Problem 351: Android Unlock Patterns

Problem Information

Difficulty: Medium
Acceptance Rate: 0.00%
Paid Only: No

Problem Description

Android devices have a special lock screen with a

3 x 3

grid of dots. Users can set an "unlock pattern" by connecting the dots in a specific sequence, forming a series of joined line segments where each segment's endpoints are two consecutive dots in the sequence. A sequence of

k

dots is a

valid

unlock pattern if both of the following are true:

All the dots in the sequence are

distinct

.

If the line segment connecting two consecutive dots in the sequence passes through the

center

of any other dot, the other dot

must have previously appeared

in the sequence. No jumps through the center non-selected dots are allowed.

For example, connecting dots

2

and

9

without dots

5

or

6

appearing beforehand is valid because the line from dot

2

to dot

9

does not pass through the center of either dot

5

or

6

.

However, connecting dots

1

and

3

without dot

2

appearing beforehand is invalid because the line from dot

1

to dot

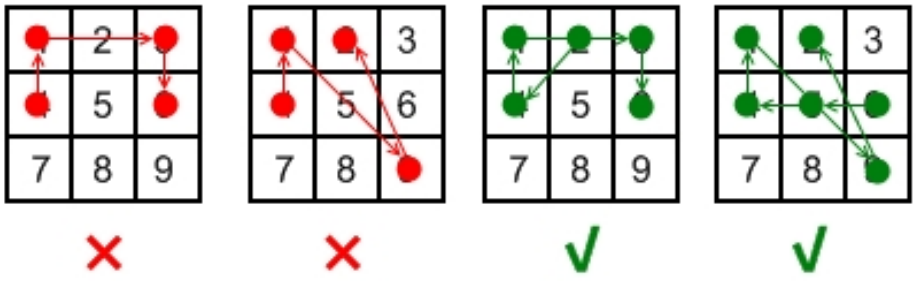
3

passes through the center of dot

2

.

Here are some example valid and invalid unlock patterns:



The 1st pattern

[4,1,3,6]

is invalid because the line connecting dots

1

and

3

pass through dot

2

, but dot

2

did not previously appear in the sequence.

The 2nd pattern

[4,1,9,2]

is invalid because the line connecting dots

1

and

9

pass through dot

5

, but dot

5

did not previously appear in the sequence.

The 3rd pattern

[2,4,1,3,6]

is valid because it follows the conditions. The line connecting dots

1

and

3

meets the condition because dot

2

previously appeared in the sequence.

The 4th pattern

[6,5,4,1,9,2]

is valid because it follows the conditions. The line connecting dots

1

and

9

meets the condition because dot

5

previously appeared in the sequence.

Given two integers

m

and

n

, return

the

number of unique and valid unlock patterns

of the Android grid lock screen that consist of

at least

m

keys and

at most

n

keys.

Two unlock patterns are considered

unique

if there is a dot in one sequence that is not in the other, or the order of the dots is different.

Example 1:

Input:

m = 1, n = 1

Output:

9

Example 2:

Input:

m = 1, n = 2

Output:

65

Constraints:

1 <= m, n <= 9

Code Snippets

C++:

```
class Solution {
public:
int numberOfPatterns(int m, int n) {

}
};
```

Java:

```
class Solution {
public int numberOfPatterns(int m, int n) {

}
}
```

Python3:

```
class Solution:
def numberOfPatterns(self, m: int, n: int) -> int:
```

Python:

```
class Solution(object):
def numberOfPatterns(self, m, n):
"""
:type m: int
:type n: int
:rtype: int
"""
```

JavaScript:

```
/**
* @param {number} m
* @param {number} n
* @return {number}
*/
var numberOfPatterns = function(m, n) {

};
```

TypeScript:

```
function numberOfPatterns(m: number, n: number): number {

};
```

C#:

```
public class Solution {
public int NumberOfPatterns(int m, int n) {

}
}
```

C:

```
int numberOfPatterns(int m, int n) {

}
```

Go:

```
func numberOfPatterns(m int, n int) int {

}
```

Kotlin:

```
class Solution {
fun numberOfPatterns(m: Int, n: Int): Int {

}
}
```

Swift:

```
class Solution {
func numberOfPatterns(_ m: Int, _ n: Int) -> Int {

}
}
```

Rust:

```
impl Solution {
pub fn number_of_patterns(m: i32, n: i32) -> i32 {

}
}
```

Ruby:

```
# @param {Integer} m
# @param {Integer} n
# @return {Integer}
def number_of_patterns(m, n)

end
```

PHP:

```
class Solution {
```

```
/**
* @param Integer $m
* @param Integer $n
* @return Integer
*/
function numberOfPatterns($m, $n) {

}
}
```

Dart:

```
class Solution {
int numberOfPatterns(int m, int n) {

}
}
```

Scala:

```
object Solution {
def numberOfPatterns(m: Int, n: Int): Int = {

}
}
```

Elixir:

```
defmodule Solution do
@spec number_of_patterns(m :: integer, n :: integer) :: integer
def number_of_patterns(m, n) do

end
end
```

Erlang:

```
-spec number_of_patterns(M :: integer(), N :: integer()) -> integer().
number_of_patterns(M, N) ->
.
```

Racket:

```
(define/contract (number-of-patterns m n)
(-> exact-integer? exact-integer? exact-integer?)
)
```

Solutions

C++ Solution:

```
/*
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/

class Solution {
public:
int numberOfPatterns(int m, int n) {

}
};
```

Java Solution:

```
/**
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/

class Solution {
public int numberOfPatterns(int m, int n) {

}
```

```
}
```

Python3 Solution:

```
"""
Problem: Android Unlock Patterns
Difficulty: Medium
Tags: dp

Approach: Dynamic programming with memoization or tabulation
Time Complexity: O(n * m) where n and m are problem dimensions
Space Complexity: O(n) or O(n * m) for DP table
"""

class Solution:
def numberOfPatterns(self, m: int, n: int) -> int:
# TODO: Implement optimized solution
pass
```

Python Solution:

```
class Solution(object):
def numberOfPatterns(self, m, n):
"""
:type m: int
:type n: int
:rtype: int
"""
```

JavaScript Solution:

```
/**
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/
```

```
/**
* @param {number} m
* @param {number} n
* @return {number}
*/
var numberOfPatterns = function(m, n) {

};
```

TypeScript Solution:

```
/**
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/

function numberOfPatterns(m: number, n: number): number {

};
```

C# Solution:

```
/*
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/

public class Solution {
public int NumberOfPatterns(int m, int n) {

}
```

```
}
```

C Solution:

```
/*
* Problem: Android Unlock Patterns
* Difficulty: Medium
* Tags: dp
*
* Approach: Dynamic programming with memoization or tabulation
* Time Complexity: O(n * m) where n and m are problem dimensions
* Space Complexity: O(n) or O(n * m) for DP table
*/

int numberOfPatterns(int m, int n) {

}
```

Go Solution:

```
// Problem: Android Unlock Patterns
// Difficulty: Medium
// Tags: dp
//
// Approach: Dynamic programming with memoization or tabulation
// Time Complexity: O(n * m) where n and m are problem dimensions
// Space Complexity: O(n) or O(n * m) for DP table

func numberOfPatterns(m int, n int) int {

}
```

Kotlin Solution:

```
class Solution {
fun numberOfPatterns(m: Int, n: Int): Int {

}
}
```

Swift Solution:

```
class Solution {
func numberOfPatterns(_ m: Int, _ n: Int) -> Int {

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Rust Solution:

```
// Problem: Android Unlock Patterns
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// Approach: Dynamic programming with memoization or tabulation
// Time Complexity: O(n * m) where n and m are problem dimensions
// Space Complexity: O(n) or O(n * m) for DP table

impl Solution {
pub fn number_of_patterns(m: i32, n: i32) -> i32 {

}
}
```

Ruby Solution:

```
# @param {Integer} m
# @param {Integer} n
# @return {Integer}
def number_of_patterns(m, n)

end
```

PHP Solution:

```
class Solution {

/**
* @param Integer $m
* @param Integer $n
* @return Integer
*/
function numberOfPatterns($m, $n) {
```

```
}
}
```

Dart Solution:

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class Solution {
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