LEFTOVERS

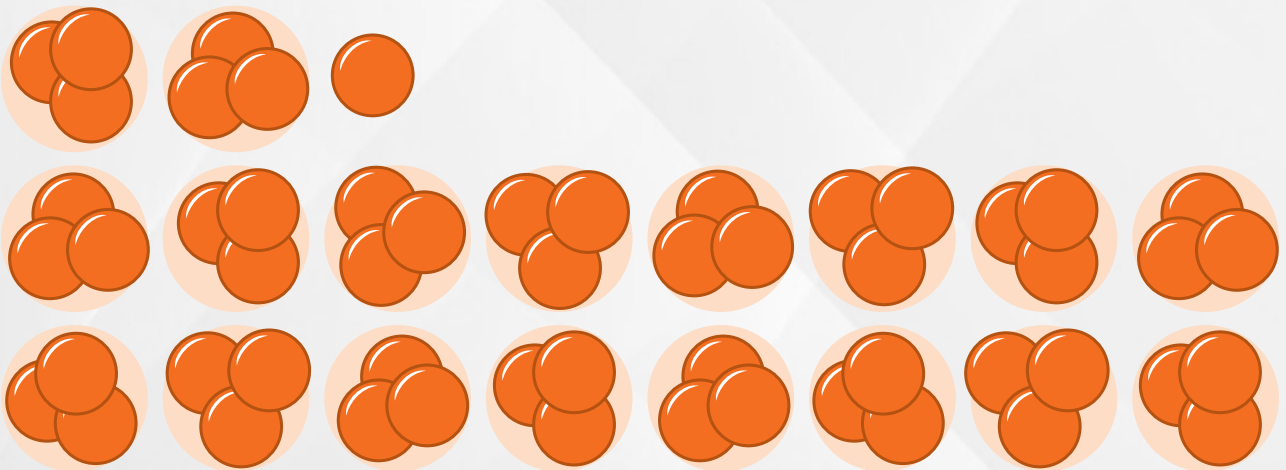## Leftovers

Reasoning behind the task

In this problem, students deal with division with remainders, even if they don't initially realise that's what they're doing. In fact, they are looking for a number that leaves a remainder of 1 when divided by 3 (a number 1 more than a multiple of 3) that happens to leave a remainder of 3 when divided by 4 (a number also 3 more (or 1 less) than a multiple of 4). It turns out that there are an infinite number of answers: 7, 19, 31, 43, ... continuing with numbers that are 12 apart. The numbers are 12 apart because using an extra 12 counters makes perfect groups of 3 as well as perfect groups of 4, so the remainder is not affected.
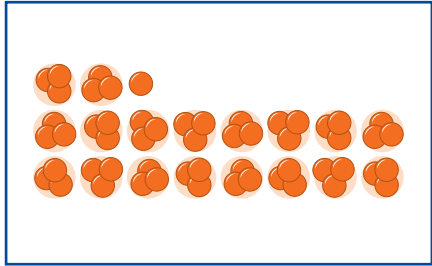
Theoretically, students with minimal skills in multiplication could still attack the problem by simply creating their groups and counting the counters they used. But students with multiplication/division skills are likely to use those skills to be more efficient.

When students are asked for a number greater than 50, they are likely to work a little harder than if numbers like 7 and 19 are allowed.

Curriculum coverage

▌ Number

▌ Multiplication

▌ Division with remainders

Expectations

All	Most	Some
▌ Find one or more possible solutions using counting or visual grouping strategies.	▌ Find one or more possible solution using counting or visual grouping strategies, extending to mental strategies to find a solution using over 50 counters. ▌ Identify that solutions are all odd numbers.	▌ Find several solutions including using over 50 counters using mental strategies. ▌ Explain why solutions have to be an odd number and why the gaps between solutions are 12 apart.

Key questions

What is the least number of counters you could have? How do you know it is least?

▌ What other ways can you find to do it?

▌ What did you notice about how far apart the possible answers are?

▌ Why do you think that happened? Explain your thinking.

▌ Why could the number of counters not be 60?

▌ Can the number be an even number? Why/why not? Scaffolding learning

Scaffolding learning

Start with a small number of counters and lay them out to help visualise the groupings.

▮ Look for a number that leaves a remainder of 1 when divided by 3, and a remainder of 3 when divided by 4.

▮ Think about how to add groups of counters so that the remainder is unaffected (look for a number that can be divided equally by 3 and 4).

Challenge

Change the rules for the problem so that possible answers could be these: 8, 43, 78, 113, …

Leftovers

You have some counters.

You put them into groups of 3, and there is 1 counter left over.

If you put THE SAME counters into groups of 4, there are 3 counters left over.

a) How many counters could you have?

b) How many different ways can you find to do this?

c) How many counters might you have had if the total number of counters was more than 50?

List as many possibilities as you can.

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