Surprises in math, and a recommendation for “The Number Devil”

Suppose you draw an altitude of a triangle as below. The altitude starts from one of the vertices of the triangle and ends at the edge opposite the vertex, forming a right angle with it.

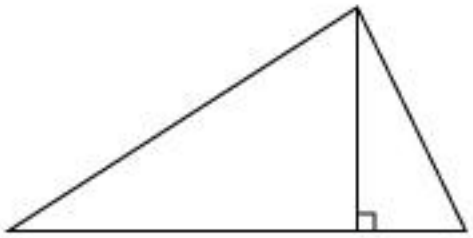

Fig. 1

Actually, there are three vertices and three edges in a triangle. Therefore, you can draw three different altitudes. Suppose you draw them as below.

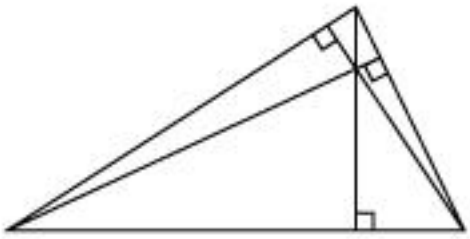

Fig. 2

Perhaps you are surprised to find that the three altitudes intersect at one point. Is this a coincidence? Curious, you try this with other triangles.

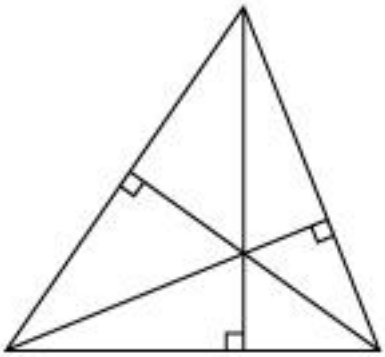

Fig. 3

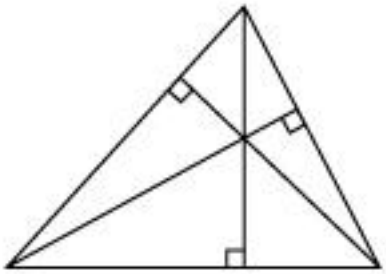

Fig. 4

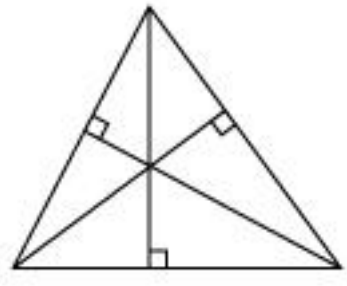

Fig. 5

More surprised, you find that all of the triangles you have drawn satisfy this property. Your interest thus aroused, you may wonder why all the triangles satisfy this property, and be motivated to learn the reason. It can in fact be proven that every possible triangle satisfies this property.[1]

For more like this, but at a more elementary level, I recommend “The Number Devil: A Mathematical Adventure” by Hans Magnus Enzensberger for elementary school or middle school students. It is full of surprising mathematical examples that motivate one to learn mathematics.

---

[1] In his autobiographical notes, Albert Einstein wrote:

[1]“At the age of 12 I experienced a second wonder of a totally different nature: in a little book dealing with Euclidean plane geometry, which came into my hands at the beginning of a schoolyear. Here were assertions, as for example the intersection of the three altitudes of a triangle in one point, which –though by no means evident- could nevertheless be proved with such certainty that any doubt appeared to be out of the question. This lucidity and certainty made an indescribable impression upon me.” –”Albert Einstein Philosopher-Scientist" by Paul Arthur Schilpp-