SUN YAT-SEN UNIVERSITY

中山大學数学学院

SCHOOL OF MATHEMATICS

A Puzzle of Triangle

Can you solve the challenging problem?

LI GUANYU

Mathematics and Applied Mathematics

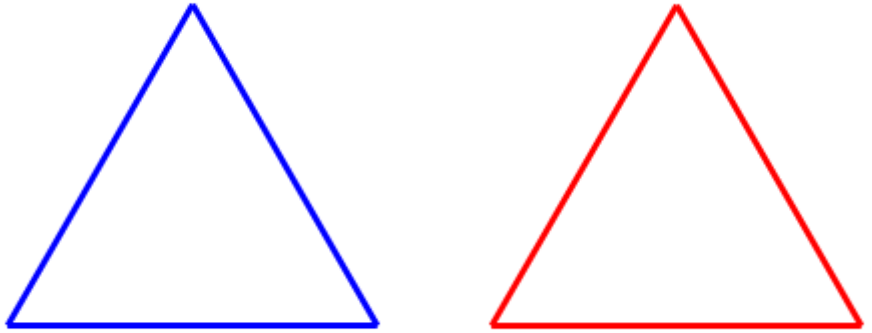
CONTENTS

PART ONE

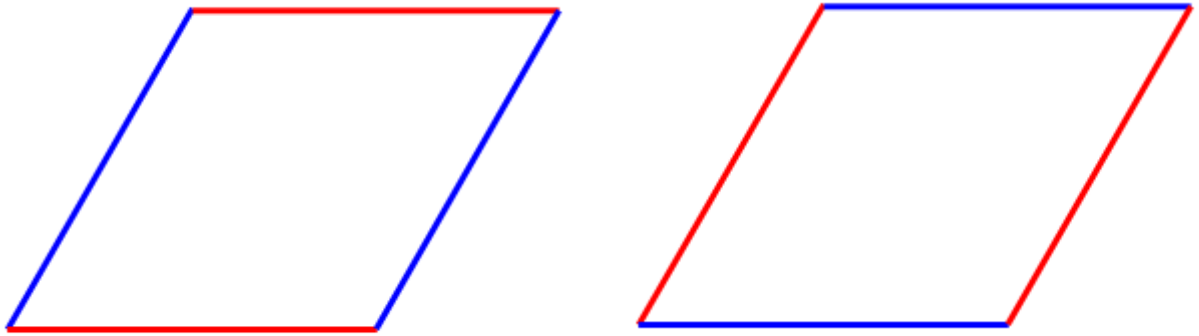
The Construction

Where do we start?

Triangles



Parallelogram

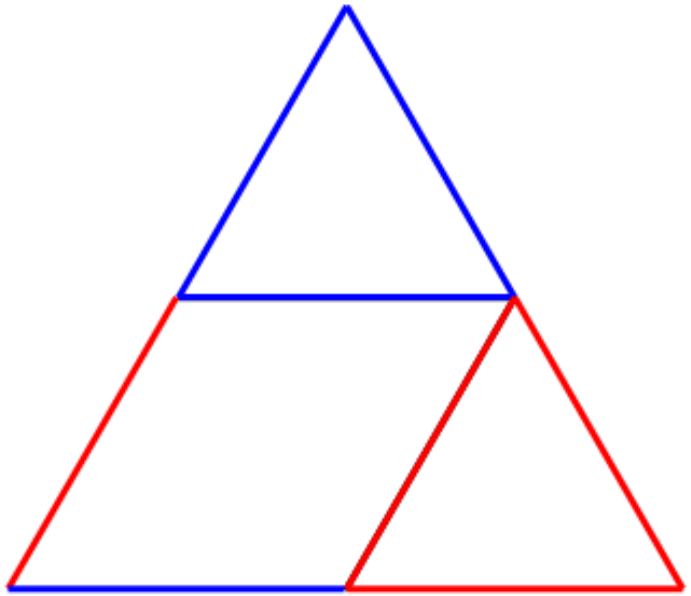


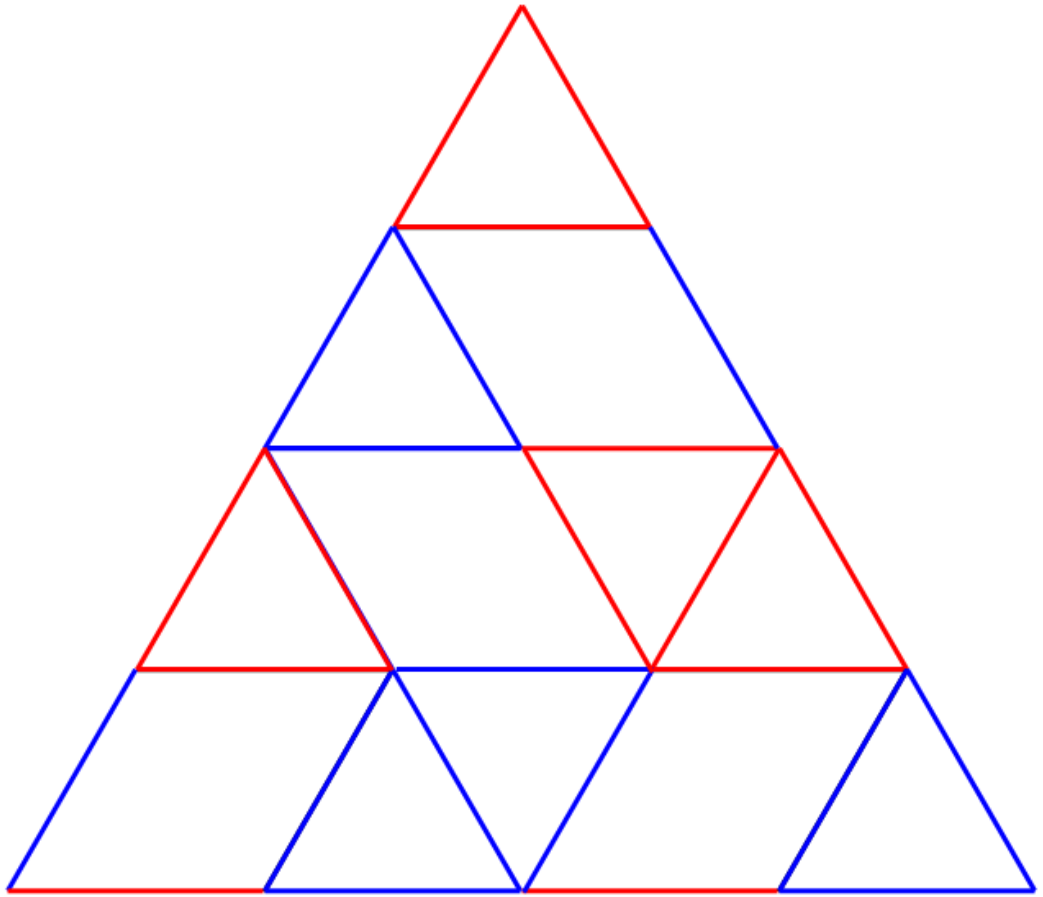
Rule of Gluing

Blue side can just be glued with another blue side, and so are the red sides.

Examples

Use these pieces of graphs to form a larger regular triangle.



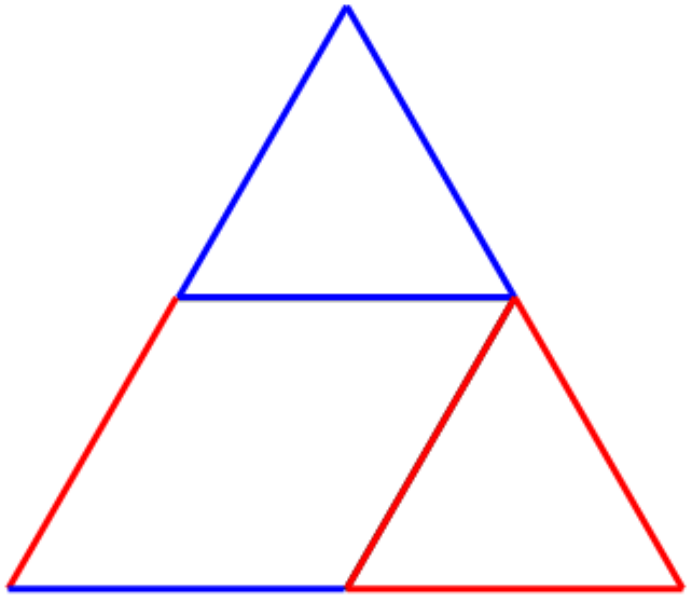


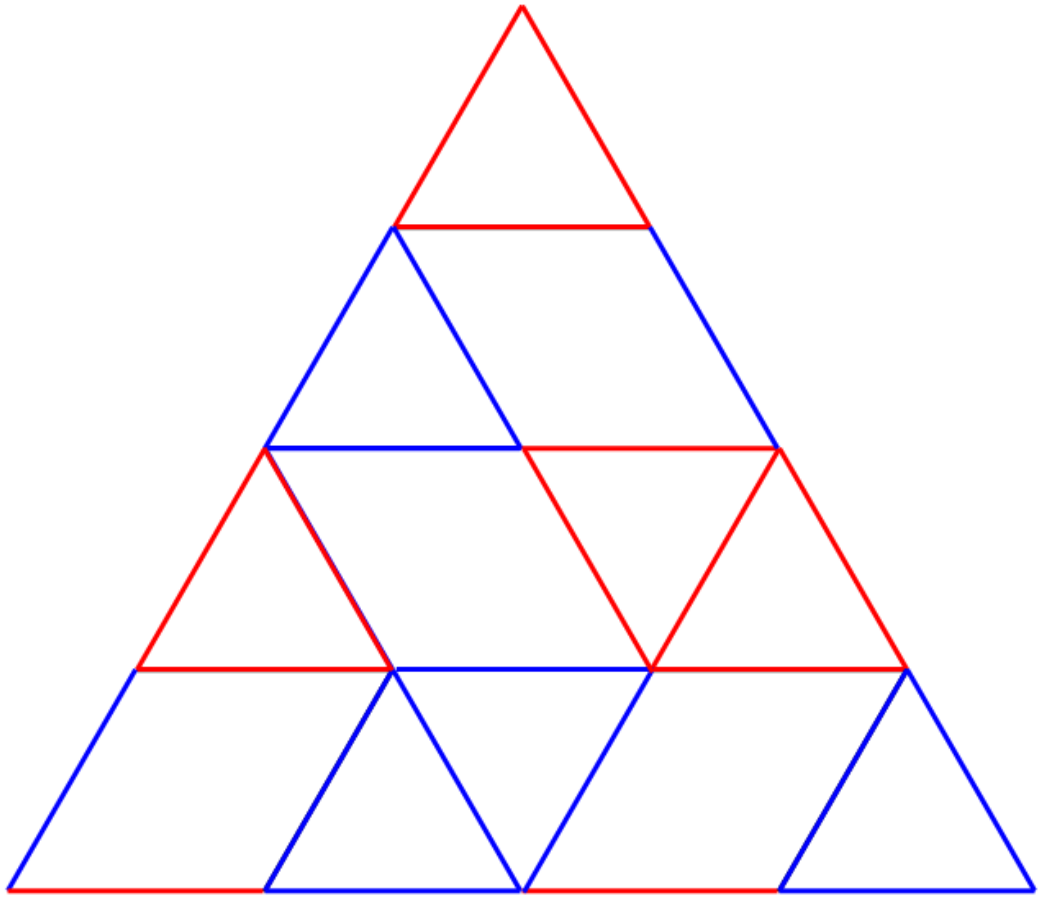
PART TWO

The Invariant

Counting

The number of red/blue pieces of each side of the larger triangle





Conclusion

SUM

The sum of numbers of blue and red pieces of each side equals.

The number of blue pieces of each side equals.

Blue

PART THREE

The Proof

A simple try

What causes the difficulties	How can we eliminate the barriers	The Core
The quadrangle makes the color changes.	Discussing the situations of quadrangle	From “local” to “global”

So what is the proof?

MAYBE we need something else to determine the color

Vectors

- Suppose we can attach a unit vector pointing out for each blue side.

Use better description

Observation

- All the small pieces have the sum of vectors 0 and the sum remains after gluing.

Translate the rule of gluing

PROOF

01 The color can be regarded as another mathematical objects.

02 The shapes and rules can be translated as equations.

03 The sum remains, so is the invariant.

PART FOUR

The Analogy

Analogy

01

Counter-example?

02

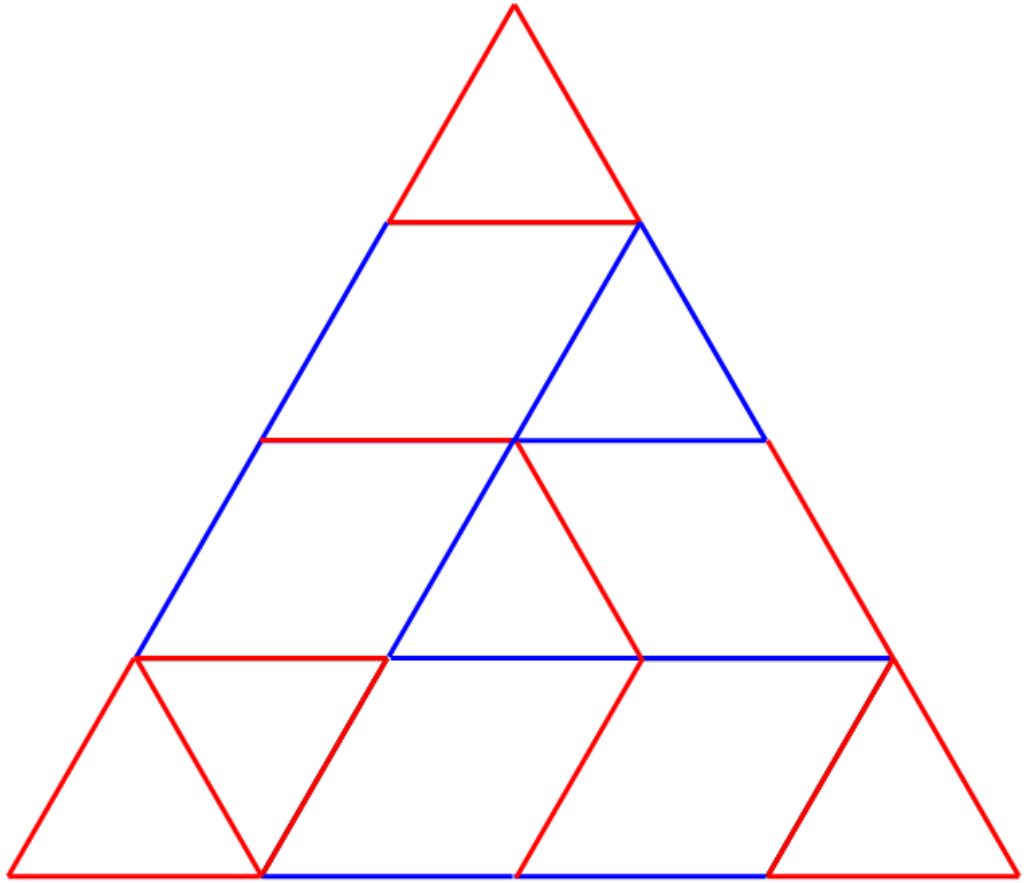
Cut off part of the triangle

03

Is there any similarity of this proof?

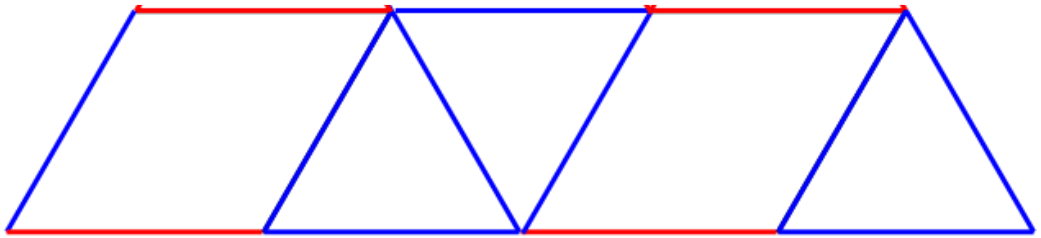
Counterexample

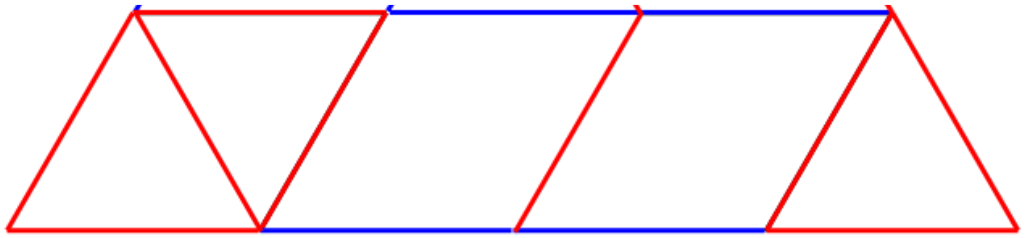
Why the statement fails to explain this regular triangle?



Cut off

How about we erase part of the triangle?





Emmmmm

Analogy of the proof? Construct the complement?

THANKS