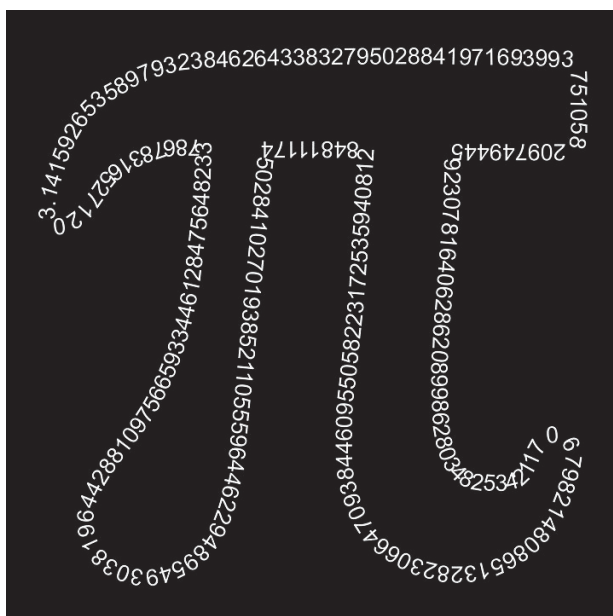# MATHS BASIC COURSE FOR UNDERGRADUATES

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STATEMENTS: 5th SUBJECT. CONGRUENCES

Exercise 1. *Calculate the remainder of the following number n when it is divided by 12.*

$$n = 1! + 2! + 3! + \cdots + 99! + 100!.$$

Exercise 2. *Prove that for any $k \geq 1$, $7 \mid (5^{2k} + 3 \cdot 2^{5k-2})$.*

Exercise 3. *Prove that an integer number n expressed in decimal form is divisible by 9 if and only if the sum of its digits is divisible by 9.*

Exercise 4. *Calculate the remainder obtained dividing 614^{6943} by 17.*

Exercise 5. *Solve the linear congruence $13x \equiv 2 (mod\ 31)$.*

Exercise 6. *Prove Wilson's Theorem: If p is a prime number, then $(p-1)! + 1 \equiv 0 (mod\ p)$.*