

Grades 1-4 (A), 5-8 (S), 9-12 (S)

Duration: 20-45 min

Tools: one 16 pcs Set / 1-2 student

Individual / Pair work

Keywords: Regular prism

603 - Pairing 16pcs



MATHS / COMBINATORICS



LOGIFACES
METHODOLOGY
Erasmus+

TEACHER

Logifaces

2019-1-HU01-KA201-0612722019-1

DESCRIPTION

Students arrange the blocks of the 16 pcs Set into pairs to form regular prisms. By measuring and comparing edges and sides, students connect two Logifaces blocks and compose regular prisms.

Students consider the number of possible pairings of the blocks. (Two pairings are different, if there is at least one pair present in one pairing and not present in the other.)

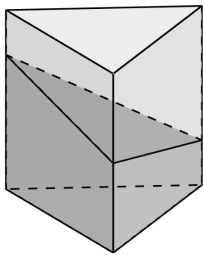
LEVEL 1 Students first find two pairs that form regular prisms 555, then a pair that forms a regular prism 333. Arranging the remaining blocks into pairs gives one possible pairing of the blocks.

LEVEL 2 Students find a pairing with only one pair that forms a regular prism 555 and without a pair that forms the regular 333. This gives another possible pairing of the blocks.

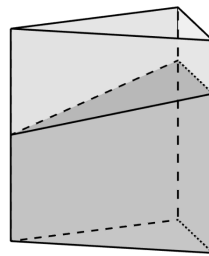
LEVEL 3 Students find the blocks that can only be paired with one other block then find the possible pairings of the remaining blocks.

LEVEL 4 Students find all the possible pairings without the assistance given in the Level 1-3 exercises.

SOLUTIONS / EXAMPLES



Blocks 321 and 321 form the regular prism 444



Blocks 233 and 112 form the regular prism 444

LEVEL 1

The pairs forming regular prism 555: two pairs of 223 - 233

The pair forming regular prism 333: 112 - 122

The remaining pairs, all form regular prisms 444: 112 - 233, 111 - 333, 113 - 133, 123 - 123, 132 - 132

Observe that the addition of the numbers $112+221=333$ seems like it works, but in the case of 123 and 321 it does not work: the blocks 123 and 321 do not form a regular prism, but the blocks 123 and 123 do. The reason is that in the formation of the prism from the blocks abc and def, one gets a prism with heights $a+f=b+e=c+d$. The addition $112+221$ works because the block 221 can also be written as block 122.

LEVEL 2

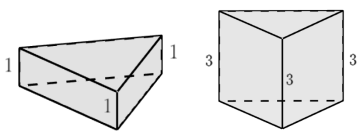
The pair forming regular prism 555: 223 - 233

The remaining pairs, all form regular prisms 444: 112 - 233, 112 - 233, 122 - 223, 111 - 333, 113 - 133, 123 - 123, 132 - 132

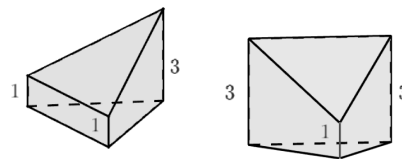
LEVELS 3 and 4

There are 8 blocks that can be paired with only one block. These blocks form the following prisms:

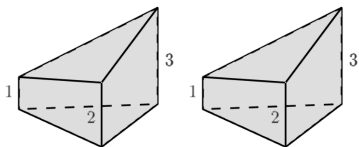
blocks 111 and 333 → prism 444



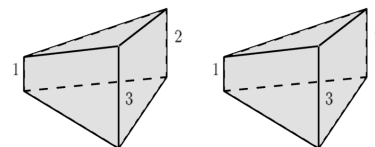
blocks 113 and 133 → prism 444



blocks 123 and 123 → prism 444



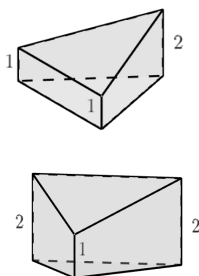
blocks 321 and 321 → prism 444



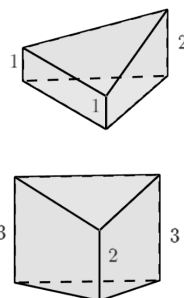
The remaining 8 blocks can be paired in two ways, these are Case 1 and Case 2. The students can be helped to find both of the possible pairings by asking them to find pairings with 1 or 2 regular prisms 555.

CASE 1

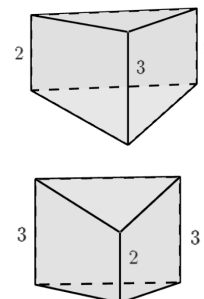
122 and 112 → prism 333



112 and 233 → prism 444

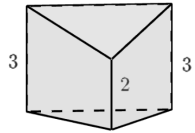
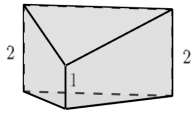


223 and 233 → prism 555 (there are 2 pairs of this type)

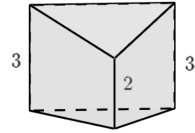
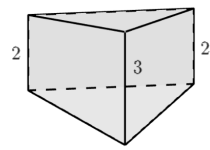


CASE 2

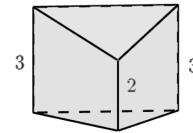
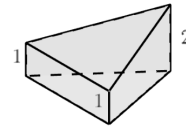
122 and 223 → prism 444



223 and 233 → prism 555



112 and 233 → prism 444 (there are 2 pairs of this type)



PRIOR KNOWLEDGE

Regular prism

RECOMMENDATIONS / COMMENTS

For students in grade 1-4 this would be an advanced lesson.

For students in grade 5-12 this can be a warm-up exercise before the more difficult combinatorics problems.

The exercise can be used to differentiate within a class: Level 1 and Level 2 are easier exercises of almost the same difficulty. Level 3 is the combination of Levels 1 and 2 with an assistance to the solution. Level 4 is the most difficult version of this question without any assistance.