

The Hexagon

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Abstract

We provide coordinates of a regular 6-gon

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1. Introduction

There are some general facts about a regular n -gon, see, but we have found only one website about a *regular 6-gon* or *hexagon*. There are approximate coordinates of a hexagon in the German wikipedia, see [1,2]. The exact values of a hexagon appear as a mystery. To our great surprise, we have found only one more information. It seems that the first who calculated the coordinates of a hexagon was the Indian Gopal Menon. See [3]. He yields formulas for a hexagon depending on a number a . Here are exact values if $a = 2$. It holds that

$$(-2, 0); (-1, +\sqrt{3}); (+1, +\sqrt{3}); (+2, 0); (+1, -\sqrt{3}); (-1, -\sqrt{3})$$

are coordinates for a horizontal hexagon, and

$$(0, +2); (+\sqrt{3}, +1); (+\sqrt{3}, -1); (0, -2); (-\sqrt{3}, -1); (-\sqrt{3}, +1)$$

are coordinates of an upright hexagon.

Proof. An easy calculation shows that in the horizontal 6-gon the six interior angles have 120 degrees. All edgelengths are 2. The proof is done. $\square$

We have made the coordinates as simple as possible. The calculation of the above coordinates without [3] would be easy, if one knows that a hexagon consists of six equilateral triangles. Now we make a conjecture about regular polygons.

2. Definition

A regular n -gon is a polygon with n vertices such that the edges have the same length, and all inner angles are equal.

3. Conjecture

Let $n > 2$ be a natural number, where n is not 4. It holds: An n -gon is regular if and only if all inner angles are equal.

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References

- [1] <https://math.stackexchange.com/q/117164>
- [2] <https://de.wikipedia.org/wiki/Sechseck>
- [3] <https://www.quora.com/How-can-you-find-the-coordinates-in-a-hexagon>

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