Grades 5-8 (A), 9-12 (A)

Duration: 20-30 min

Tools: one 16 pcs Set / 1-2 students

Individual / Pair work

Keywords: Regular prism

606 - Stacking Toblerone 16pcs

MATHS / COMBINATORICS

LOGIFACES METHODOLOGY

Erasmus+

TEACHER

Logifaces

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DESCRIPTION

Students stack all the blocks in the 16 pcs Set into a regular prism then consider the number of different stackings (two packings are different if the order of the elements is different).

SOLUTIONS / EXAMPLES

$2 \times \frac{9!}{2} \times 2^{5} = 32 \times 9! = 11612160$

DETAILS The blocks can be paired in two different ways, this gives the factor 2. For the two different pairings see exercise 603 - Pairing 16pcs, or the following argument. Some blocks have a fixed pair: 113-331, 123-123, 132-132, 332-112. There are two ways of pairing the remaining blocks 332, 332, 221, 112, 223, 223.

The 7 pairs and the pieces 111 and 333 have $\frac{9!}{2}$ permutations, because in both cases of the pairings there are 2 pairs which occur twice. In the pairs consisting of two different elements the order can be switched, that gives the factor 2^{5}.

ASSISTANCE FOR STUDENTS

First arrange the blocks into pairs! (This is exercise 603 - Pairing 16pcs.)
Calculate the number of the different orders of the 7 pairs and the blocks 111 and 333!
In some pairs, the order of the blocks of the pair can be switched. Which pairs are these?
(113-331, 332-112, 122-112 (occurs in only one case), 112-233, 223-233)

PRIOR KNOWLEDGE

Basic exercises in combinatorics

RECOMMENDATIONS / COMMENTS

This is a difficult Combinatorics problem. It can be given as an extra exercise only to students who have already answered the other exercises.

Exercise 603 - Pairing 16pcs is recommended before this exercise.