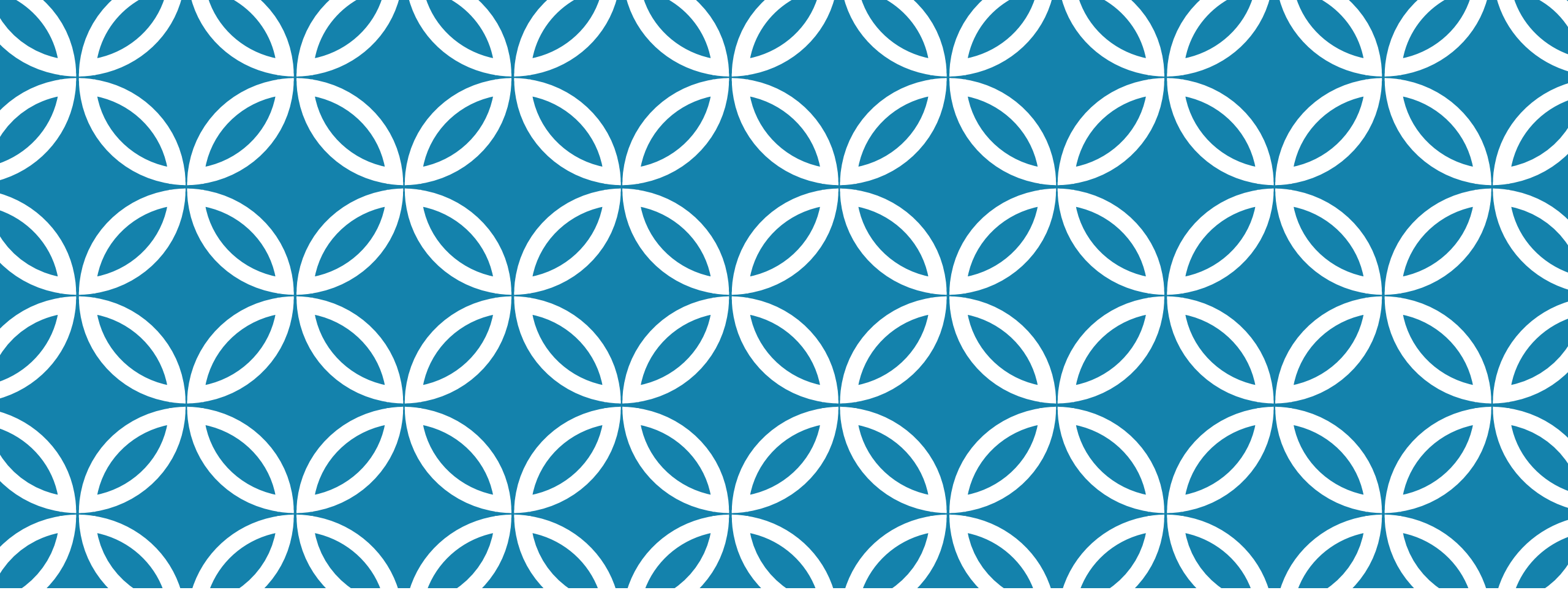
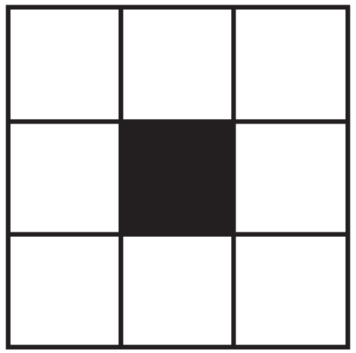


USING THE FIVE PRACTICES

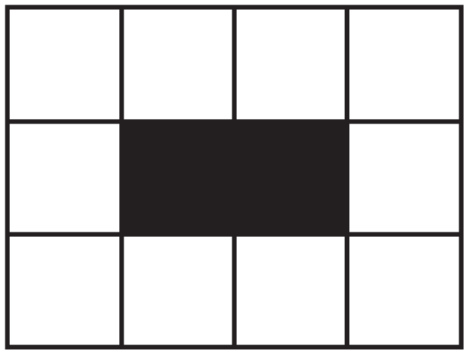
Ratio | Proportion
Rate | Percent
Decimals

TILING A PATIO

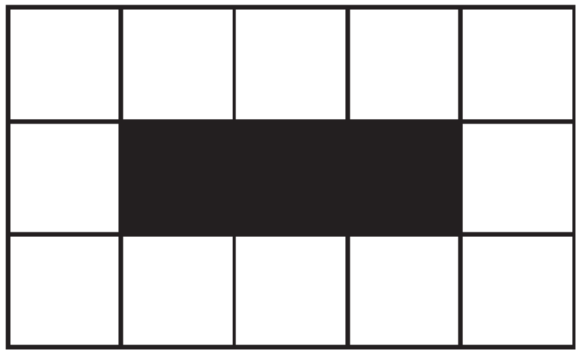
Alfredo Gomez is designing patios. Each patio has a rectangular garden area in the center. Alfredo uses black tiles to represent the soil of the garden. Around each garden, he designs a border of white tiles. The pictures shown below show the three smallest patios that he can design with black tiles for the garden and white tiles for the border.



Patio 1

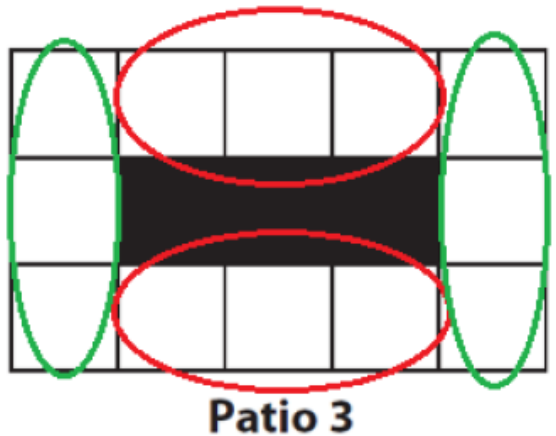


Patio 2



Patio 3

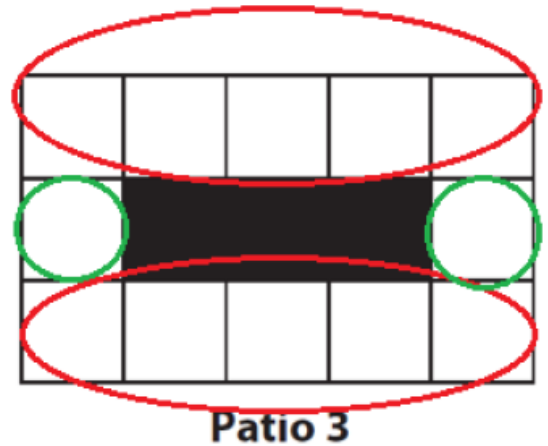
Source: *5 Practices for Orchestrating Productive Mathematics Discussions*



Patio 3

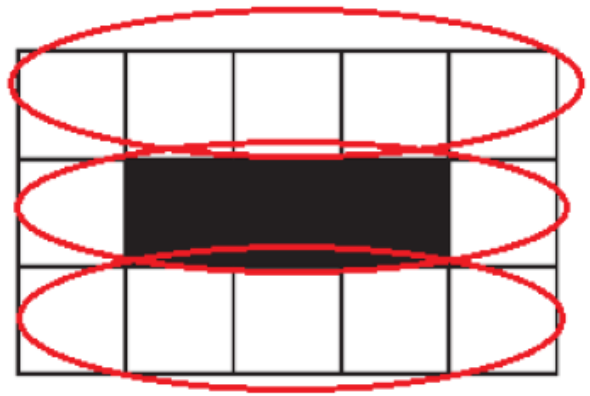
Approach 1

Approach 1: This was most common. In red, you can see that you have the same number of white tiles as black tiles both above and below the black tiles. This gives $2b$. Then you can see the tiles circled in green (3 to the left, 3 to the right). Notice that for any patio number, it's always 3 and 3. Thus, you get 6 more white tiles. So $w = 2b + 6$.



Approach 2

Approach 2: Look at one part circled in red. This is the same as the number of black tiles but with two extra—so, $b+2$. However, there are two such sections so the parts circled in red show $2(b+2)$ white tiles. Then we need to get the remaining 2 white tiles (circled in green). Thus, we get $w=2(b+2)+2$. Notice this simplifies to $w=2b+6$.



Patio 3

Approach 3

Approach 3: Similar to Approach 2, you can just count **all** of the tiles first. This will give you $3(b+2)$. However, if you want only the white tiles, you now need to subtract the black tiles.

Thus, subtract b. This gives $w=3(b+2)-b$. Again, show that this is equivalent to $w=2b+6$.

5 PRACTICES (SMITH & STEIN, 2011)

1. **Anticipate** likely student responses to a task

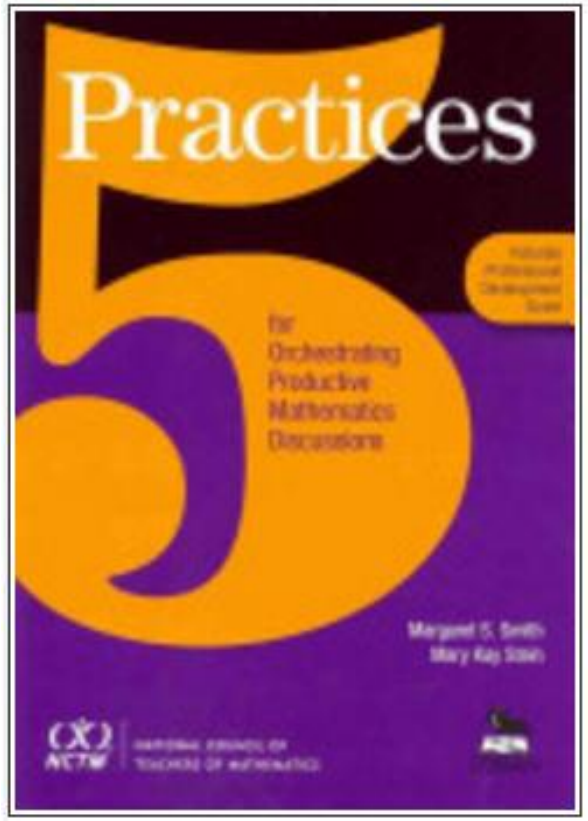
2. **Monitor** responses to the task (while students work)

3. **Select** particular students to present their results during whole class discussion

4. **Sequence** the student responses in a particular order

5. **Connect** the student responses and connect the responses to important mathematics

Source: Smith & Stein (2011), p. 8

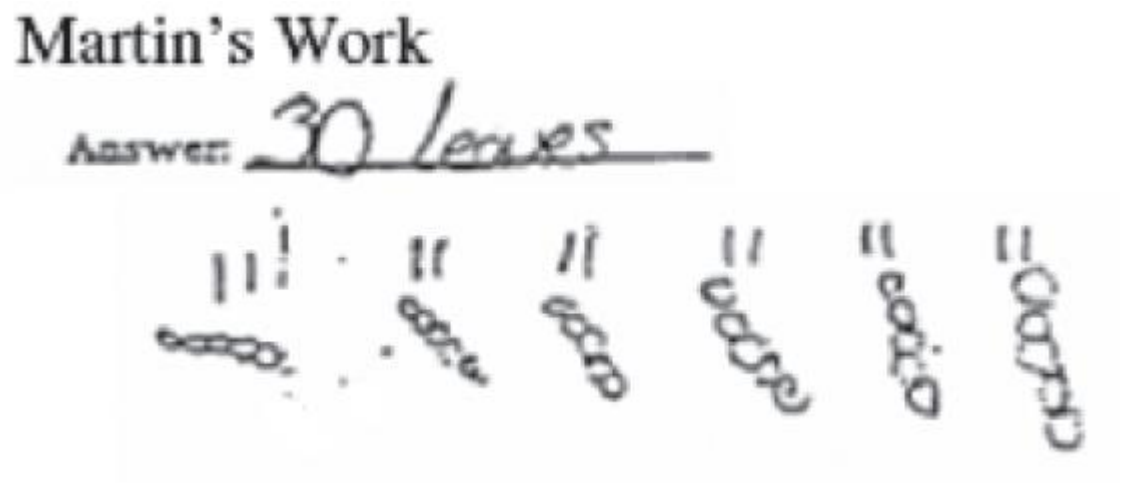


LEAVES AND CATERPILLARS

A fourth-grade class needs 5 leaves each day to feed its 2 caterpillars. How many leaves would the students need each day for 12 caterpillars?

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS



SCALING UP (BY PICTURE)

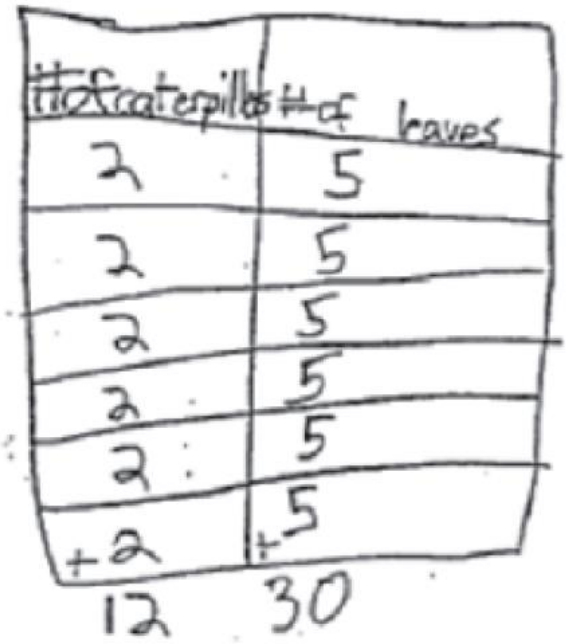
Groups of 5 leaves per 2 caterpillars.

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS

Melissa's Work

Answer: 30

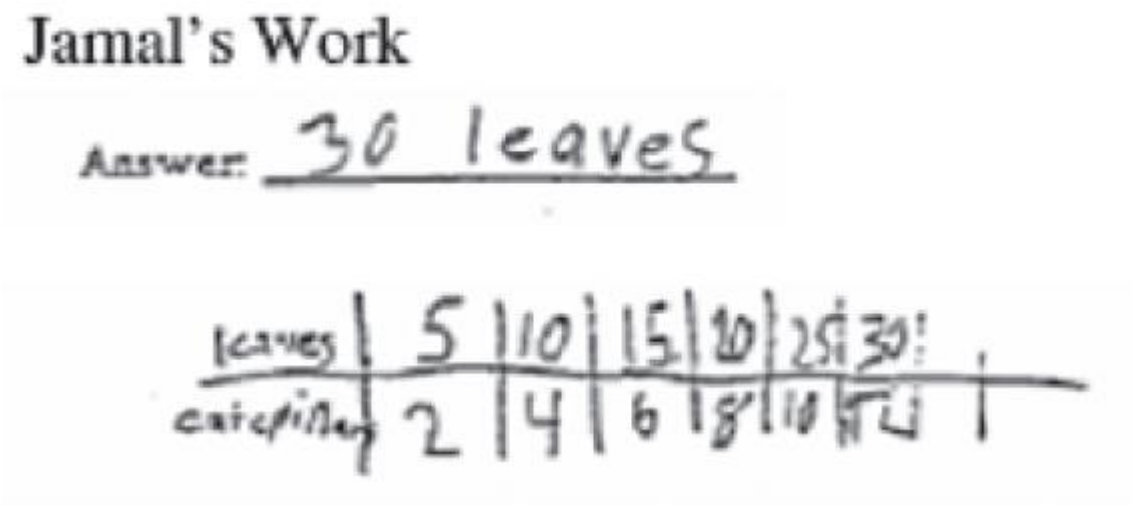


SCALING UP (BY TABLE)

Groups of 5 leaves per 2 caterpillars.

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS



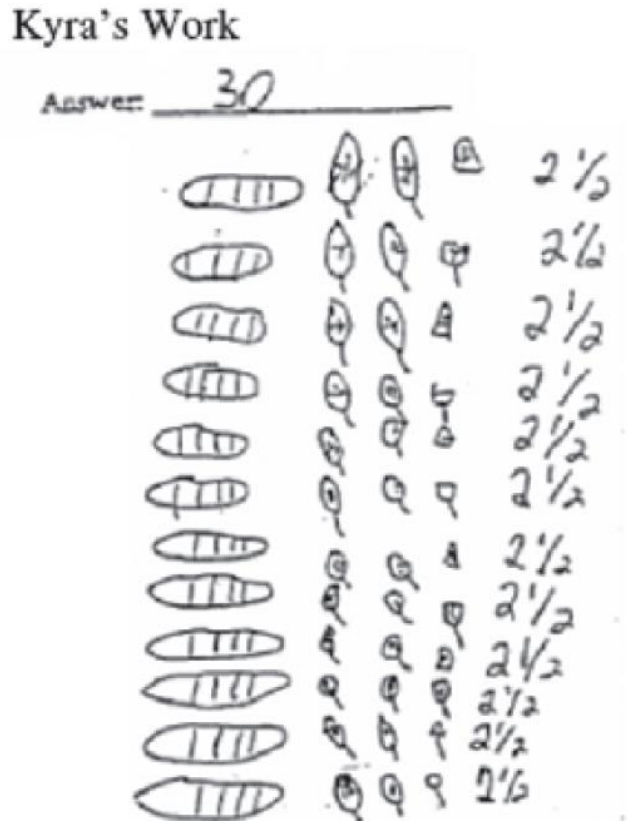
SCALING UP

Increase the number of leaves by 5 and the number of caterpillars by 2 until we reach 12 caterpillars.

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS

Kyra's Work

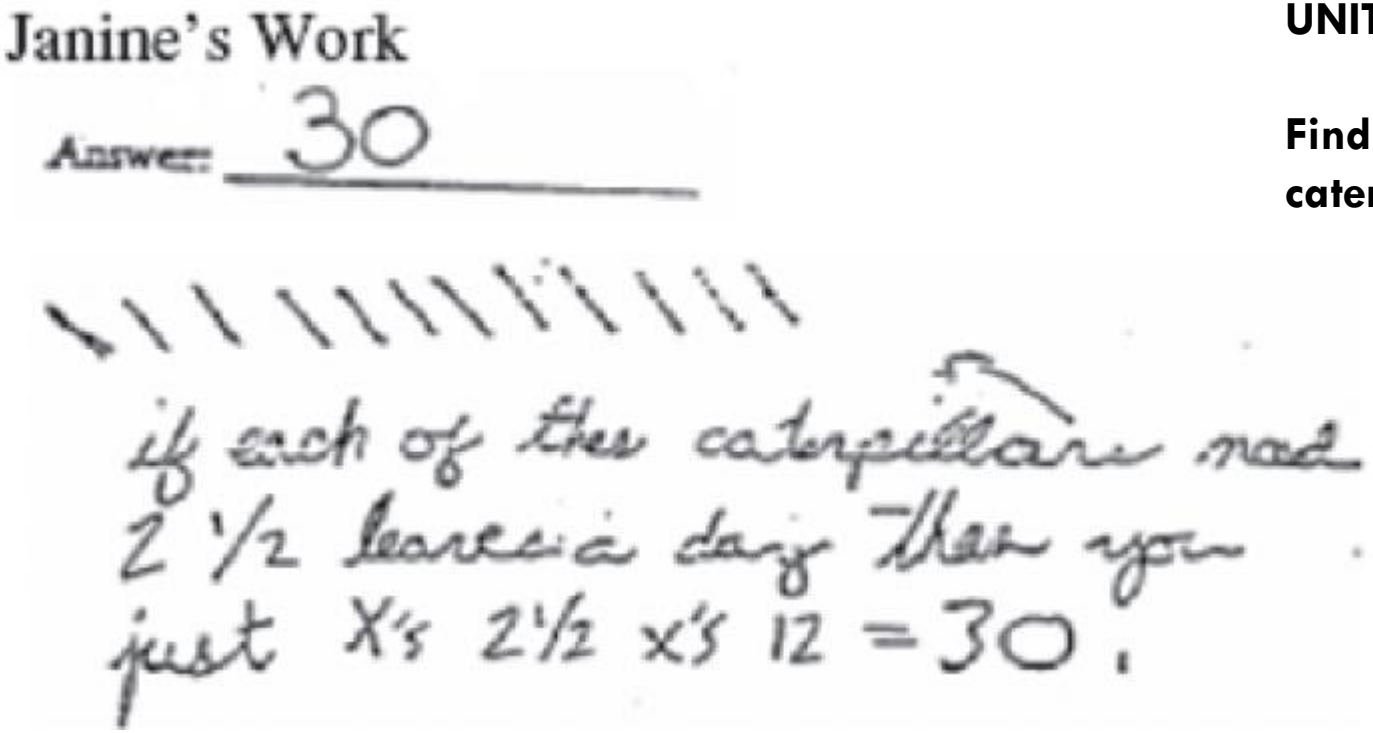


UNIT RATE

Find the number of leaves eaten by one caterpillar; duplicate this 12 times.

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS



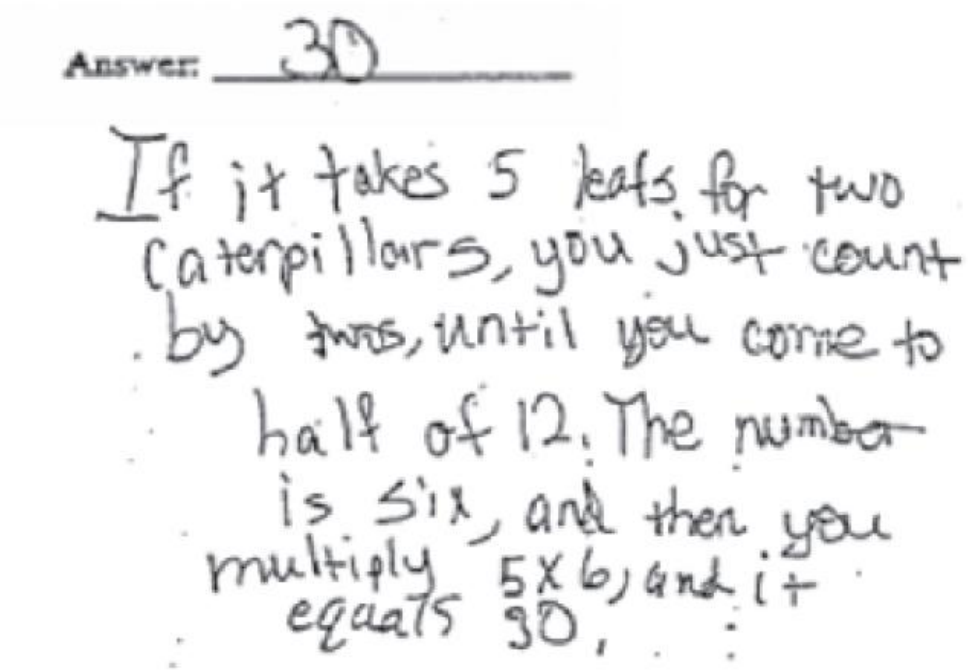
UNIT RATE

Find the number of leaves eaten by one caterpillar; duplicate this 12 times.

Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS

Jason's Work

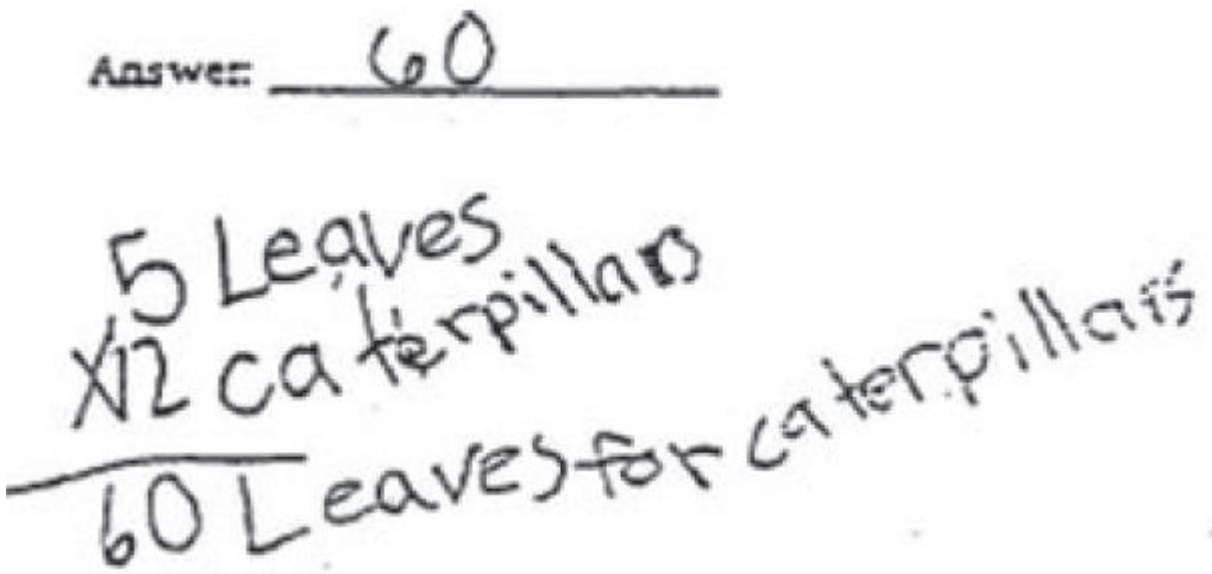


SCALE FACTOR

12 caterpillars is 6 times the original amount (2 caterpillars) so the number of leaves should be 6 times the original 5 (30 leaves)

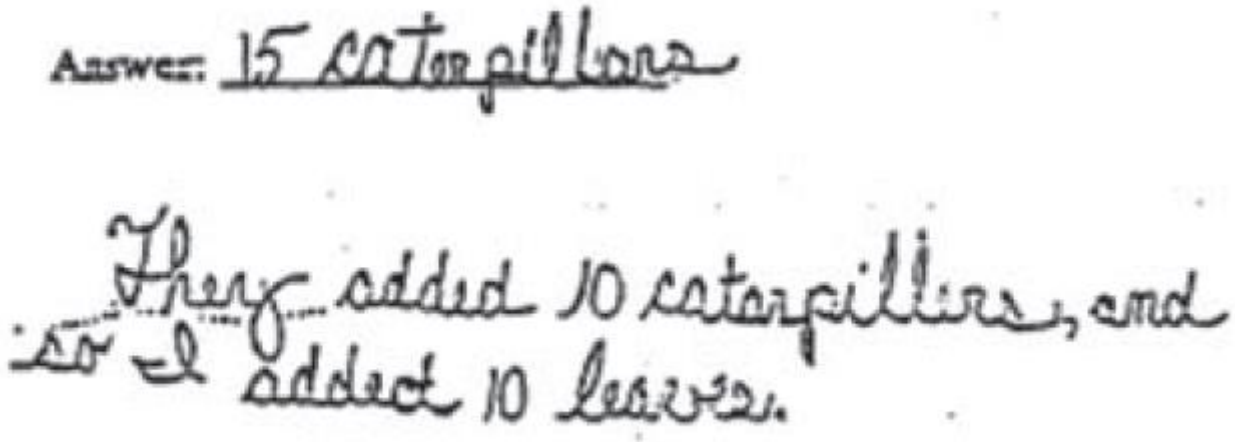
Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS



Source: 5 Practices for Orchestrating Productive Mathematics Discussions

LEAVES AND CATERPILLARS



ADDITIVE

The number of caterpillars has increased by 10 (2+10=12) so the same should happen for the number of leaves (5+10=15)

Source: 5 Practices for Orchestrating Productive Mathematics Discussions