Problem Collection

A collective effort of ISI Bangalore 2021-2024 batch

November 5, 2021

Contents

1 Introduction

2 Problems

2.1 Week 1

Problem 1. Let α be the greatest positive root of $x^3 - 3x^2 + 1 = 0$. Prove that

$$17 \mid \lfloor \alpha^{1996} \rfloor$$

(shared by Aaratrick Basu)

Problem 2. Find all n-tuples of positive integers $(a_1, a_2, \ldots, a_n)$ such that

$$(a_1! - 1)(a_2! - 1) \cdots (a_n! - 1) - 16$$

is a perfect square.

(shared by Soumya Dasgupta)

Problem 3. Find the angles A, B, C of all possible triangles ABC such that $\tan A, \tan B, \tan C \in \mathbb{N}$

(shared by Bikram Halder)

2.2 Week 2

2.3 Week 3

3 Solutions

3.1 Week 1

3.2 Week 2

3.3 Week 3

4 Demo

This are all the environment styles available in this project. Feel free to add some more newenvironments, if you want. Just make sure to add them in the styles.tex file, and leave a comment so that everyone can see the changes.

Theorem 4.1. *This is a theorem.*

Problem 4. This is a problem.

Corollary 4.1.1. *This is a corollary from 4.1*

Lemma 4.2. *This is a lemma.*

Example 4.2.1. This is an example.

Solution. This is a solution. ■

Proof. This is a proof. □