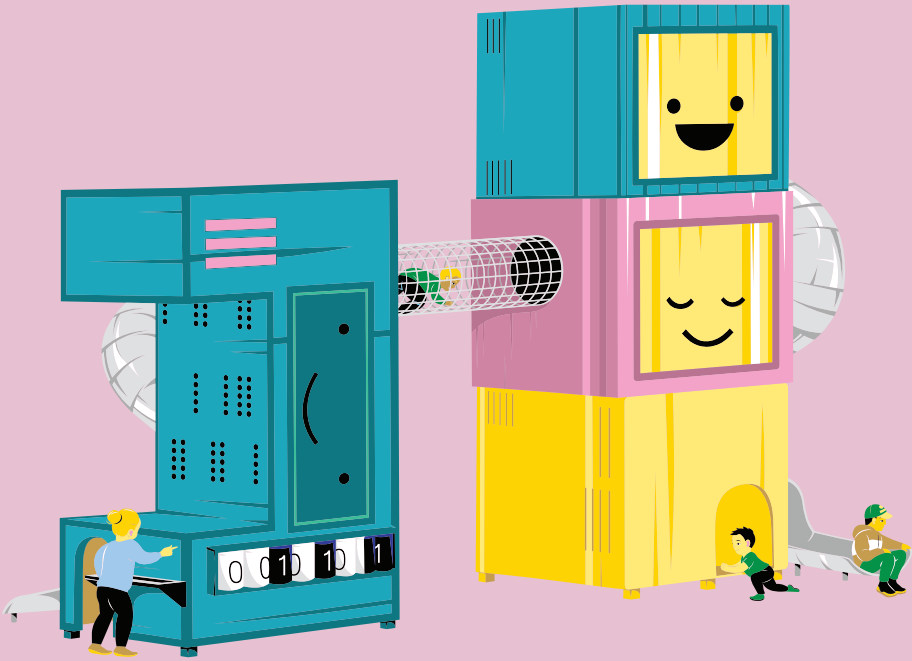
BINARY CALCULATOR



7-9

This activity supports students' understanding of the binary system, logical reasoning, and numeracy. It also promotes technological proficiency through the use of digital tools for calculations.

Binary Calculator

Find the green computer tower and the binary abacus nearby. What decimal number does the binary sequence below represent? Can you create your birthdate using the abacus or add numbers together? Use a phone as needed..

0101110100000111

Binary is a number system that uses only two digits: 0 and 1.

When you want to convert a binary number to a decimal number, follow these steps:

Write down the binary number.

Example: 0101110100000111

Assign a place value to each bit, starting from the right.

The place values are powers of 2:

The rightmost bit: $2^0 = 1$

The second bit from the right: $2^1 = 2$

The third bit: $2^2 = 4$

The fourth bit: $2^3 = 8$

And so on.

Go through the binary number and add together only the values where the bit is 1.

For example, in 0101110100000111:

$2^0 = 1$

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^7 = 128$

$2^9 = 512$

$2^{10} = 1024$

$2^{12} = 4096$

Add together all these values:

4096 + 1024 + 512 + 128 + 8 + 4 + 2 + 1 = 23,431

Converting a decimal number to a binary number:

If you want to convert a decimal number to binary, follow these steps:

Start with the decimal number.

Example: 23

Find the largest power of 2 that fits into the number.

The largest 2's power ≤ 23 is 16 (2^4).

Subtract that value from the number.

23 - 16 = 7

Repeat the process for the remaining value:

Largest ≤ 7 is 4 (2^2) → 7 - 4 = 3

Largest ≤ 3 is 2 (2^1) → 3 - 2 = 1

Largest ≤ 1 is 1 (2^0) → 1 - 1 = 0

Write down the binary number, starting from the largest power of 2:

16 (2^4) → bit 1

8 (2^3) → bit 0

4 (2^2) → bit 1

2 (2^1) → bit 1

1 (2^0) → bit 1

Thus, the decimal number 23 = binary number 10111

Curriculum Connections:

- **Grades 7-9:** Students deepen their mathematical thinking and develop skills in applying ICT concepts (Mathematics, ICT).