NMU Math & CS Department

Problem of the Month, January 2024

Choose a positive integer n. Show that there exists a positive integer that is divisible by n, with each of its digits equal to either 1 or 0 (in base ten).

For example, if you choose $n = 3$, then 111 works. Of course there are others, such as 1101, 1011, etc., but you just have to show that one such integer exists, for any n.

Here's a few more examples: if you choose $n = 4$, then 100 works; if you choose $n = 5$, then 10 works; if you choose $n = 6$, then 1110 works; and if you choose $n = 7$, then 1001 works.