

Problem of the Block - Block 3



Negative-Based Campaign

The number 10 is a base for all the positive integers because every positive integer can be written uniquely as

$$d_n 10^n + d_{n-1} 10^{n-1} + d_{n-2} 10^{n-2} + \cdots + d_1 10 + d_0$$

where each d_i is one of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. This is called the decimal representation of the number.

Similarly, the number -2 is also a base for all integers (even negative ones), since every integer can be written uniquely as

$$b_n (-2)^n + b_{n-1} (-2)^{n-1} + b_{n-2} (-2)^{n-2} + \cdots + b_1 (-2) + b_0$$

where each b_i is one of the digits 0 or 1.

For example, in base -2 , 1101 represents the number -3 , since

$$1(-2)^3 + 1(-2)^2 + 0(-2) + 1 = -3$$

This month's Problem of the Block is to find the representation, in base -2 , for the (decimal) number -2374 . Needless to say, you have to show your work on this one. You will not receive credit if you use computer software to find the answer, but you will receive credit if you write a program that finds the answer. Of course, it is also possible to solve this problem with pencil and paper, using no computer at all.

Turn in solutions to Dr. Bean in Law 206E or by email at sbean@cornellcollege.edu by Wednesday, November 15th. You may ask any Mathematics and Statistics faculty member about the questions, but Dr. Bean wrote them (and therefore at one time at least knew the answer to them) so that might be your best bet.

Partial solutions will receive credit (and are encouraged!). Submitting solutions for the Problem of the Block can earn culture points toward the major in mathematics.

For more information about the Problem of the Block, including the current leader board for the yearly competition, and to print off your own copy visit <http://www.cornellcollege.edu/mathematics/problem-of-the-block/index.shtml>.