

The Cow Problem

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We are looking to find all the quadruples such that for the first number “i” of each quadruple, the next three numbers of the quadruple satisfy the following relation:

$i-1=i/x+i/y+i/z$ if our quadruple is denoted as (n,x,y,z) . We can also substitute 1 with a more general step “k”.

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(*The function Cow needs two integers as inputs. The first integer represents the
integer "n" up to what we need to search for quadruples that share the property
and the second integer represents the "step" as we have described above *)
Cow[n_Integer, k_Integer] := For[i = 1, i ≤ n, i++,
For[x = 1, x ≤ i + 1, x++,
For[y = x, y ≤ i + 1, y++,
For[z = y, z ≤ i + 1, z++,
If[Mod[i, x] == 0 && Mod[i, y] == 0 && Mod[i, z] == 0 && i - k == i/x + i/y + i/z,
Print[i - k, "(", x, ", ", y, ", ", z, ")"] ]]]]]
Cow[
100,
1]
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3 (4,4,4)

5 (2,6,6)

5 (3,3,6)

7 (2,4,8)

9 (2,5,5)

11 (2,3,12)

11 (2,4,6)

11 (3,3,4)

17 (2,3,9)

19 (2,4,5)

23 (2,3,8)

41 (2,3,7)

Cow[100, 2]

3 (5,5,5)

4 (3,6,6)

6 (2,8,8)

6 (4,4,4)

7 (3,3,9)

8 (2,5,10)

10 (2,4,12)

10 (2,6,6)

10 (3,3,6)

10 (3,4,4)

13 (3,3,5)

14 (2,4,8)

16 (2,3,18)

18 (2,5,5)

22 (2,3,12)

22 (2,4,6)

22 (3,3,4)

28 (2,3,10)

34 (2,3,9)

38 (2,4,5)

46 (2,3,8)

82 (2,3,7)

(*However, when we increase n, the programme is not efficient *)

Cow[200, 1]

3 (4,4,4)

5 (2,6,6)

5 (3,3,6)

7 (2,4,8)

9 (2,5,5)

11 (2,3,12)

11 (2,4,6)

11 (3,3,4)

17 (2,3,9)

19 (2,4,5)

23 (2,3,8)

41 (2,3,7)