Tan Pattern Block Angles

Find the measure of the 2 different angles of the tan pattern block piece.

You may use the information you found out about the angles of the other pattern block pieces. Use precise mathematical language in your write up of your solution. Use diagrams to help explain your reasoning.

Grade Levels 6 - 8

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Context

This was used as a problem-solving assessment task after students studied central angles and other aspects of angles. They used the idea of central angles to find the measures of the angles of the hexagon, trapezoid, square and triangles. It was interesting to see which students were flexible in coming up with other strategies for finding the obtuse angle of the tan parallelogram. Using information recently learned is a valuable tool for students to practice. In this problem they will need to use the information about the measure of the other Pattern Block angles to find the measure of the obtuse angle of the tan parallelogram.

What This Task Accomplishes

This task can elicit a good deal of geometric language. It shows how flexible students can be in finding a strategy to solve a problem when a familiar strategy fails to work. This task connects much of what is studied in a beginning angle unit.

What the Student Will Do

The student will find that the idea of central angles is a viable strategy to find the measure of the acute angle of the tan parallelogram, but not for the obtuse angle. The student will need to use previously learned information about angles (and possibly the other pieces) to come up with a workable strategy.

Time Required for Task

45 minutes

Interdisciplinary Links

This unit on angles coordinated with a unit on light reflection in science. Students needed to be able to measure the angle of incidence and the angle of reflection as a light beam was reflected off a mirror. It also can be related to the skill needed in playing table pool or in designing a miniature golf course to see if a "hole in one" was possible.

Teaching Tips

Students will need to have had some experience with angles before they can attack this problem.

Suggested Materials

- Pattern blocks
- Blank paper
- Pencil

Possible Solutions

The acute angle measures 30 degrees (30 divides 360 evenly) and the obtuse angle measures 150 degrees (150 does not divide 360 evenly).

Benchmark Descriptors

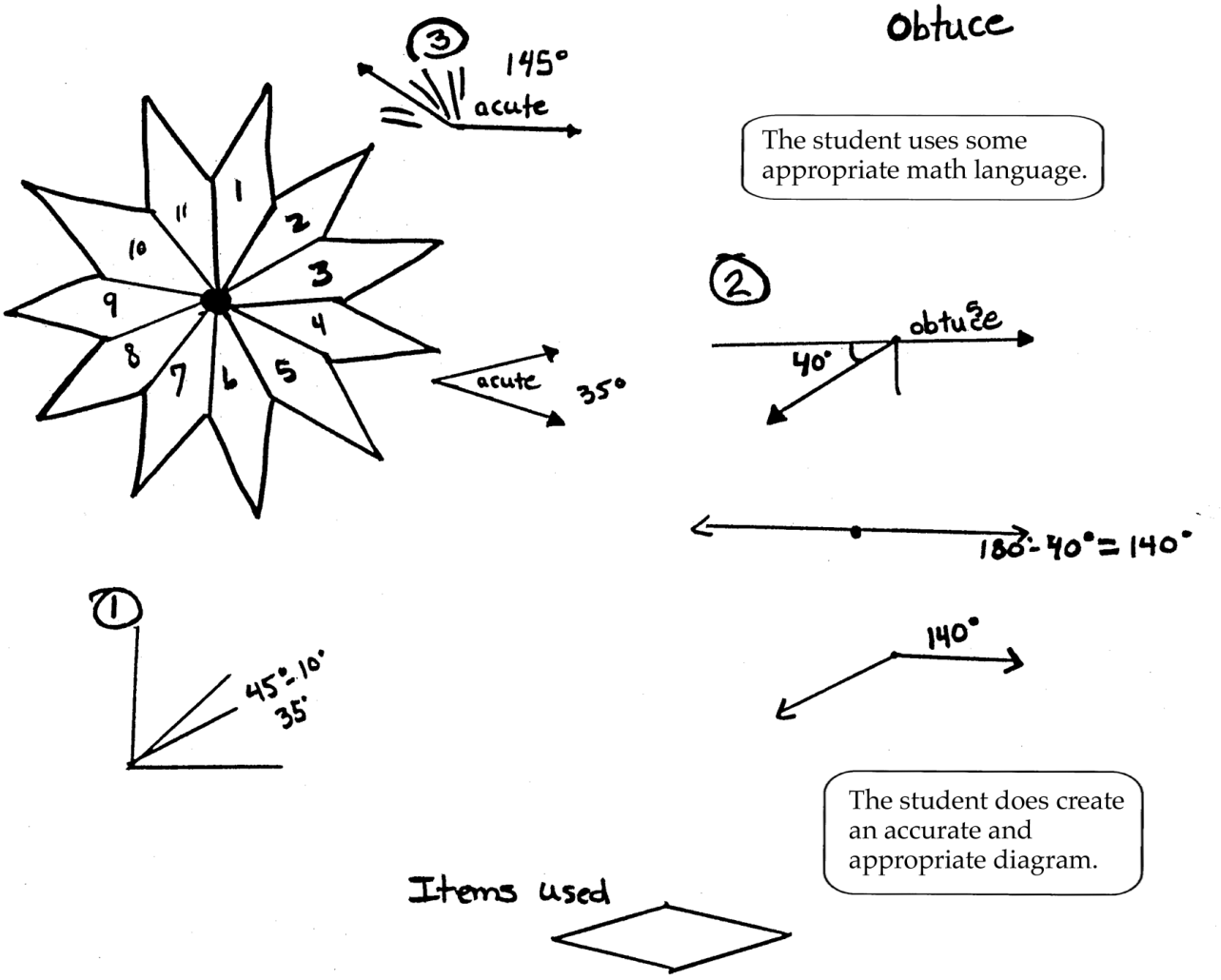
Novice
The student applied inappropriate concepts in solving the problem. The strategy of estimating the size of the angle from a 45-degree angle will not solve the problem. The student comes up with two measures for the obtuse angle and does not reconcile the two solutions.

Apprentice
The student solved part of the problem indicating that the other part of the problem was not understood. S/he has a strategy that is partially useful, leading to part of the solution, but not to a full solution of the problem. There is some evidence of mathematical reasoning. The solution is not clearly explained.

Practitioner
The solution shows the student has a broad understanding of angles. The strategy leads to a solution of the problem. His/her mathematical reasoning is effective. There is a clear explanation with appropriate mathematical terminology, notation and representation.

Expert
The student uses a strategy that connects the knowledge of supplementary angles to the solution. S/he also solves the problem two different ways to verify his/her solution. There is precise and appropriate use of mathematical terminology (except for "decahedron" and "divided 2 by 360") and notation.

Novice



The student uses some appropriate math language.

The student does create an accurate and appropriate diagram.

Novice

The student uses an estimate that will not work for solving the problem.

1- I got the answer 35° for because I took a 90° angle and divided it into half, that equals 45°, that was a little to big so I subtracted 10° and came up with 35°.

2- I got 140° because I made a 180° line and cut it in half to a 90° then I looked at the ray, it was a little less than half so it looked like a 40° add 100° because I cut it off before and its a 140° angle.

3- I got the answer 145° because I made a 180° and 90° then made lines that represented 10° each were the ray was it = 145°.

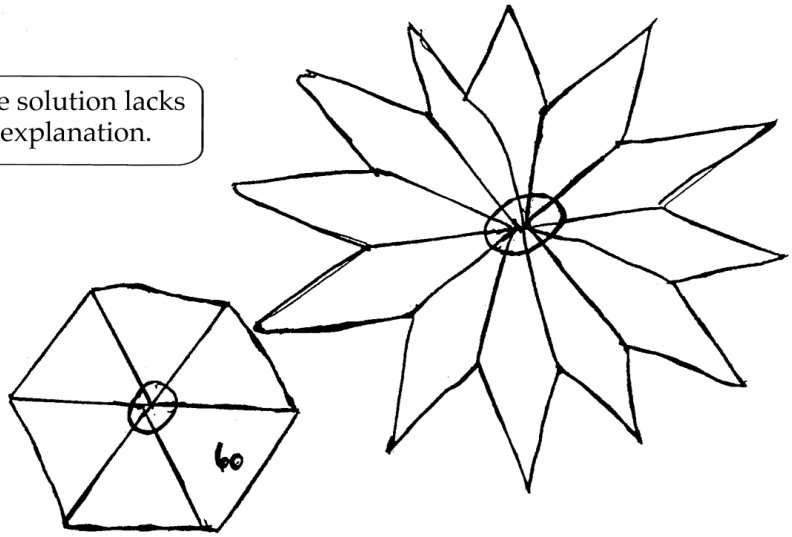
Apprentice

The student's use of math language is limited.

12
12
12
36

It is unclear if the student knows what the answer is.

The solution lacks an explanation.



30
12) 360
36
000

60
6) 360
36
000

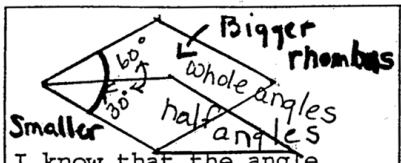
The student creates a diagram, which lacks labels.

Tan Pattern Block Angles

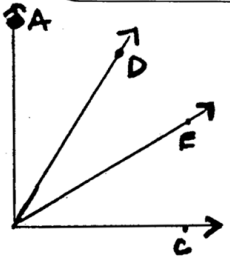
Practitioner

The student creates accurate and appropriate diagrams.

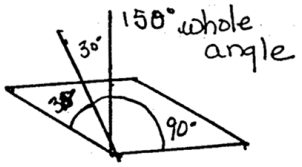
The student communicates reasoning and decision making precisely.



I know that the angle measurement of the acute angle in the blue rhombus I drew above is 60°, and the acute angle of the white rhombus takes up half of the 60° angle, so the white rhombus's acute angle is 30°. I knew that the blue rhombus's accute angle was 60° because I knew that if you put a shape into the mirror and count how many reflections there are (including the actual shape) and then divide 360° by that number.



I draw a 90° then drew the acute angle of the white rhombus into the 90° angle. I saw that 3 of the white rhombus's fit into a 90° angle. So I divide by 3 and got 30°.

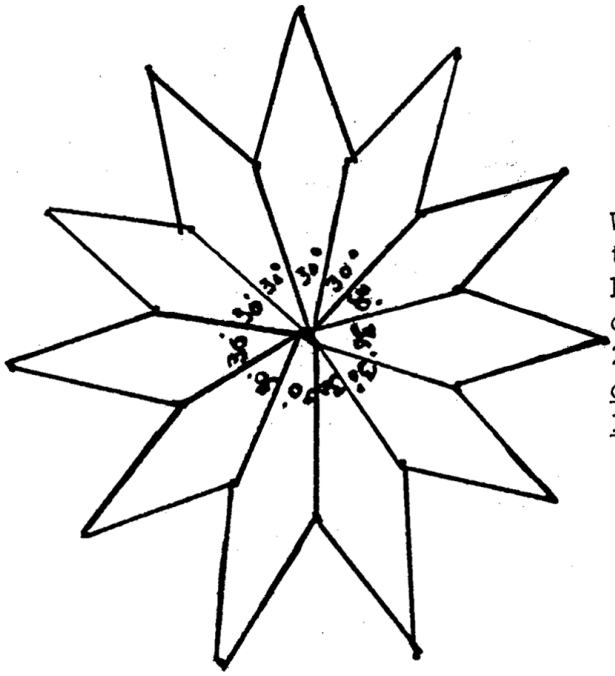


I drew the obtuse angle in the white rhombus. Then using the same vertex, I drew a 90° angle inside of it. Then I figured out how many of the white rhombus's acute angles could fit into the remaining space. Two acute angles fit in, and I know that they are 30°, so I added 90°, 30° and 30° and got 150°

I drew the obtuse angle of the white rhombus. Then I drew two triangles(which I know are 60° from the mirror strategy) into it. Then I saw that I could fit the acute angle of the white rhombus into it. I know the acute angle is 30°, so I added 60°, 60°, and 30° and got 150°

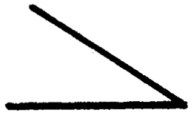
The student uses accurate and precise math language.

Expert



The student's approach is efficient and sophisticated.

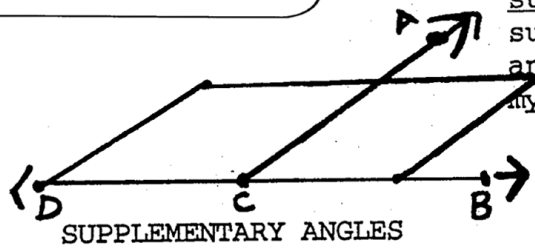
When I put the Rhombus to the mirror it <u>multiplied</u> by 12 and made a decahedron then I <u>divided</u> 2 by 360° the number of <u>degrees</u> in a circle <u>360°</u> ÷ <u>12</u> and I got <u>30°</u>.



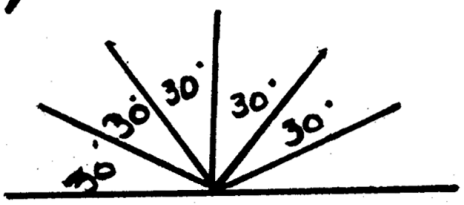
= 30° <u>ACUTE ANGLE</u>

The student creates labeled diagrams to communicate the solution.

Then I needed to find out the number of the degrees in the <u>obtuse</u> angle I knew that there were 180° in a <u>straight</u> angle so I subtracted 30° from 180° and got 150°. I checked my answer and I was right.



SUPPLEMENTARY ANGLES



ACB 30° ACUTE ANGLE

DCA 150° OBTUSE ANGLE

DCB 180° STRAIGHT ANGLE

30° X 5= 150°

The student uses accurate and precise math language to communicate.

= 150°