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1.

$\varphi(122) = \varphi(2)\cdot\varphi(61) = 60$

$\varphi(p^n) = (p-1)\cdot p^{n-1}$

122	2
61	61
1	

$\boxed{\varphi(122) = 60}$

$19^{-1234567}$ mod 122

Calculamos (19, 122)

$122 \,\underline{|19}$ → 8, 6
$19 \,\underline{|8}$ → 3, 2
$8 \,\underline{|3}$ → 2, 2
$3 \,\underline{|2}$ → 1, 1
$2 \,\underline{|1}$ → 0, 2

$(19, 122) = 1$

Usamos Teorema de Euler

si $(n, a) = 1 \Rightarrow a^{\varphi(n)} \equiv 1 \bmod (n)$

Hemos comprobado que $(19, 122) = 1$.

Ahora calculamos $-1234567 \bmod \varphi(122) = 60$

~~$-1234567 \,\underline{|60}$; $-20(-5)\cdot(-7)(-7)$; 120 ; -345 ; $+300$; -456 ; $+420$; -367~~

$-1234567 \,\underline{|60}$; $-20(-5)\cdot(-7)\cdot(-8)$
120
-345
$+300$
-456
$+420$
-367
420
113

$-1234567 : 60 \simeq 20578$

Ahora calculamos 113 mod 60

$113 \,\underline{|60}$ → 53, 1

$113 \bmod 60 \equiv 53 \bmod 60$

~~$19^{53} \bmod (60) = (19^5)^{10}\cdot 19^3$~~

$19^{53} \bmod 60$

$19^{53} \bmod 60 = (19^6)^8 \cdot 19^6$

$19^6 \bmod 60 = 1$

$19^{53} \bmod 60 = (1)^8 \cdot 1 = 1^9 = 1 \bmod (122)$

Sol $19^{-1234567} \equiv 1 \bmod 122$