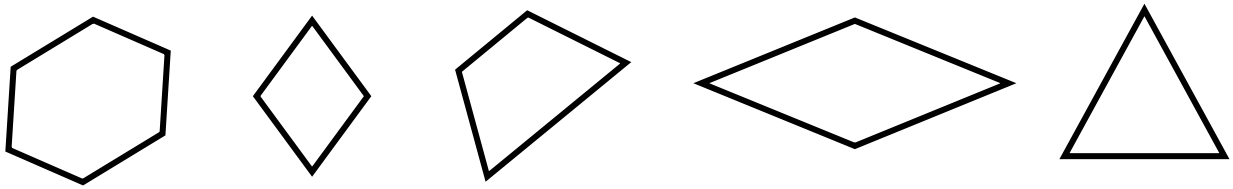
Teacher Instructions: Paleontologist

Grade Level: K - 2

Task: Paleontologist

Standard: Geometry, Spatial Sense, and Measurement

On a fossil dig, I recovered these items:



How could I put them in order?

Please be specific, show all your solutions, and explain how you solved the problem.

Context – From the Task Author: While studying dinosaurs, the students dug "fossils" of wooden dinosaur puzzle pieces that were embedded in sand. It was difficult for the students to organize, categorize, and order the pieces because of their irregular shapes. This task requires students to systematically categorize and order the pieces (of familiar objects-pattern blocks), based on specific attributes and criteria.

What the task accomplishes…

- This task allows children to use their logical thinking and problem solving skills to determine an order for the pattern blocks.
- Students have the opportunity to demonstrate their knowledge of attributes including size, length, shape, color, weight, etc.

What students will do…

- Most students will physically arrange the blocks on their paper, and trace the blocks using some form of order of size.
- The children will eagerly took for additional solutions and tried to find new ideas.
- Some will ask for rulers, and some may ask for balance scales.

Time Required: The task will take approximately 45 minutes.

Interdisciplinary Links: This task works well with a social studies unit on archeology, or a science unit on dinosaurs, rocks, shells, leaves, apples or anything that can be classified and ordered.

Teaching Tips…

- Set the stage for this activity with students. Talk about being a paleontologist and digging for fossils.
- Scientists often discover items that do not fit into neat classification, and must think of a way to put their objects in order.
- Talk about ways order is used in the classroom. Sometimes children line up in size order, while words are put in alphabetical order.
- Clarify the difference between putting in order and grouping.

- In this activity children need to think of different ways to put 5 pattern blocks in order. Instruct them that they will be faced with many choices, and must decide what to do. For example, what if two or more pieces are the same height? Which side is really the longest side?
- Encourage the child to explain how the problem was solved. If the child is able to express her/him self in writing, then the child is to do so independently, and the paper stands by itself. If the child is unable to write her/his own thinking, then the teacher (or other "scribe") must elicit the child's thinking without coaching.

Suggested Materials: Pattern blocks, Rulers, Scales, Crayons, Pencils, Paper, and Graph paper

Possible Solution…
This task is open-ended. There are many possible solutions.

Benchmark Descriptors:
- The benchmark descriptors and rubric are designed to help the teacher analyze student thinking and understanding at each of the four performance levels.
- The descriptors are generalizations of what student work could look like.
- It is not possible to anticipate every answer a student can give, so in scoring student work the teacher must use these generalizations to come to their own conclusions as to where a student is performing on the assessment.
- It is recommended that teachers create their own task specific rubric by listing the specific math skills that would make up each section of the four performance levels.

Novice
- ✓ A novice may draw the shapes in random order, and neglect to label them.
- ✓ The novice solution may be unclear, and mathematical reasoning may be lacking or incorrect.

Apprentice
- ✓ An apprentice solution may not be complete.
- ✓ The student may demonstrate some understanding of the problem, knowing that they need to find an order, but the solution may contain errors and demonstrate some incorrect reasoning for part of the problem.

Practitioner
- ✓ A practitioner's solution demonstrates understanding of the major concepts needed to order the pieces.
- ✓ The student uses effective reasoning that leads to a solution.
- ✓ The student attempts to communicate her/his reasoning, and begins to use basic terminology of geometry and measurement.

Expert
- ✓ An expert demonstrates deep understanding of the problem by obtaining multiple correct solutions.
- ✓ The student communicates her/his correct reasoning, and uses geometric and measurement terms to communicate.
- ✓ The student's work is well labeled, and it is clear how the student obtained her/his solution.

APS Mathematical Standards…

❖ **The math standards stated for this task are aligned to the APS Draft Standards 2000.**

Geometry, Spatial Sense, And Measurement: Learners will demonstrate an understanding of concepts, properties, and relationships of geometry and measurement through experiences with meaningful mathematical problems, while focusing on identifying, describing, classifying, visualizing, comparing, estimating, and measuring various aspects of shapes and sizes.

Kindergarten:

Geometry: Compare, classify, and arrange geometric shapes and begin to develop spatial sense.

- **Sort and match** shapes according to attributes.
- **Describe** geometric shapes.
- **Model, draw, and classify** geometric shapes and simple solids.
- **Identify** circles, squares, rectangles, and triangles using the proper mathematical terms.
- **Compare** size of plane geometric figures.

First Grade:

Geometry: Recognize, identify, describe, compare, and classify geometric shapes.

- **Observe, describe, identify, and compare** 2-D shapes (rectangles, circles, triangles, squares, hexagons).
- **Develop** vocabulary to describe 2-D shapes (e.g., square, circle, triangle, rectangle).
- **Sort and group** shapes according to common characteristics.
- **Recognize** geometry as a means of describing the physical world.

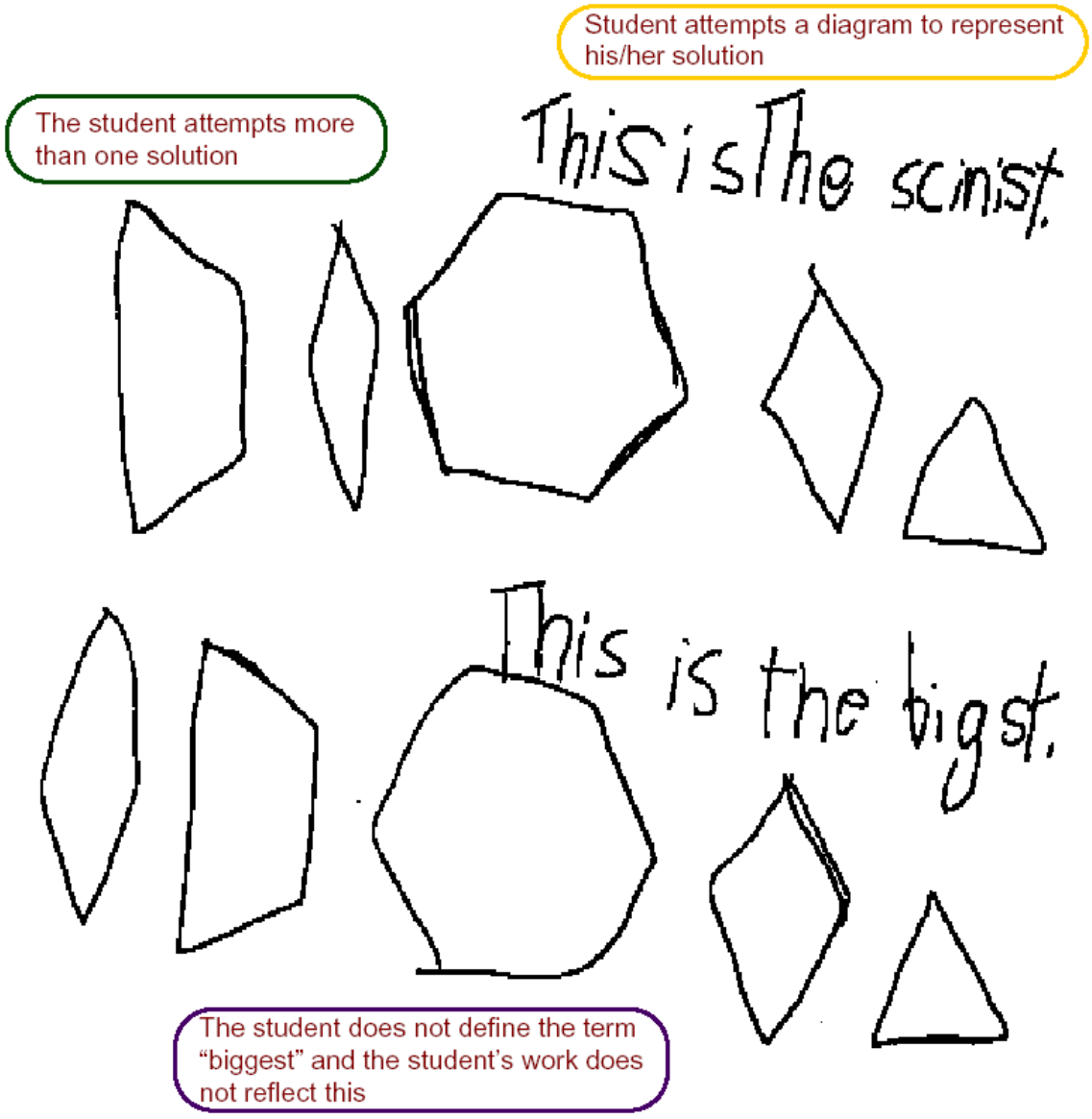
Second Grade:

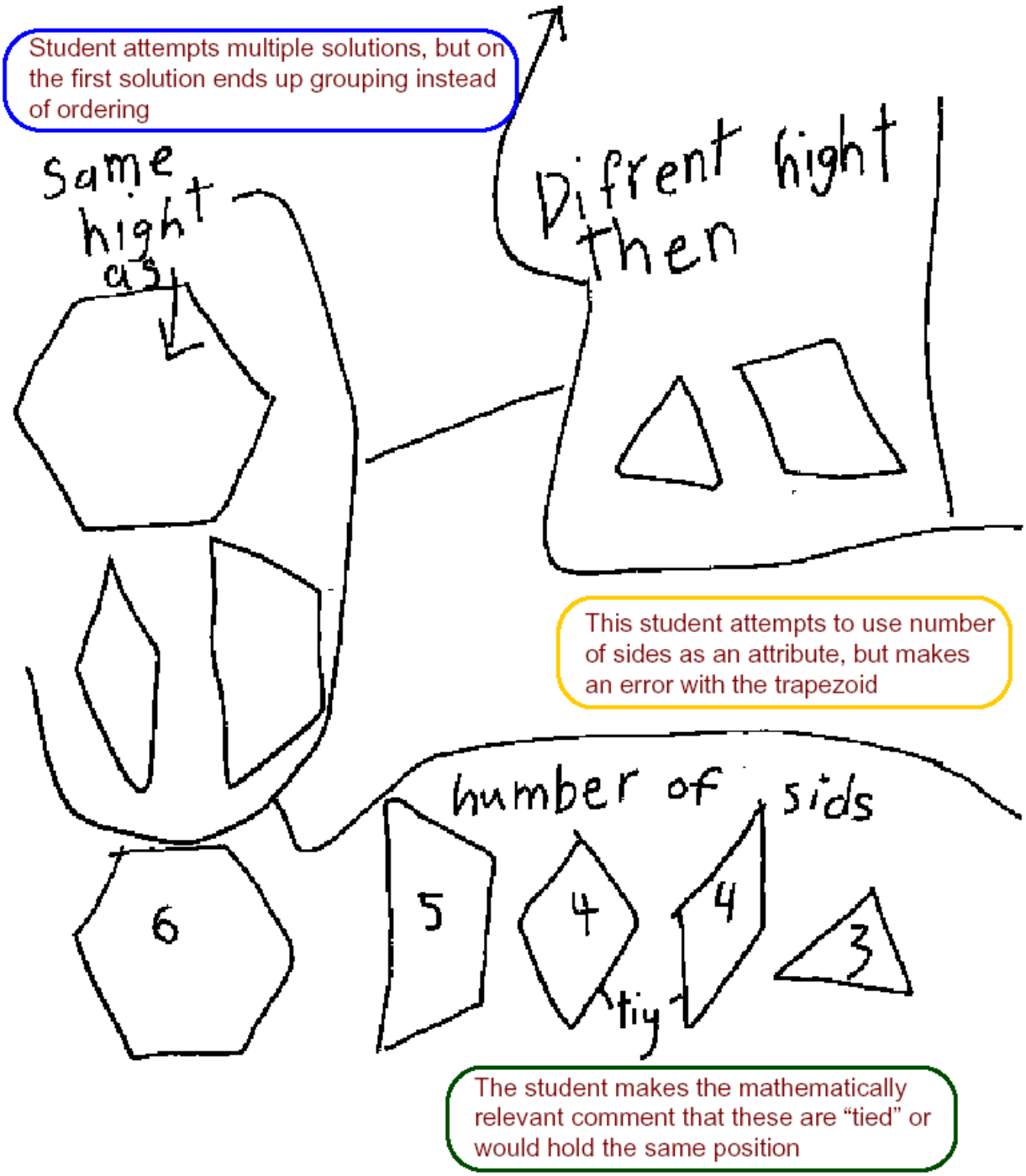
Geometry: Sort, describe, identify, and analyze geometric shapes and solids and begin to apply spatial sense.

- **Sort, describe, identify, and analyze** shapes and solids by various attributes.
- **Describe** spatial and numerical relationships found among shapes.
- **Develop and apply** definitions for circles, triangles, squares, and rectangles.
- **Recognize** geometry as a means of describing the physical world.
- **Explore** the concept of area using common geometric shapes.

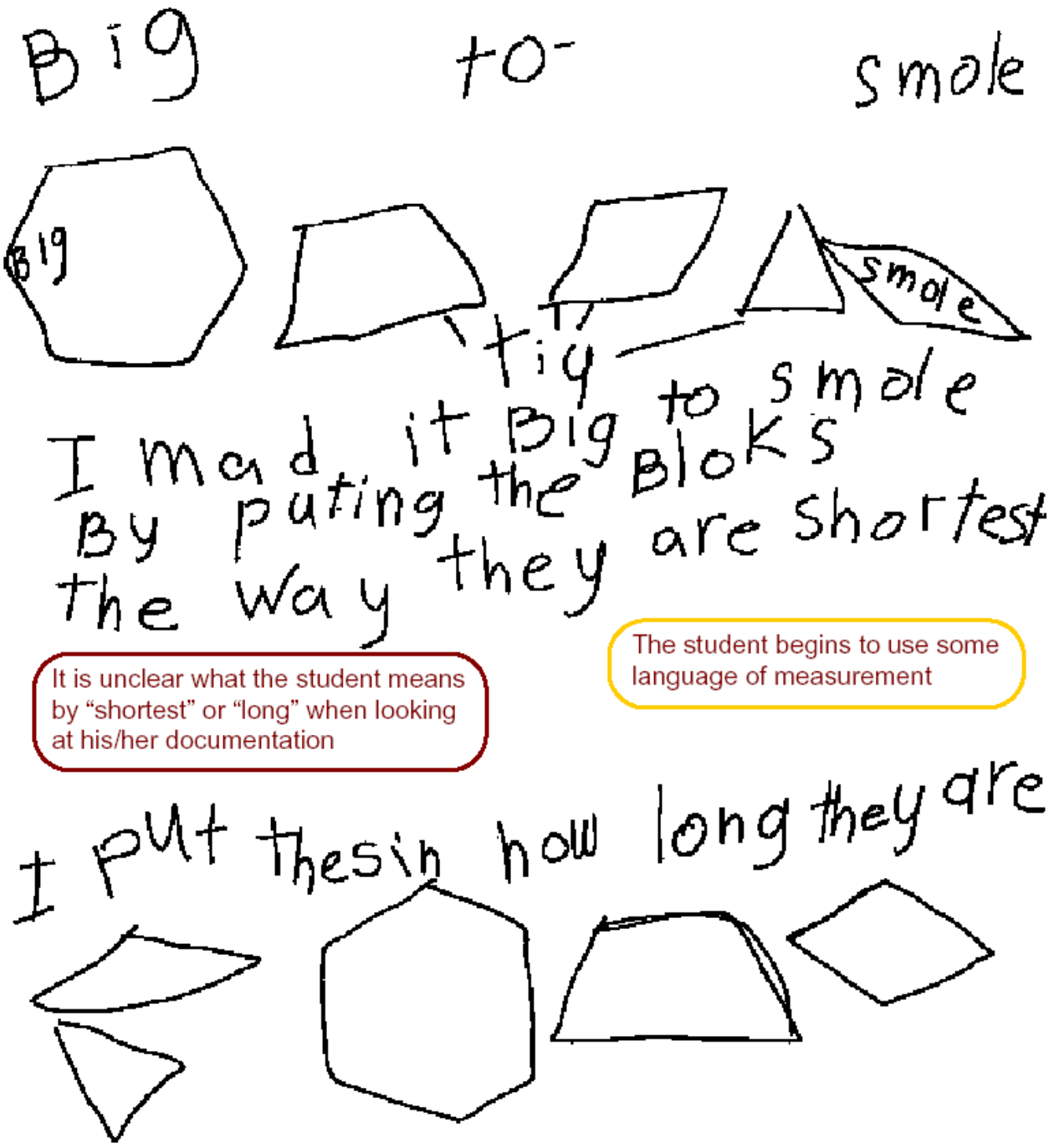
Benchmark Papers

NOVICE




Student attempts multiple solutions, but on the first solution ends up grouping instead of ordering
same hight as
Difrent hight then
This student attempts to use number of sides as an attribute, but makes an error with the trapezoid
humber of sids
6
5
4
4
3
tiy
The student makes the mathematically relevant comment that these are "tied" or would hold the same position

APPRENTICE

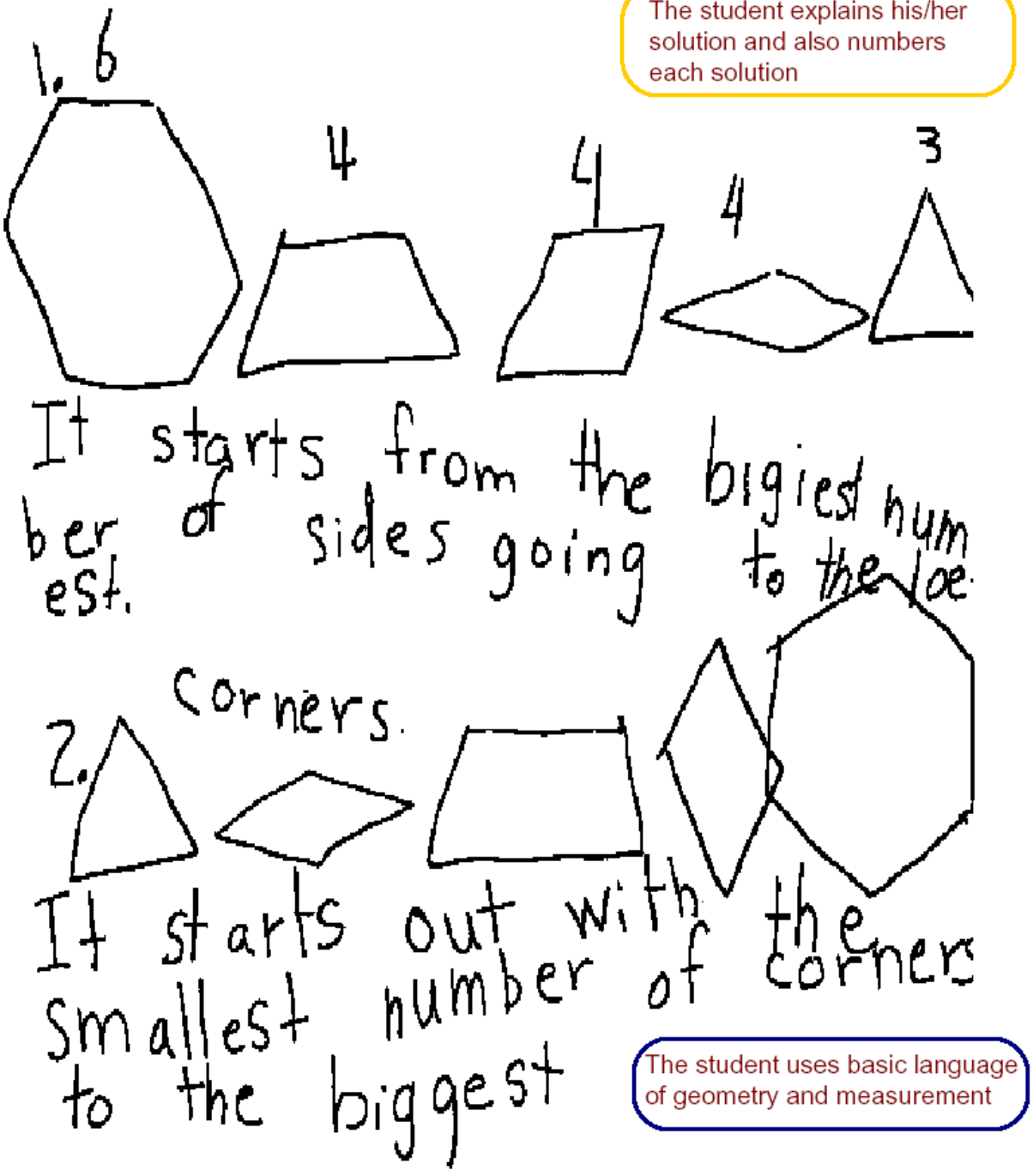


It is unclear what the student means by "shortest" or "long" when looking at his/her documentation

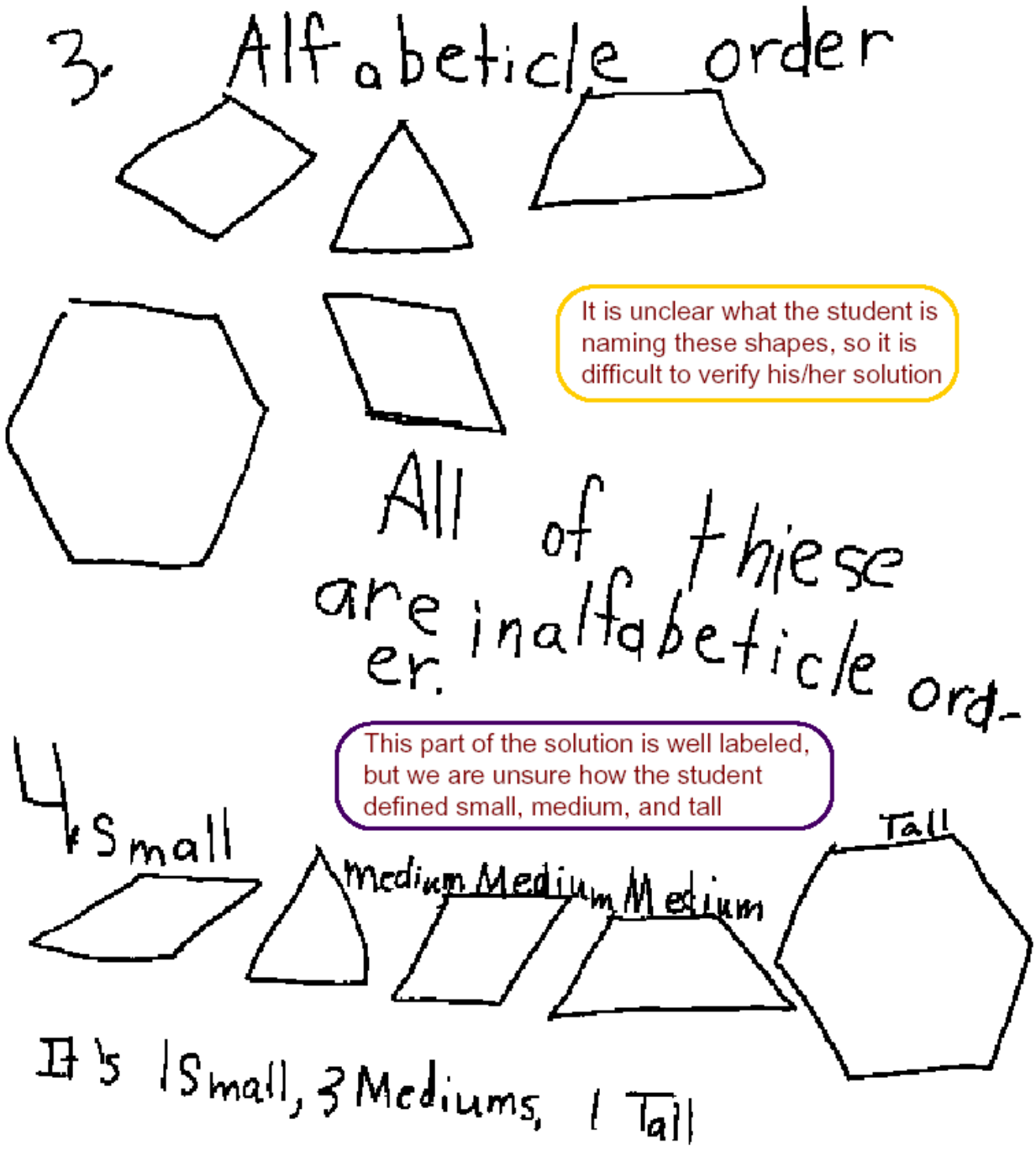
The student begins to use some language of measurement

PRACTITIONER

The student explains his/her solution and also numbers each solution



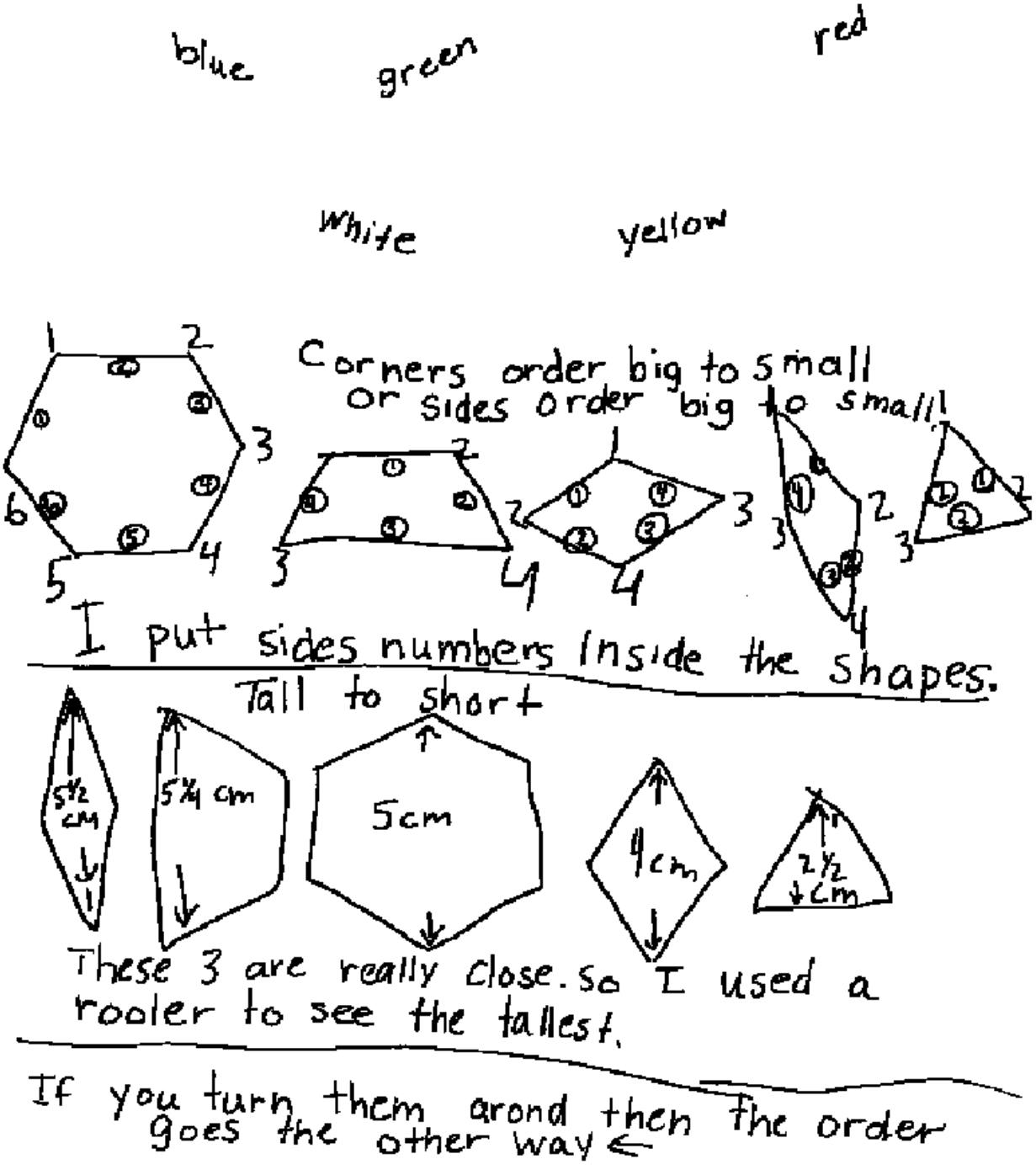
The student uses basic language of geometry and measurement



It is unclear what the student is naming these shapes, so it is difficult to verify his/her solution

This part of the solution is well labeled, but we are unsure how the student defined small, medium, and tall

EXPERT


blue
green
red
White
yellow
Corners order big to small
or sides order big to small
I put sides numbers inside the shapes.
Tall to short
5½ cm
5¼ cm
5cm
9cm
2½ cm
These 3 are really close. So I used a rooler to see the tallest.
If you turn them arond then the order goes the other way

EXPERT

Alphebatical Order for colors is

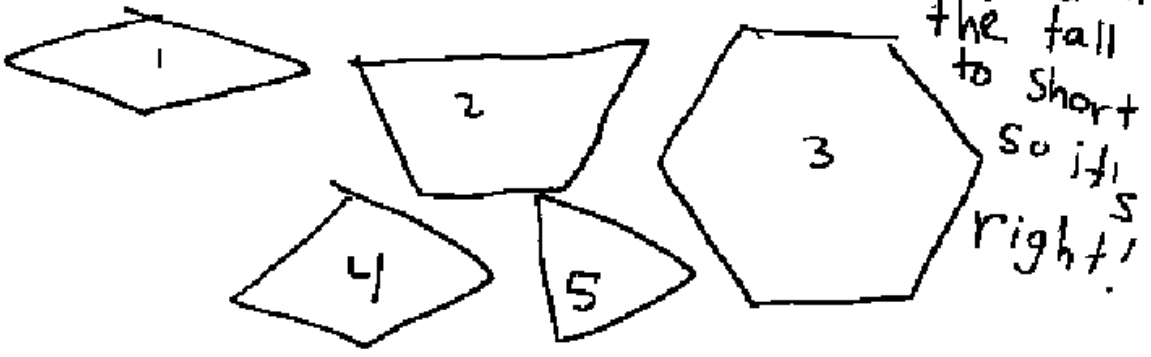
blue
green
red
white
yellow

(Look at the colors of the blocks on the front.)

Alphebatical by Shape name

dimend - dimend
hexigon
trapizoid (I think) -- the one that looks like 
triangol.

Wide to narro



I layd down the tall to short so it is right!