

### Lesson Plan for Number Theory

Chapter	Course contents/ Topics	Lecture hours	Topics *	Problems
1	Introduction of number theory	1		1,2,3,4,6
2	Pythagorean Triples	2	T1	1,2,3,4,5,6,7,8
3	Pythagorean Triples and the unit circle	1	T1	1,2,3,4
4,5	Fermat's last theorem and Divisibility and the GCD	1	Euclidian algorithm	
		1		1,4
6	Linear Equations and GCD	2	T1	1,4,2,5
7	Factorization and Fundamental theorem of arithmetic	2	L1,T2, Even Number world	1,3,2,4
8	Congruences	2	T1,T2	1,2,3,5,6,7
9	Congruences, power, and Fermat's little theorem	2	T1,L2	1,2,4
10	Congruence , powers and Euler's Formula	2	T1,L2	2,3
11	Euler's phi function and Chinese remainder Theorem	1	T1,T2	1,3,5,9
12	Prime numbers	2	T1,T2	1,2,5,6
13	Counting Primes	2	T1(WP), C2,C3,C4( Discussion all for Conjectures)	2,6,3,4
14	Mersenne Primes	1	P1	1,2,3
15	Mersenne Primes and Perfect Numbers	2	T1,T2,T3 T4(WP)	1,2,3,8,4,5
16	Powers Modulo m and Successive Squaring	1	Algorithm 1	1,2
17	Computing kth roots Modulo m	1	Algorithm 1	1,2
18	Powers, Roots, and "Unbreakable" Codes	1		
19	Primality Testing and Carmichael Numbers	1	T1,T2	3,4
20	Squares modulo p	1	T1,T2(WP),T3	1,2
21	Quadratic Reciprocity	1	T1(WP)	1,4,7,8
22	Proof of Quadratic Reciprocity	1	T1(WP),L2(WP),L3 (Verification)	1,3
23	Which Primes are Sums of Two Squares?	2	T1(WP), Desacend procedure	2,3,4
24	Which Numbers are Sums of two squares?	1	T1(WP),	1,2,3,4

25	Euler's Phi Function and Sums of Divisors	2	L1,T2	1,2
26	Powers Modulo p and primitive Roots	1	T1(WP), T2(WP)	2,5(New Question)
27	Primitive Roots and Indices	1	T1(WP)	1,2
28	The Equation $X^4+Y^4=Z^4$	1	Discussion of $X^4+Y^4=Z^4$	1,2
29	Square-Triangular number Revisited		Th-1	1, 2
30	Pell's Equation		Th-1	2,3
31	Diophantine equation		The Pigeonhole Principle	2,3
33	Number Theory and Imaginary Numbers			3,4,5,6

\* Without Proof (WP), Theorems (T), Lemma(L), Conjecture(C), Proposition (P)

**Red letters to be solved in the class and black letters to be given as homework.**

**Book:** A Friendly introduction to Number Theory ,Fourth Edition

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