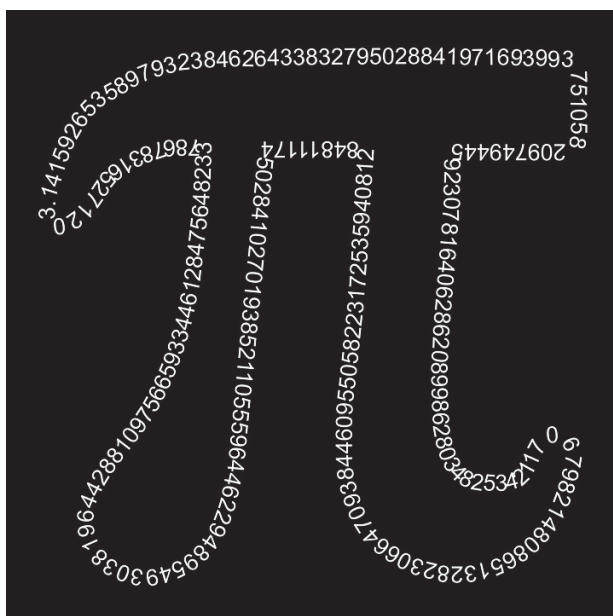


MATHS BASIC COURSE FOR UNDERGRADUATES



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STATEMENTS: 1st SUBJECT. SET THEORY

Exercise 1. Let $A = \{1, 2, 3\}$ be a set. Say which is the relation between the sets $\{1, 2\}$, $\{1, 4\}$ and the set A , and calculate all the subsets of the set A .

Exercise 2. Let $A = \{1, 2, 3\}$ and $B = \{x, y\}$ be two sets. Calculate $A \times B$.

Exercise 3. Reduce the following expressions:

$$a)(A \cup B) \cup (A \cap (C \cup B))$$

$$b)(A \cap B) \cup (C \cap A) \cup (A^c \cap B^c)^c$$

Exercise 4. Let A be the set formed by all the multiples of 4 and $B \subset \mathbb{N}$ the set formed by all the natural numbers whose last digit is equal to 4. Prove that $A \not\subseteq B$ and $B \not\subseteq A$.

Exercise 5. Let us define in $\mathbb{Z}$ the following $\mathcal{R}$ relation: $m\mathcal{R}n$ if and only if $m - n$ is even.

- (i) Is $\mathcal{R}$ an equivalence relation?
- (ii) Which integer numbers are related to 2 (i.e which integer numbers are in the same equivalence class as 2)?
- (iii) Which integer numbers are related to 2008? And to -11 ?

Exercise 6. Let us define in $\mathbb{Z}$ the following $\mathcal{R}$ relation: $m\mathcal{R}n$ if and only if $m - n$ is a multiple of 3.

- (i) Is $\mathcal{R}$ an equivalence relation?
- (ii) Which integer numbers are related to 3 (i.e which integer numbers are in the same equivalence class as 3)?
- (iii) Which integer numbers are related to 2013? And to -11 ?

Exercise 7. Let us consider in $\mathbb{Z} \times \mathbb{Z}^*$ the following equivalence relation:

$$(a, b)\mathcal{R}(c, d) \iff ad = cb.$$

Express the equivalence class of any couple $(a, b) \in \mathbb{Z} \times \mathbb{Z}^*$ and calculate the associated quotient set.