

1. Find the prime factorizations of the following numbers:

(a) 16,777,216

(b) 123,456

(c) 100^5

(d) 9^{100}

(e) $6^{20} \cdot 15^{40}$

2. Find the following:

(a) $42 \pmod{9}$

(b) $-3 \pmod{2}$

(c) $531 \pmod{7}$

(d) $-100 \pmod{8}$

(e) $1000 \pmod{11}$

3. Find the next 16 terms of $v_2(n) \pmod{2}$ (that is, for n from 17 to 32).

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
$v_2(n)$	0	1	0	2	0	1	0	3	0	1	0	2	0	1	0	4
$v_2(n) \pmod{2}$	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0

4. Make your own fractal! Choose $q \geq 4$ and $P > 100$. Try some values of k and choose the most appealing image, then upload it to Canvas by the beginning of class Wednesday. Remember, the solutions to

$$T(2^q) \cdot \alpha_0 + T(2^{q-1}) \cdot \alpha_1 \equiv \frac{P}{2} \pmod{P}$$

are

$$\left(k \cdot T(2^{q-1}) \pmod{P}, \frac{P}{2} - k \cdot T(2^q) \pmod{P} \right), \quad 1 \leq k \leq P.$$