TangIn

Tangible Programming & Inclusion

TangIn Toolbox

Calculations

7-10 years old

Operations and Properties

Algebraic Expressions

Itineraries

Probotic

www.tangin.eu

/tanginproject

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Summary

Algebraic expressions - a game played in teams where the goal is to develop algebraic calculus and optimize the code to win over the opponents.

Expected duration: **60 min** (the lesson plan duration is flexible, and teachers can adapt them accordingly to their needs and class duration).

Learning Outcomes

At the end of the session, students are expected to:

- Take advantage of the properties of operations to translate them into algebraic expressions and develop algebraic calculus;
- Program the robot adequately, being able to optimize the robot's path to achieve better results;
- Value STEM areas;
- Develop transversal competencies such as problem-solving, communication and reasoning;
- Develop group work skills, namely, to respect and favor the inclusion of all elements, regardless of gender, culture, etc.

Links With Curriculum Topics

Covered Curriculum Topics		
Subject		**Topics**
Engineering	**Mathematics**	Numbers and Operation • Multiplication, Division, Sum, Subtraction and its properties Algebra • Algebraic expressions Geometry • Orientation and localization - itineraries
	Technology	Programming • Concepts of programming • Programs – Results, errors, and troubleshooting Robotics • Programming objects to solve challenges

Notes for Teachers

The teacher should prepare, in advance, all the materials needed and the classroom according to the activities to be developed.

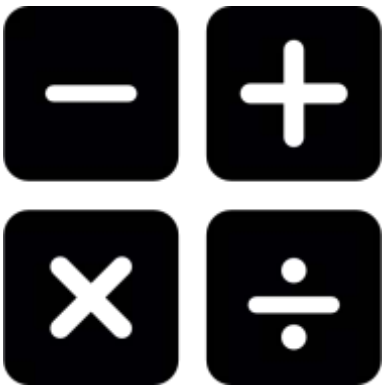
The teams should be as heterogeneous as possible to foster the integration of all students.

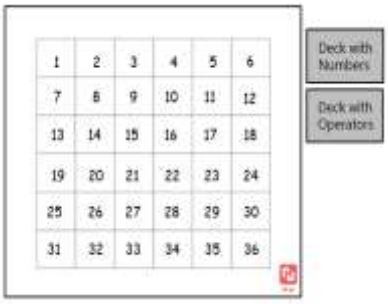
It's important that clear rules are established in terms of group work. This way, it avoids the most active children assuming the lead and the quitter ones only observing.

In this task, students get higher scores if they program the BOT efficiently, i.e. they go through the desired path in only one take. To accomplish, the use of loops should be encouraged.

The teacher must circulate through the various groups to support the activities and the dynamics of each one. In the end, it should promote a collective discussion of the main issues focused and the constraints and difficulties experienced.

Lesson Plan

Intro	10'	Class	"Today's mission is to teach MI-GO how to do some algebra" Briefly address the class and discuss with them the main properties of each operation and compositions of them.	

Prep	10'	Group	The teacher organizes the class into groups. Each group will have a robot, a map, a deck of cards with numbers (1 to 36) and another with arithmetic operators. Number each cell of the map (1 to 36) with a marker. The teacher instructs the students that they will have to teach the robot to perform calculations and that they will have to program it in order to achieve the result of the operation indicated on the cards, directly or indirectly.	
			Each group will be divided into 2 teams (Team A and Team B) **Dynamic**: Team A draws 2 cards from the Number deck and 1 from the Operator deck. Then, the cards shall be displayed on the table. Team B must perform the calculation and go to the correct result. If the result is a number higher than 36 then Team B must find other operations that provide a similar result. With the BOT placed on number 1, Team B programs the BOT to go to the desired numbers – in the example, numbers 29, 10 and 4 (it's not mandatory that the BOT stops on the number, it must only pass by it). Team B can choose freely the operators they need. Team B writes their operation on a piece of paper before programming the BOT so that Team A can check the correct movements of the BOT.	

Scoring:

- Team B gets 2 points if 1 operator is used.
- Team B gets 3 points if 2 operators are used.
- Team B gets 4 points if 3 or more operators are used.
- Team B gets 1 point if no operator is used.
- Team B gets 0 points if the result is wrong or the BOT is nor programmed correctly.
- Team B multiplies by 3 the points received if the BOT is programmed only once and at least 1 operator is used (in the example, Team B would get extra 3 points if the BOT had passed by 29, 10 and 4, all in the same "movement". The use of loops should be encouraged).

Example of code:

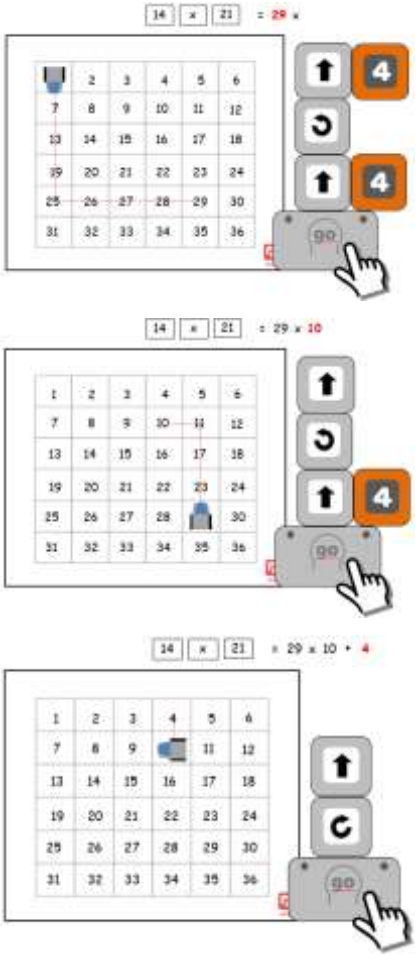
Alternative 1 - Score would be 3 points for using more 2 operators. The path was completed using 3 "movements" so no extra points are awarded.
Final score - 3 points.

Alternative 2 - Score would be 4 points for using more than 3 operators (4 were used) multiplied by 3 for using only one "movement".
Final score - 4 x 3 = 12 points.

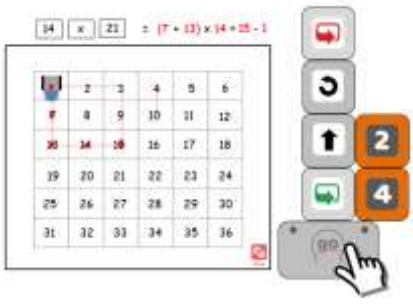
Note:

For division, if the result is a rational number, round the number to the nearest integer.
Using the 'neutral' and/or 'absorbing (or, annihilating)' elements of the operations must be accepted. Thus, students earn points for additional operators.

Alternative 1



Alternative 2



Play and discussion	40'	Group	The game starts and continues until each group member programs the robot at least once. When teams change roles, the cards go back to the decks. A collective final discussion should make it possible to review the main operative properties used	

Resources List & Support Material

Per each group:

- A robot Kit with drawing capabilities;
- Markers for each group (easy to erase/clean), to write the numbers on the scenario;
- Alcohol for cleaning the scenarios (for teacher use only);
- Transparent scenario with a 6x6 grid;
- Cards with symbols of basic arithmetic operations (Annex);
- Cards with numbers (1 to 36, in Annex).

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	+	-	x	/