

# Some Elementary Number Theory Problems\*

Coolmanboi

November 2020

1. What does the Fundamental Theorem of Arithmetic state?
2. Express the following as a product of power of primes:
  - (a) 4500
  - (b) 2349960
  - (c) 231
  - (d) 343
  - (e) 216
  - (f) 288
3. All integers are of the form  $2x + 1$  for some integer  $x$ . True or False?
4. If  $b \mid a$  and  $a \mid c$ , does this imply  $b \mid c$ ?
5. For any natural number  $p$ , can  $4^p$  end in zero?
6. If  $t^x = 49$ ,  $(t, x \in \mathbb{Z}^{\geq 0})$ , find the value of

$$x^2t + xt^2 + 2tx$$

7. If  $2^x \cdot 3^y \cdot 5^z \cdot 7^{(t^2+2t+1)} = 180$ , find the value of

$$(t+1)(x^3 + y^3 + z^3)(xy + yz + xz)$$

8. If  $a, b, c$  are whole numbers that satisfy  $3^a \cdot 5^b \cdot 7^c = 105$ , then what is the value of

$$a - (b + c)$$

9. If  $\alpha\beta^2\gamma = 12$ , find

$$\alpha + \beta + \gamma$$

where  $\alpha, \beta, \gamma \in \mathbb{N}$  and  $\beta$  is a prime such that  $\beta \mid 4^p$  and  $\alpha > \beta > \gamma$

---

\*Check [Coolmanboi's website](#) out