Nested Repetition

for-statement

Brute force approach

Exercise

1. (Pythagorean Triples) A right triangle can have sides whose lengths are all integers. For example, 3 and 4 are two sides, and 5 is the hypotenuse. Write an application to display a table of Pythagorean triples for side1, side2, and hypotenuse, all no larger than 500.

Hint: since triangle (3, 4, 5) is equivalent to triangle (4, 3, 5), we may assume that side1 < side2 to eliminate redundancy. (Can side1 = side2 if all edges are integers?)

Count the number of such triangles.

count	side 1	side 2	hypotenuse
1	3	4	5
2	5	12	13
3	6	8	10
4	7	24	25
4	8	15	17
…			

Exercise II

2. Given enough cents, nickels, dimes, and quarters, find out all possible ways to get one dollar (for example, 100 cents is one dollar, so is 20 nickels, and so on.)

Related question

Q1: With sufficient $2 and $5 bills, list all possible combinations to get $15.

A: # of $2 bills # of $5 bills

5	1
0	3

Five(5) two dollar bills and one(1) five dollar bills adds up to $15.

Related question: II

Q2: Can Alice get $11 by selling two kinds of cookies: $4 and $5 per box?

Answer: NO.

- None of $4 cookies sold.
- One box of $4 cookies sold.
- Two boxes of $4 cookies sold.
- Need to consider three or more boxes of cookies?

Connection between Q1 and Q2

Q1: With sufficient $2 and $5 bills, list all possible combinations to get $15.

x: number of $2 bills

y: number of $5 bills

What is min and max value of x?

What is min and max value of y?

min=0
max = 15/2 = 7

min=0
max = 15/5 = 3

Find all integer pairs (x, y) so that 2x + 5y = 15,

where x in [0, 7] and y in [0, 3]

Connection between Q1 and Q2: II

Q2: Can Alice get $11 by selling two kinds of cookies: $4 and $5 per box?

x: number of $4 cookies

y: number of $5 cookies

What is min and max value of x?

What is min and max value of y?

min=0
max = 11/4 = 2

min=0
max = 11/5 = 2

Find all integer pairs (x, y) so that $4x + 5y = 11$,

where x in [0, 2] and y in [0, 2]

Get all possible integer pairs in a range

Rephrase Q1: Get all integer pairs (x, y), where x in [0, 7] and y in [0, 3], such that 2x + 5y = 15.

```
int x, y;

x = 0;
        y = 0;
        y = 1;
        y = 2;
        y = 3;
```

(to be continued)

Get all possible integer pairs in a range

Get all integer pairs (x, y), where x in [0, 7] and y in [0, 3].

x = 1;

y = 0;

y = 1;

y = 2;

y = 3;

…

(to be continued)

Get all possible integer pairs in a range

How to get all possible integer pairs (x, y) where x in [0, 7] and y in [0, 3]?

x = 7;

y = 0;

y = 1;

y = 2;

y = 3;

Get all possible integer pairs in a range

Get all integer pairs (x, y), where x in [0, 7] and y in [0, 3], such that 2x + 5y = 15.

x = 0;

y = 0; y = 1; y = 2; y = 3;

x = 1;

y = 0; y = 1; y = 2; y = 3;

....

x = 7;

y = 0; y = 1; y = 2; y = 3;

x \ y	0	1	2	3
0	(0, 0)	(0, 1)	(0, 2)	(0, 3) √
1	(1, 0)	(1, 1)	(1, 2)	(1, 3)
…				
5	(5, 0)	(5, 1) √	(5, 2)	(5, 3)
6	(6, 0)	(6, 1)	(6, 2)	(6, 3)
7	(7, 0)	(7, 1)	(7, 3)	(7, 3)

Get all possible integer pairs in a range

Get all integer pairs (x, y), where x in [0, 7] and y in [0, 3], such that 2x + 5y = 15.

```
x = 0;
    for (int y = 0; y < 4; y++) …
x = 1;
    for (int y = 0; y < 4; y++) …
….
x = 7;
    for (int y = 0; y < 4; y++) …
```

x \ y	0	1	2	3
0	(0, 0)	(0, 1)	(0, 2)	(0, 3) √
1	(1, 0)	(1, 1)	(1, 2)	(1, 3)
…				
5	(5, 0)	(5, 1) √	(5, 2)	(5, 3)
6	(6, 0)	(6, 1)	(6, 2)	(6, 3)
7	(7, 0)	(7, 1)	(7, 3)	(7, 3)

Get all possible integer pairs in a range

Get all integer pairs (x, y), where x in [0, 7] and y in [0, 3], such that 2x + 5y = 15.

```
for (int x = 0; x <= 15/2; x++)
    for (int y = 0; y <= 15/5; y++
        //check whether x & y
        //satisfy 2x + 5y = 15
        //or not.
    }
```

x \ y	0	1	2	3
0	(0, 0)	(0, 1)	(0, 2)	(0, 3) √
1	(1, 0)	(1, 1)	(1, 2)	(1, 3)
…				
5	(5, 0)	(5, 1) √	(5, 2)	(5, 3)
6	(6, 0)	(6, 1)	(6, 2)	(6, 3)
7	(7, 0)	(7, 1)	(7, 3)	(7, 3)