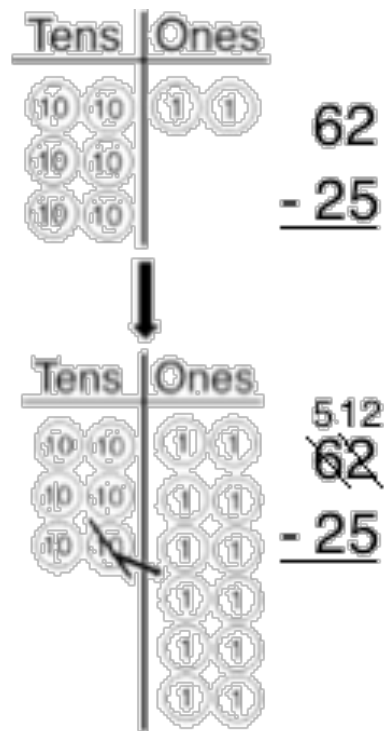


Preface

Deco Trees are decomposition activities that synthesize fluency and problem solving skills. Their design and simple to complex sequences stimulate creativity, while guiding students to think more deeply about combining like and unlike units in part/whole relationships.

I came up with the idea for Deco Trees after years of struggling to help second graders understand the subtraction with renaming algorithm. Most students could perform the mechanics of exchanging a ten disk for ten one disks, but then struggled to connect the concrete and/or pictorial disk trading to the formal algorithm process. After a lot of thinking, experimenting, and frustration, I concluded that one of the biggest struggles students encountered was not being able to recognize a two-digit number in multiple place value forms. For example, most second graders understood that 62 is the same as 6 tens and 2 ones, but far fewer knew that it is also 5 tens and 12 ones. In short, students who struggled with the subtraction algorithm only had a surface understanding of place value.



I started guiding students to express two-digit numbers in terms of *one less ten*. This helped students see numbers more elastically and as a result, connecting number disk exchanges to the subtraction algorithm became much, much easier.

Far too many elementary school students see numbers as static, instead of flexible figures. This not only encumbers their ability to understand harder concepts, but also stifles their creativity. Many third graders know that 8×7 is the same as 8 sevens, but not 5 sevens and 3 sevens. Fourth graders always seem to know that $2\frac{1}{3}$ is 2 wholes and 1-third, but not 1 whole and 4-thirds. For students to excel in elementary mathematics, they need to recognize numbers and units in varied forms. Deco trees are one method to guide this process.

Classroom uses

- Extension activity for early independent practice finishers.
- Station activity in center-based instruction.
- Teacher script for whiteboard exchange fluency.
- Whole group activity.

A two-part structure

Each Deco Tree consists of a series of missing parts that center around a given whole. In the example below, **7 minutes** is broken apart into several different formats.

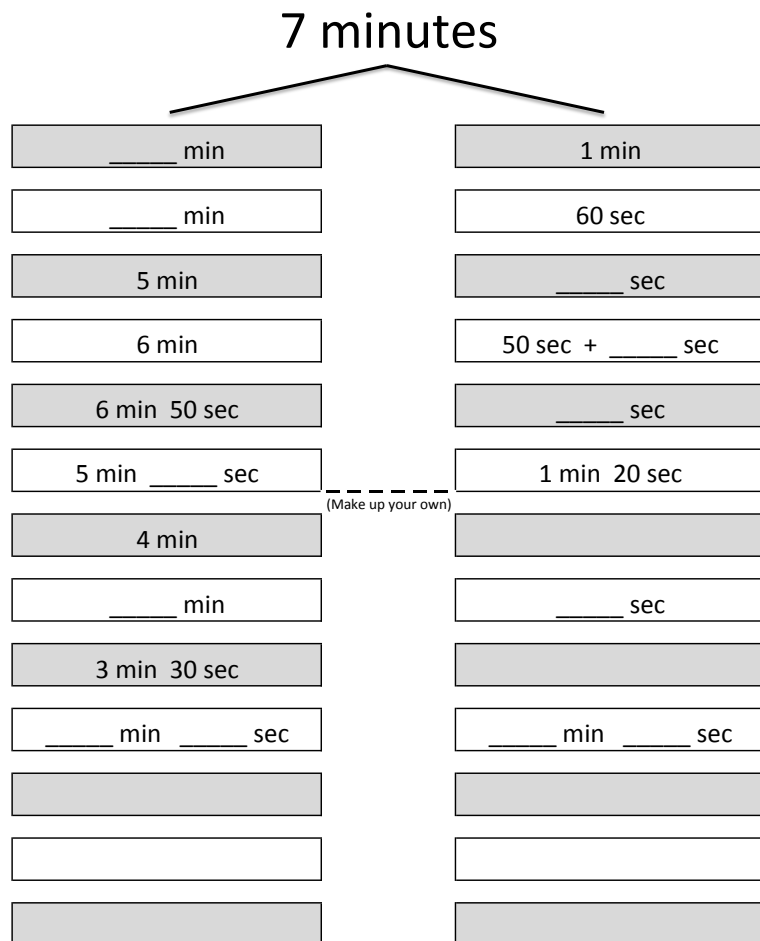
The first six problems consist of a given part that prompts students to fill-in a missing number that

combines to make the whole. The first several combinations should be confidence building for weaker students.

Through sequences, the problems gradually become more challenging, exposing students to multiple formats so that they are prepared for deeper

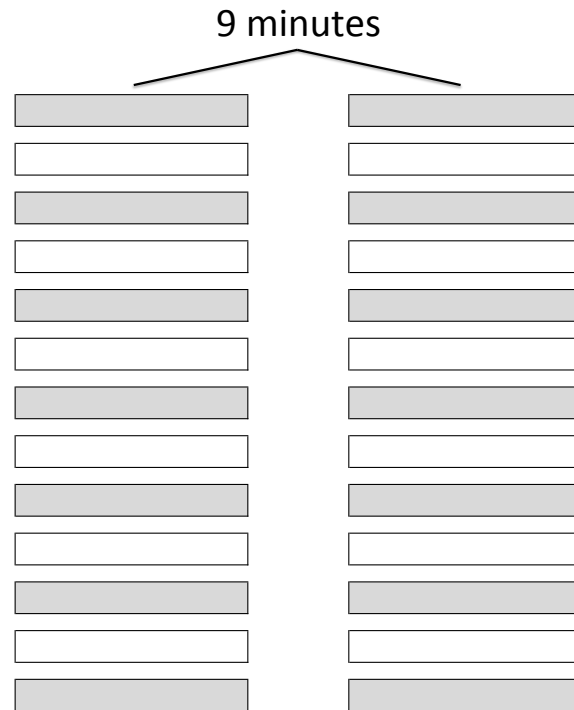
complexities in the *Make up your own* section.

Some students need stimuli to induce creativity in the *Make up your own section*, while others might feel restrained by the prompts. Teachers should consider adding or whiting out prompts based on the needs of the students doing



the activity. They also might tell students that they can “use or ignore” the prompts when creating their own combinations.

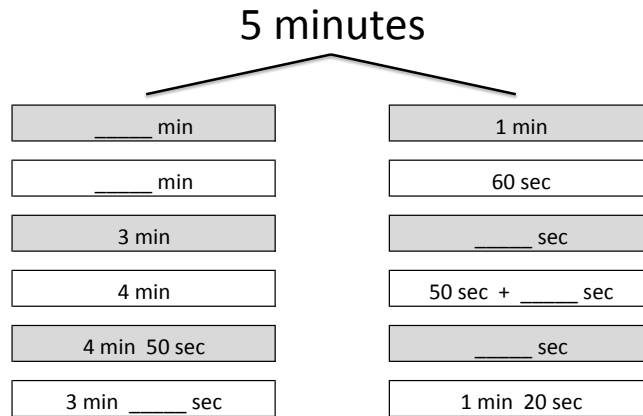
Teachers can deepen their students’ confidence and understanding by adding a second stage to the activity. After allowing students to share and expound upon their answers, provide a second Deco Tree with the same or an analogous whole. In this example, **9 minutes** works analogously to **7 minutes**, because problems and formats from stage one can be used to make combinations in stage two.



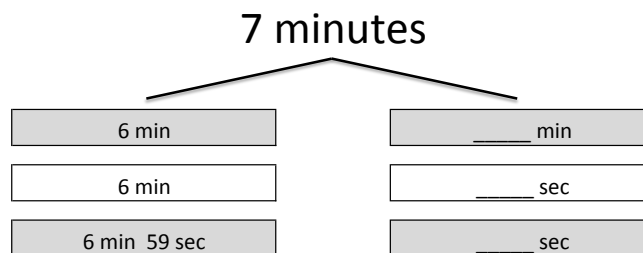
Regardless of what whole the teacher selects, the second stage of the activity can be approached several different ways. Some students will treat it as a race, trying to complete as many decompositions as possible. Others will embrace higher order thinking and stretch themselves to generate more complex and/or creative answers. As long as students are engaged and happy, the time is well spent.

Delivering Deco Trees as a Whole Group Activity

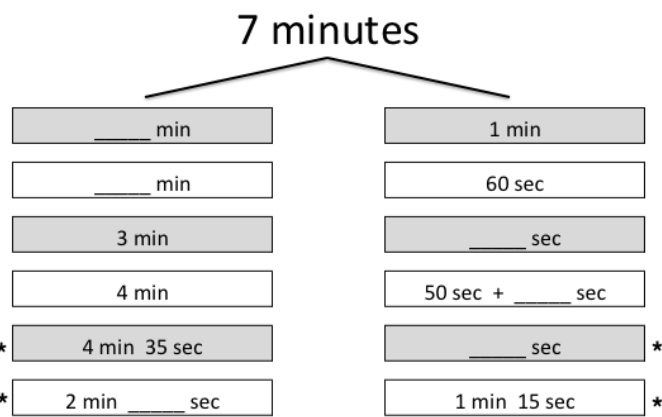
- I. For several days leading up to the activity, use analogous wholes to expose students to the different sequences and formats that they will see in the first six problems. Otherwise, the Deco Tree will likely frustrate them. To prepare students for the **7 minutes** Deco Tree, several whole minute units would work, including **5 minutes**.



- II. Examine the Deco Tree from the perspective of your weakest student. *Will they feel successful?* If not, change one or more problems to ensure success. The example to the right provides similar formats with easier computation.



- III. Think of the strongest student in your class. *Will they feel challenged?* If not, change one or more problems so that they will feel invigorated by deeper complexity. Also, consider starring problems that you anticipate



to be especially challenging. Encourage students to skip over the “starred” problems if they find them too hard. The example above provides more complicated computation.

- IV. Give students 90 seconds to 2 minutes to work on the Deco Tree.
- V. Have students exchange their Deco Tree with a partner, directing them to “Check each other’s work.”
- VI. Call out answers to the first six problems, so students can immediately document their success.
- VII. Ask groups to share disagreements that may have arisen while checking each other’s *Make up your own* section. Projecting and solving disputed combinations is a learning opportunity for everyone in the class.
- VIII. Encourage students to share the most challenging decompositions that their partner created. As students share out, record the combinations on the board. This stimulates ideas for all students during phase two of the activity.
- IX. Always be prepared to share a combination or new format that the students aren’t likely to consider. This will generate a frontier of new ideas.
- X. Direct the students to flip over their paper where they will find a blank Deco Tree. Give them the same or an analogous whole to decompose.
- XI. Repeat steps 3-6.