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Dance, tangles, and topology!

Adapting the activity to different ages

For individual school grades, the specific further objectives are set out below. The initial goals apply to all ages, and additional concepts are added as the student level increases.

Activity goals in childhood and primary school

The dance can be done on its own with a simple sequence for the development of motor coordination, rhythm, and the execution of movements coordinated with others. A second aspect is to perform certain predetermined movements, which vary according to the command given and the position occupied in the space of the dance. A third aspect is following a sequence of commands to achieve a purpose (that of untying the strings), and therefore, the development of computational thinking (coding).

Early secondary school (ages 11–13)

This activity can be used to create a connection from the world of mathematics (arithmetic and computations) to the mathematics of knots (a sector of topology) and to show how numbers can describe situations and objects that are apparently very far in scope from mathematical operations. It also shows how mathematics is found in different and nonscholastic contexts, such as dance and body movements.

It is interesting for children to see how mathematics can contribute to solving real problems (e.g., making a knot in shoelaces or a tie) and, in our case, untying a tangle of ropes not by trial and error, but with precise operational steps.

Finally, the activity presents an opportunity to practice calculations with fractions, as the numerical operations to be carried out during the dance are operations that concern the sum of fractions, the inverse, and the opposite of a fraction. The activity can, therefore, be an excellent starting point for exercising calculation skills, in the form of play and team competition. In the simplest version of the game, the children can be asked whether a given sequence of commands can lead to the dissolution of the ropes, for which they calculate the relative fractions up to the final result.

Later secondary school (ages 14–18)

In addition to the stimulus to improve the ability to calculate with rational numbers, the activity can constitute a sort of problem solving, for which students must independently find a sequence of operations among those allowed, which, given a starting fraction, lead to a result equal to zero. There is no single solution algorithm, but there is still one that is shorter (hint: as soon as you have a positive number, it isn't useful to do a swap, so to add one again it's time to rotate!): thus more purely computational skills are involved.

For advanced students, the activity can also be an interesting place to investigate some properties of infinity and zero, as represented by the loose-string configuration and 90° rotated configuration.