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Formation Of A Integer Quadrilateral Through Breaking A Stick

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***Abstract:** In this paper, using a computer programming language, we determine the number of integer quadrilaterals that can be formed by using a stick of a given length, say n units, n being a positive integer and also given sum of any two opposite angles less than 180.*

***Keywords:** quadrilateral, area of a quadrilateral.*

I. INTRODUCTION

Generally, one can form a quadrilateral by so many ways. In this paper, we form all possible quadrilaterals, for any such n [see 1,2]. First cut this stick at three places to form 4 parts of the stick. Let a, b, c, d be the lengths of the four parts of the stick and assume that a, b, c, d are positive integers. Hence we have the basic relation a + b + c + d = n. Here number n is given but a, b, c, d are variable numbers. For formation of a quadrilateral we need the angles and side lengths. In this paper by using the parts of the stick lengths and given sum of two opposite angles first we will find the area of a quadrilateral using Bretschneider's formula i.e

$$Area(A)=\sqrt{(s-a)(s-b)(s-c)(s-d)-abcd\cos^2\frac{\theta}{2}}$$

$$where\ \ s=\frac{a+b+c+d}{2}\ \ and\ \ \theta=\theta_1+\theta_2$$

Depending on the area we say that that which combination form a quadrilateral. If area is not found then that combination doesn't form a quadrilateral.

This process is very difficult if the numbers of our selection are considerably large. Now our aim is to find the integer quadrilateral using programming language.

II. MAIN RESULT

ALGORITHM

STEP-1: START.
STEP-2: Initialize i, j, k, l, m, x, s, ar, y.
STEP-3: Intialize a,q,w,e,r,ack,ack2,v to zero.
STEP-4: Display that to enter your stick length.
STEP-5: Read the integer n from the keyboard.
STEP-6: If v is less than 2 go to step-7 else go to step-33
STEP-7: Initialize i=1,q=1.
STEP-8: If q is less than n go to step-9 else go to step-28.
STEP-9: Intialize j=1,w=1.
STEP-10: If w is less than n go to step11 else go to step-27.
STEP-11: Intialize k=1,e=1.
STEP-12: If e is less than n go to step-13 else go to step-26.
STEP-13: Intialize l=1,r=1.
STEP-14: If r is less than n go to step-15 else go to step-25.
STEP-15: If q+w+r+e is equal to n then go to step-16 else go to step-25.
STEP-16: If q>=w and w>=e and e>=r then go to step-17 else go to step-25.
STEP-17: If v is equal to 0 the go to step-18 else go to step-19
STEP-18: Display the q, w, e, r values and increment the ack value.
STEP-19: If v is equal to 1 then go to step-20 else go to step-25
STEP-20: calculates=(i+j+k+l)/2,and x=cos(m*0.0174533).

STEP-21: calculate ar=(s-i)*(s-j)*(s-k)*(s-l)-(i*j*k*l*x*x).

STEP-22: If aris greater than 0 then go to step-23 else go to step-25

STEP-23: Display q,w,e,r values and display area=y and increment ack2.

STEP-24: Increment l and r value and go to step-14

STEP-25: Increment k and e value and go to step-12

STEP-26: Increment j and w value and go to step-10

STEP-27: Increment I and q value and go to step-8

STEP-28: Increment v value.

STEP-29: If v is equal to 1 go to step-30 else go to step-32.

STEP-30: Display total no. of combinations are asack value and display that to enter your angel.

STEP-31: Read m value from keyboard and and calculate m=m/2.

STEP-32: If m is greater than or equal to 180 then display that sum of the opposite angels must be less than 180 and go step 34. else go to step 32.

STEP-32: Go to step-6.

STEP-33: Display that In those combinations no. of quadrilaterals are as ack2 value.

STEP-34: END.

III. RESULT ANALYSIS

We have to break a stick into three places then we get four parts. Then write all possible combinations and to display those lengths. And we have to display the areas of the quadrilaterals formed by those combinations with a given sum of the opposite angels.

This can be achieved by the following steps.

STEP-1: Write all the possible combinations that can be obtained by breaking a stick.

STEP-2: Calculated the area of a quadrilateral which can be formed by those combinations with the given sum of opposite angels by Bretschneiders formula.

To illustrate how this work let us perform this process with a stick length of 8 and with sum of opposite angels is 145.

STEP 1: Write all the possible combinations that can be obtained by breaking a stick of length 8 into four parts.

(2, 2, 2, 2), (3, 2, 2, 1), (3, 3, 1, 1), (4, 2, 1, 1), (5,1,1,1)

STEP 2: Calculated the area of a quadrilateral which can be formed by those combinations with the given sum of opposite angels is 142.

(2, 2, 2, 2) area = 3.782075.
(3, 2, 2, 1) area = 3.275373
(3, 3, 1, 1) area = 2.836556

More examples are shown below.

IV. RESULTS

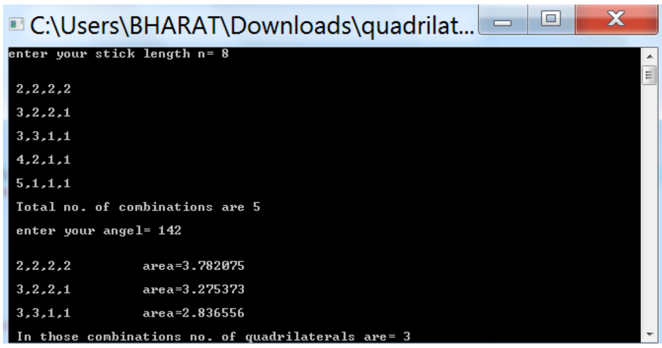

Figure 1: Formation of quadrilateral of given stick length n=8

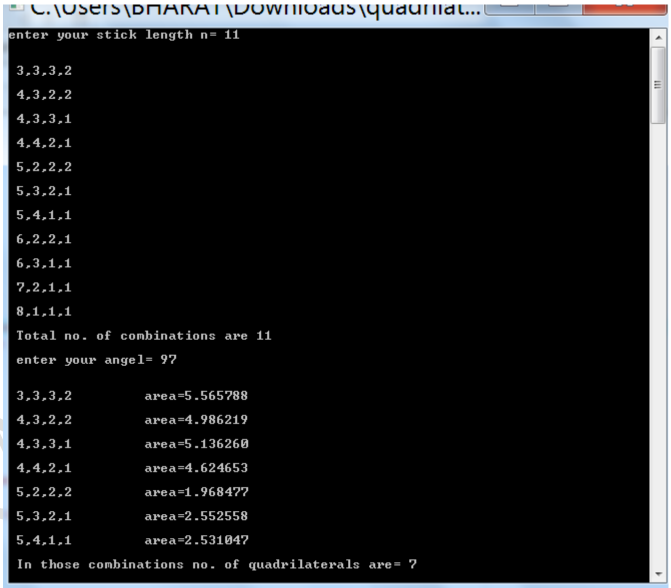

Figure 2: Formation of quadrilateral of given stick length n=11

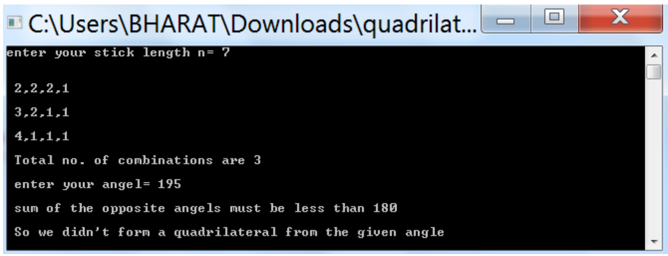

Figure 3: Formation of quadrilateral of given stick length n=7

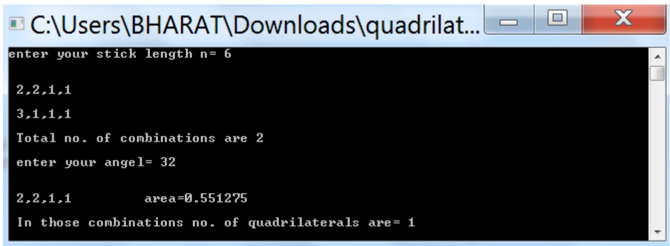

Figure 4: Formation of quadrilateral of given stick length n=6

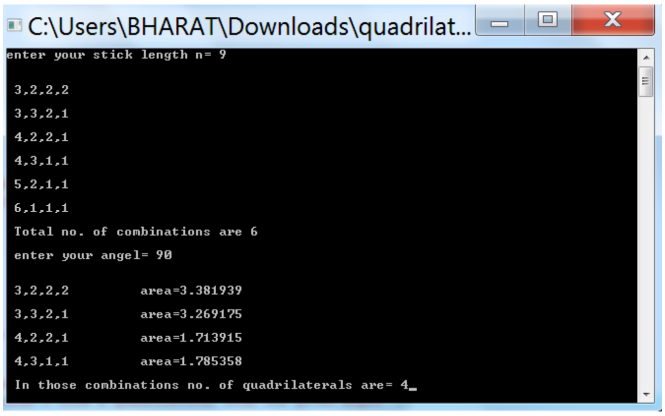

Figure 5: Formation of quadrilateral of given stick length n=9

V. CONCLUSION

Using C-language, the process of finding integer quadrilaterals for given stick length is becomes very easy.

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REFERENCES

[1] The German mathematician Carl Anton Bretschneider discovered the formula in 1842. See the link https://en.wikipedia.org/wiki/Bretschneider's_formula.

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