

Final report on the CIMPA school on:
Group Actions in Arithmetic and Geometry
Gadjah Mada University, Yogyakarta, Indonesia.
February 17-28, 2020



The CIMPA research school “ Group Actions in Arithmetic and Geometry” was organized by CIMPA in conjunction with the Gadjah Mada University, Yogyakarta, Indonesia. It was held at the **Gadjah Mada University, Yogyakarta, Indonesia**, from the 17th to the 28th of February 2020. The website of the school with updated information is located at

<http://www.rnta.eu/Yogyakarta2020/>

The classes were given by **12 lecturers from 4 different countries** including 4 from Italy, 3 from France and Indonesia and 2 from the Nedeerlands. There were 6 female lecturers which is 50% of the total number of lecturers.

There were **65 participants** (not including the lecturers) from 11 countries including 38 from Indonesia, 10 from the Philippines, 4 from India, 3 each from Thailand and Vietnam, and 1 each from Canada, Croatia, Germany, Iran, Myanmar, and Turkey; the last participant was the representative of CIMPA coming from Spain. We had 26 female and 39 male participants, so the percentage of female participant is 40% of the total number of participants.

The school obtained support from CIMPA, the Commission for Developing Countries of the International Mathematical Union (IMU-CDC), Foundation Compositio Mathematica, the Italian Minister for Foreign Affairs and International Cooperation, the International Center for Theoretical Physics, Gadjah Mada University, the Faculty of Mathematics and Natural Sciences of Gadjah Mada University and the Department of Mathematics of Gadjah Mada University and was organized in cooperation with the Roman Number Theory Association.

The program of the school was designed to give a wide variety of **instances of actions of groups in arithmetic and geometry**. The **training sessions** were of two/three types depending on the course. In one type the students were assigned problems and had to solve them, individually or in small groups, during the session with the help of the instructors. This approach was followed, for the most part, by the lecturers of the course in Groups and symmetries in geometry, Modular forms and partially by Coding theory and Finite fields. Another format consisted in the lecturers presenting solutions to previously assigned exercises. This approach was used partially by all the lecturers. Finally the lecturers of Galois theory and Finite fields introduced and used the free software PARI as a method to do explicit computations.

After a proposition of local organisers as well as CIMPA direction, all the talks have been **video recorded**. The records will be soon on a website managed by CIMPA.



The **opening ceremony** was held at the end of the first day of classes. Mr. Thierry Maré, Attaché de coopération scientifique et technologique of the French embassy traveled from Jakarta to attend. There were several speeches from representatives of the various agencies involved in the school. Moreover, I Made Andi Arsana, Ph.D. the Head of Office International Affairs UGM and Prof. Dr. Triyono, the Dean of Faculty of Mathematics and Natural Sciences, UGM delivered welcome addresses. Below a picture taken at the end of the opening ceremony.



Over the weekend, a **full day excursion** took place on Saturday. We started by taking some group photo in two different location at the university. Most participants wore the t-shirt of the school, made by the local committee.



We then visited the Sambisari Temple, the Plaosan Temple and, after a typical lunch, the Breksi Cliff Park. It was a good occasion for social interaction and for students to ask question

about future schools and programs and fellowships to study in Europe.



Participants were hosted in the MM UGM Hotel, a university owned hotel on campus and they could reach the venue of the school by foot. Lunches were taken, by means of lunch boxes on the premises of the school while student had their supper at the hotel. The hotel has several common spaces with tables which were ideal for studying. On the Thursday of the second week, the Faculty of Mathematics and Natural Sciences of Gadjah Mada University invited all participants to a dinner on a stunning location overlooking the Prambanan Temple complex, followed by the attendance to a classic Ramayana Ballet.

Classes were held at the Seminar Room on the 2nd Floor of UGM Central Library which was perfectly suited to the scope, with two screen and two large white board.



Below you find the members of the various committees, the program of the school, the list of participants, and the detailed budget.

Scientific Committee

Marusia Rebolledo **External coordinator** (Université Clermont Auvergne)
Bas Edixhoven (Universiteit Leiden, The Netherlands)
Intan Muchtadi-Alamsyah (Institut Teknologi Bandung Indonesia)
René Schoof (Università di Roma "Tor Vergata" Italy)
Peter Stevenhagen (Universiteit Leiden, The Netherlands)
Valerio Talamanca (Università Roma Tre Italy)

Local Committee: all members of the local committee are from Gadjah Mada University.

Sri Wahyuni **Local coordinator**
Indah Wijayanti
Naimah Hijriati
Sutopo

Ari Dwi Hartanto
Iwan Ernanto

Courses

Each course was of 6 hours of lectures and 3 hours of training sessions.

Groups and symmetries in geometry *Bas Edixhoven and Intan Muchtadi-Alamsyah*

Representation theory of finite groups *Laura Geatti and René Schoof*

Coding theory *Elisa Lorenzo Garcia and Kiki Ariyanti Sugeng*

Finite fields and number theory *Francesco Pappalardi and Michel Waldschmidt*

Modular forms *Marusia Rebolledo and Valerio Talamanca*

Galois theory and profinite groups *Peter Stevenhagen and Indah Wijayanti*

Lecturers

<p>Kiki Ariyanti Sugeng Departemen Matematika Universitas Indonesia</p> 	<p>Intan Muchtadi-Alamsyah Fakultas Matematika dan Ilmu Pengetahuan Alam Institut Teknologi Bandung</p> 	<p>Peter Stevenhagen Mathematisch Instituut Universiteit Leiden</p> 
<p>Bas Edixhoven Mathematisch Instituut Universiteit Leiden</p> 	<p>Francesco Pappalardi Dipartimento di Matematica e Fisica Università Roma Tre</p> 	<p>Valerio Talamanca Dipartimento di Matematica e Fisica Università Roma Tre</p> 
<p>Laura Geatti Dipartimento di Matematica Università di Roma "Tor Vergata"</p> 	<p>Marusia Rebolledo Laboratoire de Mathématiques Université Blaise Pascal Clermont-Ferrand 2</p> 	<p>Michel Waldschmidt Sorbonne Université</p> 
<p>Elisa Lorenzo Garcia Institut de recherche mathématique de Rennes Université de Rennes 1</p> 	<p>René Schoof Dipartimento di Matematica Università di Roma "Tor Vergata"</p> 	<p>Indah Wijayanti Departemen Matematika Universitas Gadjah Mada</p> 

Participants

Alaap Hasan, University of Hyderabad
Alfilgen Sebanda, Mindanao State University - Iligan Institute of Technology
Antonela Trobvic, University of Zagreb
Ari Dwi Hartanto, UGM Yogyakarta
Aristeo Abecia, University of Science and Technology of Southern Philippines
Asyraf Wajih ITB Bandung
Carlo Francisco Chavez Adajar,
Dat Tran, Ho Chi Minh University of Pedagogy
Dewa Putu Wiadnyana Putra,, USD Yogyakarta
Dian Pratama, UNU Purwokerto
Dinni Rahna Oktaviani, UIN Semarang
Elsi Fitria, Unri - Pekanbaru Sumatra
Era Setya Cahyati, UGM Yogyakarta
Eunike Setiawan, UI Jakarta
Ezra Waxman, Technische Universität Dresden
Fawwaz Fakhurrozi Hadiputra, UI Jakarta

Galih Pradananta, ITB Bandung
Gari Lincoln Chua, University of the Philippines Diliman
Henry Willyam Michel Patty, Unpati - Ambon
Intan Nisfulaila, UIN Malang
Irmatul Hasanah, UIN SMH Banten
Iwan Ernanto, UGM Yogyakarta
Jimboy Albaracin, Mindanao State University - Iligan Institute of Technology
John Lawrence Fabrero, Institute of Mathematics, UP Diliman
Juan Danie, UI Jakarta
Juancho Collera, University of the Philippines Baguio
Juanda Kelana, Putra UIN Semarang
Khalil Besrou, University of Ottawa
Kholida Khoirunnisa, UGM Yogyakarta
Laurence Petrus Wijaya, ITB Bandung
Mabud Ali Sarkar ,The University of Burdwan
Maryam Emam-Jomeh Zadeh, University of Tehran
Mochammad Zulfikar Aditya, ITB Bandung
Mu'amar Musa Nurwigantara, UGM Yogyakarta
Muhammad Imran, UGM Yogyakarta
Muhammad Sadno, ITB Bandung
Myat Hlaing Nyunt,
Na'imah Hijriati, UGM Yogyakarta / Unlam - Kalimantan
Nam Le, Ho Chi Minh University of Pedagogy
Natthaphong Chitmung ,Chulalongkorn University
Nihal Bircan Kaya, Cankiri Karatekin University,Turkey
Nikken Prima Puspita, UGM Yogyakarta
Novita Dahoklory, UGM Yogyakarta
Nur Erawaty, Unhas Makassar
Phaphontee Yamchote, Chulalongkorn University
Phornpassorn Boonchu, Chulalongkorn University
Qonita Qurrota A'yun , UGM Yogyakarta
Raiza Corpuz, University of the Philippines Diliman
Ricky Aditya, USD Yogyakarta
Rohaima Amairanto , Mindanao State University-Iligan Institute of Technology
Rubayya, University of Hyderabad
Russelle Guadalupe, University of the Philippines-Diliman
Saman Abdurrahman, Unlam - Kalimantan
Shilpi Mandal, University of Hyderabad
Siti Humaira, ITB Bandung
Sri Novita Sari, UGM Yogyakarta
Steven, UPM / Ubinus Jakarta
Sutopo, UGM Yogyakarta
Trinh Le, Ho Chi Minh University of Pedagogy
Uha Isnaini, UGM Yogyakarta
Valentino Risali, UGM Yogyakarta
Wakhid Fitri Albar Albar, UGM Yogyakarta
Yanita, Unand Padang - Sumatra
Yunita Septriana Anwar, UM Mataram - Lombok