MAKING ROBOTS: Sequence Overview

Summary of learning goals

The resource introduces the key idea of multiplication as a Cartesian product, using the language of "for each". Students explore the total number of different robots that can be made using three heads, three bodies and three feet. The students represent the different combinations for the robots as array.

Australian Curriculum: Mathematics (Year 2)

ACMNA031: Recognise and represent multiplication as repeated addition, groups and arrays.

Summary of lessons

Who is this Sequence for?

This task has been designed for students in Year 2. Students will need to have some familiarity with multiplication concepts and early strategies for solving multiplication problems. The task draws on students' knowledge that multiplication can be represented as equal groups, repeated addition and also in an array formation. Students will apply and build on this knowledge and create connections to multiplication as a Cartesian product.

Lesson 1: Robot, Go Fish

In this task students think about the number of robots it is possible to make with three heads, three bodies and three sets of legs. Students start by making one robot and checking whether anyone else has made the same robot as them. They then play a game that shows that many unique robots can be made.

Lesson 2: How Many Robots

In this task students are asked to consider how many different robots can be made using three heads, three bodies and three sets of legs. Students sort and classify their robot cards according to their body parts. From here, an array structure is introduced. Students will see that for each head there are three bodies and for each body there are three sets of legs. This means that for each head, nine unique robots can be made.

Reflection on this sequence

Rationale

Teaching multiplication in the classroom often focuses on creating equal groups and then extending this idea to the use of arrays. The concept of *equal groups* is a very important aspect of multiplication, but there are other concepts that need to be explored. Multiplication comes in multiple forms and all should be explored to build fluency with the operation. One of these forms is that of *'for each'*, e.g. for each cake there are three candles or for each egg use half a cup of flour. This resource explores the concept of *for each* through Cartesian product, although the Cartesian product is not specifically mentioned in the *Australian Curriculum: Mathematics*.

The Cartesian product of multiplication is the product of two or more sets. In this case, students are presented with three robot heads, three bodies and three types of legs. They are asked to work how many combinations are possible using these different sets. Students will see that *for each* head there are three bodies and *for each* body there are three types of legs. An array structure is used to help students work out the total in the collection.

reSolve Mathematics is Purposeful

- This sequence focuses on the substantial mathematical idea of multiplication as Cartesian product and explores and builds the language of *'for each'*.

reSolve Tasks are Challenging Yet Accessible

- Access for students to this task is achieved through using what is familiar to introduce a new concept: the tasks in this sequence pull together the familiar representation of the array structure with the new concept of Cartesian product.
- Extending prompts are provided to allow students to look beyond the original problem to consider different numbers of heads, bodies and legs.

reSolve Classrooms Have a Knowledge Building Culture

- The concept of Cartesian product is introduced in the context of a game played in small groups. Collaborative play develops students' language and their understanding of concepts in a fun and encouraging environment. These groups then work together to find all possible robot combinations.