

A3: Let $T_d := 18^d + 1$ for $d = 3, 5, 7, 9, 11, \dots$. Prove that each such T_d is composite.

[Hint: Look at $T_{\text{Odd}} \pmod{N}$, for an appropriate N .]

End of Class-A

A1: *Show no work.*

a Cubic polynomial $h(x) := [x + 5][x - 11][x + 37]$ has K many roots in \mathbb{Z}_8 , and N many roots in \mathbb{Z}_{120} , where $K = \dots$ and $N = \dots$. [Hint: CRT.]

b Euler $\varphi(36300) = 2^A \cdot 3^B \cdot 5^C \cdot 7^D \cdot 11^E$, where $A = \dots$, $B = \dots$, $C = \dots$, $D = \dots$, $E = \dots$.

As a single number, $\tau(36300) = \dots$.

c Fix a prime q and natnums J and R . Then a closed-formula for $\sigma_J(q^R)$ is: $\sigma_J(q^R) = \dots$.

Apply the [correct] CF; leave your answer as a product: $\sigma_2(140) = \dots$

d The **Blip-numbers** comprise $\mathcal{B} := 1 + 3\mathbb{N}$. **B**-number $385 \stackrel{\text{note}}{=} 35 \cdot 11$ is **B-irreducible**: T F
B-number $N := 85$ is **not B-prime** because **B**-numbers $J := \dots$ and $K := \dots$ satisfy that $N \bullet [J \cdot K]$, **yet** $N \nmid J$ and $N \nmid K$.

e Multinomial coefficient $\binom{9}{4, 2, 3} = \dots = \dots$
 [Note: Write your ans. ITOF factorials, then **also** write it as a single integer, or product of two, **without** factorials.]

OYOP: *In grammatical English sentences, write your essays on every **third** line (usually), so that I can easily write between the lines. Start each essay on a **new** sheet of paper.*

A2: State Wilson's Thm. Carefully prove Wilson's Thm.

More on next page...

A1: _____ 125pts
A2: _____ 45pts
A3: _____ 35pts

Total: _____ 205pts