2. Changing 1 number to make an easier problem

In this sample solution, a student changes 48×42 to 50×42, solves 50×42, and then compensates for the initial change.

$$48 \times 42$$

$$50 \times 42 = 2{,}100$$

$$2{,}100 - 84 = 2{,}016$$

Changing 48×42 to 50×42 results in a problem that is easier to solve. The new numbers can be either broken apart by addition, yielding $(50 \times 40) + (50 \times 2)$, or thought of as $\frac{1}{2}$ of 100×42. Then the student has to decide how to adjust the answer to 50×42. Because 50×42 is 2 more groups of 42 than 48×42, subtracting 2 groups of 42, or 84, gives the final answer.

It should be noted that, although this strategy will always work, it does not always make the problem easier to solve. It is possible to solve a multiplication problem by changing *both* numbers to make an easier problem (e.g., changing 48×42 to 50×40), but it is difficult to figure out how to adjust that answer in order to solve the original problem.

3. Creating an equivalent problem

Here are 2 ways students might create an equivalent problem.

$$48 \times 42 = 96 \times 21$$

$$48 \times 42 = 16 \times 126$$

Students often call this strategy "doubling and halving" because that is how they most often create equivalent problems in multiplication. In these examples, however, you can see that the first student "doubled and halved," and the second student actually "tripled and took one third." Using the same strategy, the students also could have changed the problem to 24×84 or 144×14.

As with changing one number to create an easier problem, it makes sense to use this strategy only if it does indeed result in a problem that is easier to solve. Sometimes a series of steps of doubling and halving can result in a much easier problem, such as $48 \times 42 = 24 \times 84 = 12 \times 168$.

When a student's first step is to create an equivalent problem, the next steps often include a combination of the other strategies. After a student has changed the problem to 96×21, it can be solved by breaking the numbers apart: $96 \times 21 = (96 \times 20) + (96 \times 1)$.

One way that you might want to think about how this strategy works is that one of the numbers is first broken apart by multiplication and then the associative property is applied. Two examples are shown below.

$$48 \times 42 = 48 \times (2 \times 21) = (48 \times 2) \times 21 = 96 \times 21$$

$$48 \times 42 = (16 \times 3) \times 42 = 16 \times (3 \times 42) = 16 \times 126$$

Students study creating equivalent problems in multiplication and division in more depth in Grade 5.

from Grade 4, Unit 8: How Many Packages? How Many Groups?