Right-Equilateral Triangle?

Vanna said, "I can build a right equilateral triangle on my geoboard."

Pat said, "No way!"

Who was right and why? Support your conclusion mathematically.

Right–Equilateral Triangle?

Suggested Grade Span
Grades 3–5

Grade(s) in Which Task Was Piloted
Grade 5

Task
Vanna said, "I can build a right–equilateral triangle on my geoboard."

Pat said, "No way!"

Who was right and why? Support your conclusion mathematically.

Alternative Versions of Task

Modified Version:
Vanna said, "I can build 3 different triangles on my geoboard. I can build an isoceles triangle, an equilateral triangle, and a scalene triangle!"

Pat said, "No way!"

Who was right and why? Support your conclusion mathematically.

NCTM Content Standards and Evidence

Geometry Standard for Grades 3–5

Instructional programs from Pre–Kindergarten through grade 12 should enable students to...

- Analyze characteristics and properties of two– and three–dimensional geometric shapes and develop mathematical arguments about geometric relationships:
  - ***NCTM Evidence A:*** Identify, compare, and analyze attributes of two– and three–dimensional shapes and develop vocabulary to describe attributes.
  - ***Exemplars Task Specific Evidence A:*** This task requires students to identify attributes of right and equilateral triangles and to compare and contrast them.
  - ***NCTM Evidence B:*** Make and test conjectures about geometric properties and relationships and develop logical arguments to justify conclusions.
  - ***Exemplars Task Specific Evidence B:*** This task requires students to develop an argument about the feasibility of making a right–equilateral triangle.

Time/Context/Qualifiers/Tip(s) From Piloting Teacher

This is a short length task. The teacher who piloted this task provided a geoboard and about 5 rubber bands to each student.

Links

Literature Link: *The Greedy Triangle*, by Marilyn Burns would complement this task nicely!

Technology Link: If you go to http://standards.nctm.org/document/examples/index.htm you can also find a electronic example of an activity that would complement this task called *Exploring Properties of Rectangles and Parallelograms Using Dynamic Software.*

Common Strategies Used to Solve This Task

Most students in the class that piloted this task called on their prior knowledge of triangles to find a solution. Other students may need to act–out the task on geoboards.

Possible Solutions

Original Version: The correct response ideally should refer to both the sides and angles of the triangle. Equilateral triangles have all acute angles, and no right angles. A right triangle has one longer side, so all sides cannot be equal. Therefore Pat is correct.

Modified Task:

You can build all three types of triangles on a geoboard.

Task Specific Assessment Notes

General Notes: Most students in the class that piloted this task relied more on their knowledge of triangles than on experimentation on geoboards. Results will vary depending on knowledge of triangles students bring to the task.

Novice: The novice will show no evidence of understanding the characteristics of equilateral nor right triangles.

Apprentice: The apprentice will show some understanding of the characteristics of equilateral and right triangles, but not complete understanding, leading to an incorrect or incomplete solution.

Practitioner: The practitioner will show complete understanding of the characteristics of equilateral and right triangles, achieving a correct solution.

Expert: Precise and appropriate math terminology will be relied on to communicate the correct solution to the task, demonstrating a command in understanding the similarities and differences between equilateral and right triangles.

Author

Margo Palmer was born in Ohio and educated in Massachusetts. She started teaching in Georgia in 1970.

Novice

Warm up

1) Vanna says she can put a right equalateral triangle on her geobaord. Pat says "No way" Who's right and why?
Yes? because you could start off with a 90° angle and add another 45° to make it a right equalateral triangle.

This is a novice response because there is no math between the last statement and the drawing.

There is also no understanding of the term "equilateral" requiring equal sides and equal angles.

Apprentice

Q: Vanna says she can put a right triangle on her geoboard. Pat says "No way" Who's right? Why? Vanna is right.

A because if you do it on the triangle side you can make an equilateral triangle w/ equal sides.

There is an incorrect solution with some understanding of the problem.

The strategy provided for putting an equilateral triangle on the "triangle side" of the geoboard works, however the writer seems to have overlooked the requirement for "right triangle."

The student does not understand part of the problem.

Practitioner

I think pat is right because if a triangle is equallateral triangle if will have all acute angles and no right angle. Then If an have a right triangle all sides arn't equal so no you cant.

Evidence is present of the student solidifying prior knowledge of triangles.

A mathematically adequate argument is constructed.

Structures are noted.

Presentation is methodical.

Formal language is used to communicate.

Expert

Pat is right because a equal ateral triangle has all of the same angels, and a aright triangle must have one right angle and the other two must be acute so the sum of the triangle would equal 180. So a equalateral triangle has to have all acute angles so therfore you could'nt have a right triangle. If you still thank you could well another reason you couldn't is that if you wanted to have a right equilateral triangle all three angles would have to be 90° angles and the sum of all three of the angels would equal over 180° and a triangle can only have 180° angels.

The end

The student analyzes the situation in mathematical terms.

Arguments are supported by mathematical properties of triangles.

A sense of audience and purpose is present through the student's comments.

Decision–making is justified and supported by the evidence.

Precise math language of geometry is used.