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Breaking a Stick to form a Pentagon with Positive Integers using Programming Language Python

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Abstract -*In this paper, using a computer programming language Python, we determine the number of pentagons that can be formed by using a stick of given length say n units, n being a positive integer greater than 5.*

Key Words: Pentagon, Triangle inequality, Polygon, inequality condition, python.

1.INTRODUCTION

In [1,2] we formed a triangle and quadrilateral through breaking a stick using C programming language. In this paper, by using Python language we form all possible pentagons with positive integers through braking stick, for any such n. For example, suppose we take a stick of length 12 units and cut this stick at four places to form 5 parts of the stick. Let a, b, c, d, e be the lengths of the five parts of the stick and assume that a, b, c, d, e are positive integers. Hence we have the basic relation a + b + c+ d + e = n. Here number n is given but a, b, c, d, e are variable numbers.For formation of a pentagon having side lengths a, b, c, d, e we need to see that the condition a + b + c + d > e and e is the largest side length compare to others i.e, the sum of the remaining side lengths is greater than the largest side length. Here (a, b, c, d, e) = (b, c, d, e, a) = (c, d, e, a, b)=(d, e, a, b, c)=(e, a, b, c, d).

This process is very difficult if the numbers of our selection are considerably large. Now our aim is to form a Pentagon with Positive Integers using Python language

2. MAIN RESULT

2.1Algorithm

function generate(n)

1. set n by incrementing by 1
2. for each number a in range of 1 to n,
3. for each number b in range of 1 to n,
4. for each number c in range of 1 to n,
5. for each number d in range of 1 to n,
6. for each number e in range of 1 to n
7. call check(a,b,c,d,e)

function check(a,b,c,d,e)

1. if sum of a,b,c,d is greater than e and e is greater than a,b,c,d and sum of a,b,c,d,e=n
2. create a element in list l i = (a, b, c, d, e) by sorting
3. append the element to list l

function get distinct(original list)

1. for each element in original list
2. if element is not there in distinct list:
3. append element to distinct list

function main()

1. initialize an empty list l
2. initialize an empty list distinct list
3. get a number n stored in n
4. print Combinations which form a pentagon are:
5. call generate(n)
6. call get distinct(l)
7. print distinct list which is list of pentagonal sets
8. print Total number of pentagons: which is length of distinct list

2.2 Result Analysis

We are required to display all the combinations that follow the triangle inequality. This can be achieved with help of the following steps.

Step 1: Write all permutations in form of triads for a given integer.
Step 2: Eliminate equivalent permutations so that only the combinations remain.
Step 3: Display only the combinations that satisfy the triangle inequality.

The above procedure can be explained below :

For example,

- Consider a stick length 12.

- Let the combinations are (1, 1, 1, 4, 5), (1, 1, 2, 3, 5), (1, 1, 3, 3, 4), (1, 2, 2, 2, 5), (1, 2, 2, 3,4), (2, 2, 2, 2, 2).
- The total number of pentagons with stick length 12 are

We can represent this result in outputs.

2.2 Outputs

```
Enter an integer:12
Combinations which form a pentagon are:
[[1, 1, 1, 4, 5],
 [1, 1, 2, 3, 5],
 [1, 1, 3, 3, 4],
 [1, 2, 2, 2, 5],
 [1, 2, 2, 3, 4],
 [2, 2, 2, 2, 4]]
Total number of pentagons: 6
```

Fig-1: For an integer n=12

```
Enter an integer:13
Combinations which form a pentagon are:
[[1, 1, 1, 4, 6],
 [1, 1, 2, 3, 6],
 [1, 1, 2, 4, 5],
 [1, 1, 3, 3, 5],
 [1, 2, 2, 2, 6],
 [1, 2, 2, 3, 5],
 [1, 2, 3, 3, 4],
 [2, 2, 2, 2, 5],
 [2, 2, 2, 3, 4]]
Total number of pentagons: 9
```

Fig -2: For an integer n=13

Enter an integer:20
Combinations which form a pentagon are:

[[1, 1, 1, 8, 9],
[1, 1, 2, 7, 9],
[1, 1, 3, 6, 9],
[1, 1, 3, 7, 8],
[1, 1, 4, 5, 9],
[1, 1, 4, 6, 8],
[1, 1, 5, 5, 8],
[1, 1, 5, 6, 7],
[1, 2, 2, 6, 9],
[1, 2, 2, 7, 8],
[1, 2, 3, 5, 9],
[1, 2, 3, 6, 8],
[1, 2, 4, 4, 9],
[1, 2, 4, 5, 8],
[1, 2, 4, 6, 7],
[1, 2, 5, 5, 7],
[1, 3, 3, 4, 9],
[1, 3, 3, 5, 8],
[1, 3, 3, 6, 7],
[1, 3, 4, 4, 8],
[1, 3, 4, 5, 7],
[1, 3, 5, 5, 6],
[1, 4, 4, 4, 7],
[1, 4, 4, 5, 6],
[2, 2, 2, 5, 9],
[2, 2, 2, 6, 8],
[2, 2, 3, 4, 9],
[2, 2, 3, 5, 8],
[2, 2, 3, 6, 7],
[2, 2, 4, 4, 8],
[2, 2, 4, 5, 7],
[2, 2, 5, 5, 6],
[2, 3, 3, 3, 9],
[2, 3, 3, 4, 8],
[2, 3, 3, 5, 7],
[2, 3, 4, 4, 7],
[2, 3, 4, 5, 6],
[2, 4, 4, 4, 6],
[3, 3, 3, 3, 8],
[3, 3, 3, 4, 7],
[3, 3, 3, 5, 6],
[3, 3, 4, 4, 6],
[3, 4, 4, 4, 5]]
Total number of pentagons: 43

Fig -3: For an integer n=20

Enter an integer:10

Combinations which form a pentagon are:

[[1, 1, 1, 3, 4],
[1, 1, 2, 2, 4],
[1, 2, 2, 2, 3]]

Total number of pentagons: 3

Fig -4: For an integer n=10

```
Enter an integer:17
Combinations which form a pentagon are:
[[1, 1, 1, 6, 8],
 [1, 1, 2, 5, 8],
 [1, 1, 2, 6, 7],
 [1, 1, 3, 4, 8],
 [1, 1, 3, 5, 7],
 [1, 1, 4, 4, 7],
 [1, 1, 4, 5, 6],
 [1, 2, 2, 4, 8],
 [1, 2, 2, 5, 7],
 [1, 2, 3, 3, 8],
 [1, 2, 3, 4, 7],
 [1, 2, 3, 5, 6],
 [1, 2, 4, 4, 6],
 [1, 3, 3, 3, 7],
 [1, 3, 3, 4, 6],
 [1, 3, 4, 4, 5],
 [2, 2, 2, 3, 8],
 [2, 2, 2, 4, 7],
 [2, 2, 2, 5, 6],
 [2, 2, 3, 3, 7],
 [2, 2, 3, 4, 6],
 [2, 2, 4, 4, 5],
 [2, 3, 3, 3, 6],
 [2, 3, 3, 4, 5],
 [3, 3, 3, 3, 5]]
Total number of pentagons: 25
```

Fig -5: For an integer n=17

```
Enter an integer:14
Combinations which form a pentagon are:
[[1, 1, 1, 5, 6],
 [1, 1, 2, 4, 6],
 [1, 1, 3, 3, 6],
 [1, 1, 3, 4, 5],
 [1, 2, 2, 3, 6],
 [1, 2, 2, 4, 5],
 [1, 2, 3, 3, 5],
 [1, 3, 3, 3, 4],
 [2, 2, 2, 2, 6],
 [2, 2, 2, 3, 5],
 [2, 2, 3, 3, 4]]
Total number of pentagons: 11
```

Fig -6: an integer n=14

3. CONCLUSIONS

By using Python programming language, we can easily form a pentagon with positive integers, it becomes novel and easy process.

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