
State: (3, 2, 2, 0), Attacks: 4
State: (3, 2, 2, 1), Attacks: 3
State: (3, 2, 2, 2), Attacks: 4
State: (3, 2, 2, 3), Attacks: 4
State: (3, 2, 3, 0), Attacks: 5
State: (3, 2, 3, 1), Attacks: 3
State: (3, 2, 3, 2), Attacks: 5
State: (3, 2, 3, 3), Attacks: 5
State: (3, 3, 0, 0), Attacks: 3
State: (3, 3, 0, 1), Attacks: 3
State: (3, 3, 0, 2), Attacks: 1
State: (3, 3, 0, 3), Attacks: 3
State: (3, 3, 1, 0), Attacks: 4
State: (3, 3, 1, 1), Attacks: 4
State: (3, 3, 1, 2), Attacks: 3
State: (3, 3, 1, 3), Attacks: 4
State: (3, 3, 2, 0), Attacks: 3
State: (3, 3, 2, 1), Attacks: 4
State: (3, 3, 2, 2), Attacks: 3
State: (3, 3, 2, 3), Attacks: 5
State: (3, 3, 3, 0), Attacks: 4
State: (3, 3, 3, 1), Attacks: 4
State: (3, 3, 3, 2), Attacks: 4
State: (3, 3, 3, 3), Attacks: 6
```

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