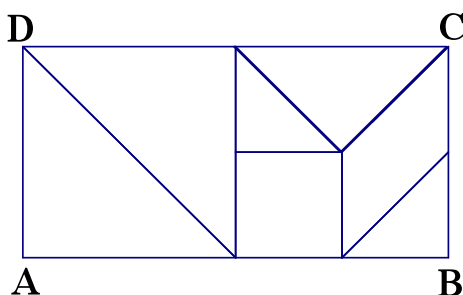# Comparing Area with Tangrams
Transcript from a 6th-Grade Classroom

The transcript below records the discussion held by four sixth grade students and their Teacher. This part of their discussion pertains to problem 1. b) from Comparing Area with Tangrams: "Describe a way to find the area of your rectangle without using a ruler." Prior to this discussion, the students had successfully completed the task of creating a non-square rectangle with seven tangram pieces. Their solution to 1. a) resembled the following diagram:

1   Teacher: So, how could you find the area? It says, "Describe a way to find the
2   area."
3   Marco You could count how many pieces are inside the object.
4   Teacher: So, what would you say the area of that is?
5   Marco: There's 5 pieces this way (traces along the length AB of the rectangle),
6   and then 3 pieces this way (traces along the width BC of the rectangle).
7   So 5 times 3.
8   ISABEL: 15.
9   Teacher: Does everybody agree with that? Do you think it's 15? Tell me again why
10   you think it's 15. Somebody repeat that and show me.
11 YUNENG: You count 1, 2, 3, 4, 5 (counts along the length AB of the rectangle),
12   times 1, 2, 3 (counts along the width BC)....unless it's only 1, 2 on this
13   side (counts along the width AD).
14 MARCO: It could be 10 or 15.
15 Teacher: It could be 10 or 15....so...go ahead.
16 YUNENG: This is on the inside (points to a shape in the interior of the rectangle),
17   so it wouldn't really count, so, it's only 10, right?
18 KARINA: Wait...there's only 2 on the side, so it should be 10.
19 MARCO: This is harder than I thought.
20 Teacher: What does area mean besides length times width? What does it tell me?
21 MARCO: It tells you about the inside.
22 Teacher: The inside? OK. It tells me how big the inside is. So...do you agree with
23   it? Is it 10? Is it 15? What is it?
24 MARCO: I think it's 7.
25 ISABEL: We can't really agree...we can't really know without measuring it
26   correctly. We could give a rough estimate...
27 Teacher: OK. What do you think your estimate would be?
28 ISABEL: It would be about 15 square inches.
29 Teacher: 15 square inches?
30 MARCO: Or, it could also be....like, since there's 7 shapes that we use, then, each
31   shape should be 1. So 1, 2....and then, if you count the sides, it makes
32   up...this one doesn't really count (points to the small tangram triangle
33   located in the middle of the rectangle)...so 1, 2, 3....so it will just be 5.
34 Teacher: Are you telling me that this shape, the triangle, does not count in area?
35 MARCO: It kind of does because the yellow point....every other shape has at least
36   a full part of it (traces the outer edge of the rectangle), but this one
37   (the small triangle in the middle of the rectangle) is more in the middle
38   than at the top.

39 Teacher: What did you tell me about....you told me two things about area. One,
40   you told me you find it by multiplying the length times the width. But
41   the other piece is that it's the measure of how much is inside.
42 MARCO: Well, there's 7 inside. You could also, probably, since there's 7 shapes
43   inside, you could multiply 7 times 2.
44 Teacher: Why would you multiply 7 times 2?
45 MARCO: Because there's 7 shapes in here...
46 KARINA: ....and 2 on the side....
47 MARCO: ...and then 2 on the side...2 or 3 on the side. If there's 3 on the side,
48   then that will make 21.
49 Teacher: So, if you count it that way, there's 21? So, if I took this shape out
50   (removes the medium-sized tangram triangle from the rectangle), how
51   much of the area of 21 am I removing? Are you telling me that this is
52   worth part of the 21?
53 KARINA: It's worth about 3....cause 21.
54 ISABEL: (Counting tangram pieces) 3, 6, 9, 12, 15, 18, 21
55 YUNENG: It will be 3 plus 3 plus 3 plus 3.....
56 MARCO: Yep...it's worth 3.
57 Teacher: It's worth 3. So this one's worth 3 (points to the medium-sized tangram
58   triangle), and the large triangle's worth 3, and the small triangle's also
59   worth 3?
60 All Students: Yes.
61 MARCO: Because, there's 7 shapes here. If you add 3 seven times, it's 21. And if
62   you add 7 three times, it's 21.
63 Teacher: So you're telling me each shape is worth 3. Each shape is three twenty-
64   firsts of the total area. Is that what you're saying?
65 KARINA: Yes.
66 Teacher: OK. So you're telling me that the large triangle is taking up as much
67   space as the small triangle?
68 YUNENG: Umm...yeah.