

Grades 5-8 (S) 9 (S)

Duration: 10-20 min

Tools: one Logifaces Set / class

Individual work

Keywords: Number system

306 - Binary System



MATHS / NUMBERS



LOGIFACES
METHODOLOGY
Erasmus+

TEACHER
Logifaces

2019-1-HU01-KA201-0612722019-1

DESCRIPTION

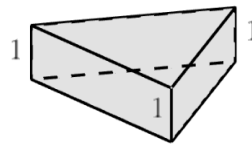
Heights of Logifaces blocks are marked with numbers 1, 2 and 3. In that way, we can get a three-digit number that represents the Logifaces blocks as numbers in base 10. Students convert these numbers into numbers written in the binary system.

SOLUTIONS / EXAMPLES

There are a few examples in the following lines.

EXAMPLE 1:

$$111_{(10)} \longrightarrow 1101111_{(2)}$$



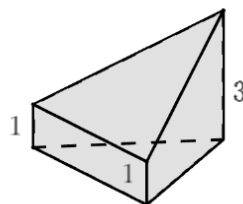
Procedure:

$111 : 2 = 55$	(1)
$55 : 2 = 27$	(1)
$27 : 2 = 13$	(1)
$13 : 2 = 6$	(1)
$6 : 2 = 3$	(0)
$3 : 2 = 1$	(1)
$1 : 2 = 0$	(1)

$$\text{Proof: } 1101111_{(2)} = 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 64 + 32 + 0 + 8 + 4 + 2 + 1 = 111_{(10)}$$

EXAMPLE 2:

$$311_{(10)} \longrightarrow 100110111_{(2)}$$



Procedure:

$$\begin{array}{r} 311 : 2 = 155 \quad (1) \\ 155 : 2 = 77 \quad (1) \\ 77 : 2 = 38 \quad (1) \\ 38 : 2 = 19 \quad (0) \\ 19 : 2 = 9 \quad (1) \\ 9 : 2 = 4 \quad (1) \\ 4 : 2 = 2 \quad (0) \\ 2 : 2 = 1 \quad (0) \\ 1 : 2 = 0 \quad (1) \end{array} \quad \uparrow$$

Proof: $100110111_{(2)} = 1 \times 2^8 + 0 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 256 + 32 + 16 + 4 + 2 + 1 = 311_{(10)}$

Note that if we represent the same block with a different sequence of numbers, we get a different numeric value, for example:

$$113_{(10)} \longrightarrow 1110001_{(2)}$$

$$131_{(10)} \longrightarrow 10000011_{(2)}$$

PRIOR KNOWLEDGE

Exponentiation of numbers, Division of numbers, Remainder in division.

RECOMMENDATIONS / COMMENTS

As a similar exercise, we recommend exercise [307 - Number with Base 4](#). This exercise is suitable for drawing students' attention to the fact that the same Logifaces block can be coded with different strings of numbers.