

Breaking a Stick to form a Nonagon with Positive Integers using Programming Language MATLAB

S.N.R.G. Bharat Iragavarapu ¹, Konathala Chetan ²

¹ Assistant Professor, Department of Mathematics

GVP College of Engineering (Autonomous), Visakhapatnam, AP, India

² B.Tech. Student, Department of Electronics and Communication Engineering

GVP College of Engineering (Autonomous), Visakhapatnam, AP, India

Abstract - In this paper, using a computer programming language, we determine the number of nonagons that can be formed by using a stick of given length say n units, n being a positive integer greater than 8.

Key Words: Nonagon, Triangle inequality, Polygon, inequality condition, Programming language

1. INTRODUCTION

In [1, 2, 3, 4, 5, 6] we formed a triangle, quadrilateral, pentagon, hexagon, heptagon, octagon through breaking a stick using programming language. In this paper, by using MATLAB we form all possible nonagons with positive integers through breaking stick, for any such n . For example, suppose we take a stick of length 12 units and cut this stick at 8 places to form 9 parts of the stick. Let $a, b, c, d, e, f, g, h, i$ be the lengths of the nine parts of the stick and assume that $a, b, c, d, e, f, g, h, i$ are positive integers. Hence we have the basic relation $a + b + c + d + e + f + g + h + i = n$. Here number n is given but $a, b, c, d, e, f, g, h, i$ are variable numbers. For formation of a nonagon having side lengths $a, b, c, d, e, f, g, h, i$ we need to see that the condition $a + b + c + d + e + f + g + h > i$ and h 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 $(a, b, c, d, e, f, g, h, i) = (b, c, d, e, f, g, h, i, a) = (c, d, e, f, g, h, i, a, b) = (d, e, f, g, h, i, a, b, c) = (e, f, g, h, i, a, b, c, d) = (f, g, h, i, a, b, c, d, e) = (g, h, i, a, b, c, d, e, f) = (h, a, b, c, d, e, f, g) = (i, h, a, b, c, d, e, f, g)$.

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

2. MAIN RESULT

2.1 Algorithm

Step 1: start
Step 2: Initialize $a, b, c, d, e, f, g, h, i, l$ all to zero
Step 3: read stick length value as n
Step 4: initialize for loop with $i < n$
Step 5 : if step 4 satisfies goto step 6 else goto step 32
Step 6: initialize for loop $h=1$ with $h < i$

Step 7: if step 6 satisfies goto step 8 else goto step 31
Step 8 : initialize for loop $g=1$ with $g < h$
Step 9 : if step 8 satisfies goto step 10 else goto step 30
Step 10 : initialize for loop $f=1$ with $f < g$
Step 11 : if step 10 satisfies goto step 12 else goto step 29
Step 12 : initialize for loop $e=1$ with $e < f$
Step 13 : if step 12 satisfies goto step 14 else goto step 28
Step 14 : initialize for loop $d=1$ with $d < e$
Step 15 : if step 14 satisfies goto step 16 else goto step 27
Step 16 : initialize for loop $c=1$ with $c < d$
Step 17 : if step 16 satisfies goto step 18 else goto step 26
Step 18 : initialize for loop $b=1$ with $b < c$
Step 19 : if step 18 satisfies goto step 20 else goto step 25
Step 20 : initialize for loop $a=1$ with $a < b$
Step 21 : if step 20 satisfies goto step 22 else goto step 24
Step 22 : if the condition $a + b + c + d + e + f + g + h > i$ and $a + b + c + d + e + f + g + h = n$ and $i > a$ and $i > b$ and $i > c$ and $i > d$ and $i > e$ and $i > f$ and $i > g$ and $i > h$ satisfies goto step 23 else goto step 20
Step 23 : print $a, b, c, d, e, f, g, h, i$ values as output and increment l value
Step 24 : increment a value by 1
Step 25 : increment b value by 1
Step 26 : increment c value by 1
Step 27 : increment d value by 1
Step 28 : increment e value by 1
Step 29 : increment f value by 1
Step 30 : increment g value by 1
Step 31 : increment h value by 1
Step 32 : increment i value by 1
Step 33 : print l value as number of nonagons
Step 34 : stop

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, 1, 1, 1, 2, 3), (1, 1, 1, 1, 1, 1, 1, 4).
- The total number of hexagons with stick length 12 are 2
We can represent this result in outputs..

2.2 Outputs

Enter stick length=12

```
1 1 1 1 1 1 2 3
1 1 1 1 1 1 1 4
```

Total number of nonagons is 2

Fig. 1 Stick length n=12

Enter stick length=15

```
1 1 1 1 2 2 2 2 3
1 1 1 1 1 2 2 2 4
1 1 1 1 1 1 2 3 4
1 1 1 1 1 1 2 2 5
1 1 1 1 1 1 1 3 5
1 1 1 1 1 1 1 2 6
1 1 1 1 1 1 1 1 7
```

Total number of nonagons is 7

Fig. 2 Stick length n=15

Enter stick length=17

```
1 1 2 2 2 2 2 2 3
1 1 1 2 2 2 2 2 4
1 1 1 1 2 2 2 3 4
1 1 1 1 1 2 3 3 4
1 1 1 1 2 2 2 2 5
1 1 1 1 1 2 2 3 5
1 1 1 1 1 1 3 3 5
1 1 1 1 1 1 2 4 5
1 1 1 1 1 2 2 2 6
1 1 1 1 1 1 2 3 6
1 1 1 1 1 1 1 4 6
1 1 1 1 1 1 2 2 7
1 1 1 1 1 1 1 3 7
1 1 1 1 1 1 1 2 8
```

Total number of nonagons is 14

Fig. 2 Stick length n=17

```

Enter stick length=20
 2  2  2  2  2  2  2  2  4
 1  2  2  2  2  2  2  3  4
 1  1  2  2  2  2  3  3  4
 1  1  1  2  2  3  3  3  4
 1  1  1  1  3  3  3  3  4
 1  2  2  2  2  2  2  2  5
 1  1  2  2  2  2  2  3  5
 1  1  1  2  2  2  3  3  5
 1  1  1  1  2  3  3  3  5
 1  1  1  2  2  2  2  4  5
 1  1  1  1  2  2  3  4  5
 1  1  1  1  1  3  3  4  5
 1  1  1  1  1  2  4  4  5
 1  1  2  2  2  2  2  2  6
 1  1  1  2  2  2  2  3  6

1  1  1  1  2  2  3  3  6
1  1  1  1  1  3  3  3  6
1  1  1  1  2  2  2  4  6
1  1  1  1  1  2  3  4  6
1  1  1  1  1  1  4  4  6
1  1  1  1  1  2  2  5  6
1  1  1  1  1  1  3  5  6
1  1  1  2  2  2  2  2  7
1  1  1  1  2  2  2  3  7
1  1  1  1  1  2  3  3  7
1  1  1  1  1  2  2  4  7
1  1  1  1  1  1  3  4  7
1  1  1  1  1  1  2  5  7
1  1  1  1  1  1  1  6  7
1  1  1  1  2  2  2  2  8
1  1  1  1  1  2  2  3  8

 1  1  1  1  1  1  3  3  8
 1  1  1  1  1  1  2  4  8

 1  1  1  1  1  1  1  5  8
 1  1  1  1  1  2  2  2  9
 1  1  1  1  1  1  2  3  9
 1  1  1  1  1  1  1  4  9

Total number of nonagons is 37
    
```

Fig -4: Stick length n=20

3. CONCLUSIONS

By using this program, we can easily find the number of nonagons that can be formed through breaking a stick using MATLAB. In future, we are planning to extend this idea to find number of n-sided polygons that can be formed through breaking a stick.

REFERENCES

[1] S.N.R.G.Bharat Iragavarapu, M.Anuraag Chandra Breaking a Stick to form a triangle, Journal of Computational Mathematics and Applied Mathematics, Volume 1, Issue 1, Mantech Publications, 2016.

[2] S.N.R.G.Bharat Iragavarapu, J. kushwanth, Formation of a Integer Quadrilateral through Breaking a Stick, International Journal of Innovative research and Advanced Studies, Volume 4, Issue 3, Pg 350-352, March 2017.

[3] S.N.R.G.Bharat Iragavarapu, Chandolu Somarjun, Breaking a Stick to form a Pentagon with Positive Integers using Programming Language Python, International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 8, Pg 95-97, Aug- 2017.

[4] S.N.R.G.Bharat Iragavarapu, Breaking a Stick to form a Hexagon with Positive Integers using Programming Language Python, International Journal of Scientific Research and Development (IJSRD), (Accepted for publication).

[5] S.N.R.G.Bharat Iragavarapu, Breaking a Stick to form a Heptagon with Positive Integers Journal of Journal of information technology and sciences, MAT journals. (Accepted for publication).

[6] S.N.R.G.Bharat Iragavarapu, vasudeva Rao, Breaking a Stick to form a Octagon with Positive Integers, International Journal for Research in Applied Science & Engineering Technology (IJRASET)(Accepted for publication).

BIOGRAPHIES



S.N.R.G.Bharat Iragavarapu (born April 25, 1990) is working as Assistant professor in the Department of Mathematics, GVP College of Engineering (A), Visakhapatnam, Andhra Pradesh, India. He completed his Masters degree in Mathematics from Andhra University in the year 2012 with 8.9

CGPA. (Secured university second). Worked as Junior research fellow in NBHM-DAE project during 2012-2015. Published 3 research papers in international journals. During this academic year 2016-17 there are 10 publications in national journals on the topic related to the present work.



Konathala Chetan is studying B.Tech. , Fourth year in the Department of Electronics and communication engineering, Gayatri College of Engineering (A), Visakhapatnam, Andhra Pradesh, India.