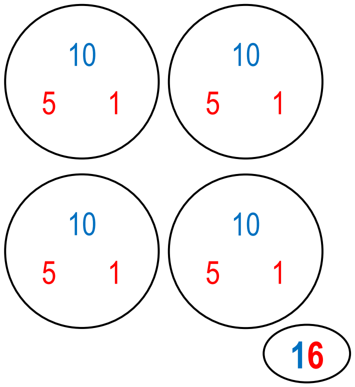
Grades 3 – 5 Progression of Division Strategies

Circles and Stars

64 ÷ 4



This strategy is used in grade 3 to provide a visual model for both multiplication and division as they are first being introduced. The picture shows 64 being split into 4 equal groups. (The student first gives 10 to each circle (40 altogether). With 24 left to split, the student gives 5 more to each circle, after which 60 have been split among the four circles. Finally one more is given to each circle, so 64 have been split equally.) This strategy helps build a conceptual understanding of the operations, but it is not efficient for larger numbers.

Partial-Quotients

64 ÷ 4

```
4 | 64
  - 40 | 10
    24
  - 20 |  5
     4
  -  4 |  1
     0   (16)
```

This strategy is used in grade 4. It is a modified version of the *U.S. Standard Algorithm* that allows students to write all of their calculations and maintains place value at each step, making it easier for students to understand. This is a more abstract representation of the exact same steps shown in *Circles and Stars*, but not yet as efficient (or abstract) as the *U.S. Standard Algorithm*.

By the end of grade 4, students should be able to do each place value in one step (shown in the next column).

Partial-Quotients

7552 ÷ 32

```
32 | 7552
   - 6400 | 200
     1152
   -  960 |  30
      192
   -  192 |   6
        0   (236)
```

When students maximize the efficiency of this strategy (use only one partial-quotient for each place value), this strategy becomes as compact and efficient as the *U.S. Standard Algorithm*. To do it, a student thinks: “Can at least one hundred 32’s fit into 7552? Yes, that would be 3200. Will two hundred 32’s fit? Yes, that’s 6400. Will three hundred 32’s fit? No, that’s too big.” This thought process is followed for each place value.

Students should be able to do this (with only one partial-quotient for each place value) before they begin to transition to the *U.S. Standard Algorithm*.

U.S. Standard Algorithm

7552 ÷ 32

```
      236
32 | 7552
   - 64
     115
   -  96
      192
   -  192
        0
```

This strategy is required by the standards in grade 6, though it is taught in grade 5 at Skaneateles. It follows a very similar set of steps as *Partial-Products*, but uses a more compact notation to make it more efficient. This efficiency, however, also obscures the place value of the numbers and the logic of the steps (ex., A student thinks “How many 32’s are in 75?” rather than 7500.). Students will come to understand the logic of each step and the meaning of the shorthand much better when they follow the progression of strategies depicted here. **Therefore, this algorithm should not be introduced prematurely.**

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