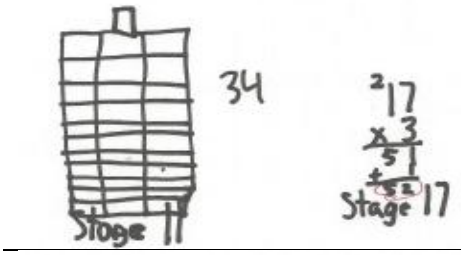
Student Solutions for 3n+1 Geo Metric Pattern

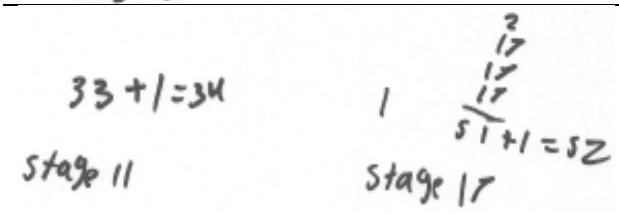


Carlos

Stage 11: Drew rows of 3 plus one on the top.

Stage 17: Calculated 17 rows of 3, plus one on the top

$$n \cdot 3 + 1$$

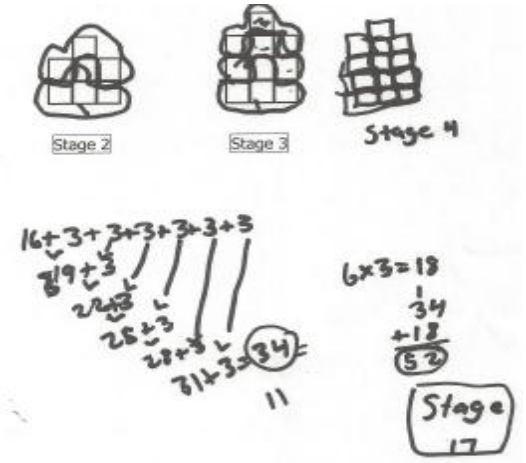


Naomi

Stage 11: She multiplied (skip counted) on her fingers 3 x 11 plus the one on the top.

Stage 17: Added 3 17's plus one on the top.

$$3 \cdot n + 1$$



Oswaldo

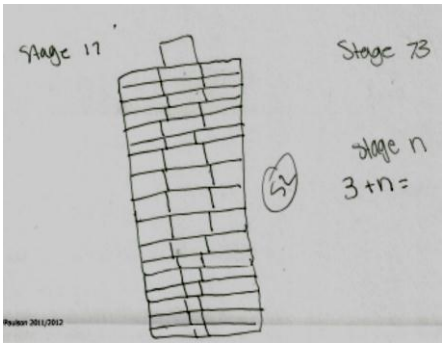
Oswaldo sees the pattern growing by the three on the top, plus the one on the bottom.

Stage 11: Multiplied 3 times 6 because that was the stage difference from stage 5 to stage 11. He added that in his head to get 34, but then wrote stage 5 amount (16) and added 3 6 times to check his mental math.

Stage 17: Initially doubled stage 11 to get 68. He was thinking that he needed to double the stage difference from 5 to 11, because from 11 to 17 it was also 6 stages differences. His later explanations confirmed this strategy.

For Stage n: He is holding the last stage that he knows as the constant, finding the stage difference from that stage to the n stage and multiplying it by 3.

$$\boldsymbol{known\ stage} + (\boldsymbol{difference\ from\ last\ stage}) \cdot \mathbf{3}$$

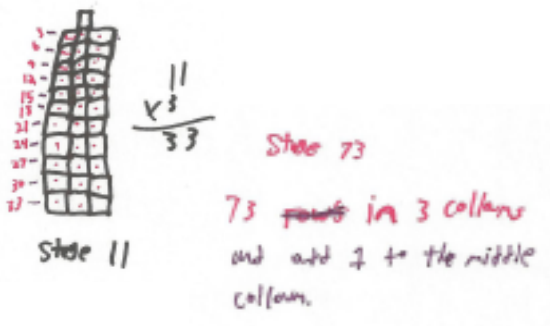


Yocelin

Used a recursive strategy throughout. She sees the pattern growing by three discrete squares each time, as is evidenced in her drawing of stage 17

Stage 11: added on 3 at a time in sort of a horizontal table.
Stage 17: She drew a big tall rectangle, divided it into 17 rows, then divided each row into three parts. She didn't really see the columns.
Stage 73: She would draw 73 rows of 3, then count them, keep adding from 52 (stage 17) and add the one on the top.

$$\boldsymbol{known\ stage} + \boldsymbol{rows\ of\ 3\ to\ the\ n\ stage}$$



Ryan

Ryan's initial drawing shows that he sees the three on the top growing, as did Oswaldo, but for stage 73 he explained it differently.

Stage 11: Drew 11 rows of three, had difficulty counting by 3's so he multiplied the three columns by 11, and then one in the middle column

Stage 73: Explained that there were 3 columns of 73, and add one to the middle column. So, he may have seen it as:

$$2n + (n + 1)$$