Locus and Coordinate Geometry

Mathematics Secondary 3

Level 2: School-based Pull-out Programme

Background and Notes

The design of the learning and teaching plan reflects the actual circumstances of the particular school at the time of implementation. As it is developed and tailor-made to meet the specific cognitive and affective needs of students, all learning and teaching resources are for reference only.

When adapting the materials, curriculum, instructional and assessment modifications can be made in accordance with the diverse needs and abilities, learning styles and aspirations of students, professional competence of teachers, and gifted education development of the schools.

Teachers are strongly recommended to read the introduction, theoretical background and summary of the resource package to have a better understanding of the principles of Gifted Education and strategies for implementation.

This unit includes 1 programme description and lesson plan, 5 worksheets and 1 file of students' work.

With reference to our resources, educators can design suitable learning activities and implement the elements of Gifted Education, based on students' needs and interests, and teaching experience, so as to unfold students' potentials to the fullest.

Topic —— Locus and Coordinate Geometry

Subject: Mathematics
Grade: Secondary 3

Operation Mode of Gifted Education	Level 2: School-based Pull-out Programme
No. of Lessons	6
Target Students	- Students having outstanding performance in mathematics - Students having strong interest in mathematics
Learning Objectives	- Students learn advanced content about coordinate geometry - Students can plot and investigate the graphs of functions - Students develop self-study skills and investigation skills

Programme Description

Coordinate Geometry is a topic usually taught in S3 mathematics curriculum. After learning the topics, students should have basic concepts about coordinate geometry, including the **slope of straight line** and the **distance formula**.

The programme serves as an extension to the regular curriculum. Students are expected to see some real-life application and learn advanced content about coordinate geometry. Self-study materials are provided to students from time to time to promote students' self-study skills and investigation skills. Also, students are introduced to an online graphing tool called "Desmos". With the aid of Desmos, students can plot the graph of functions easily and investigate the graphs.

Basic concepts about locus and equation of some common locus are discussed in the first lesson. In the second lesson, students learn to use Desmos. Next, students are divided into groups and have investigation about locus and coordinate geometry. Four investigation topics are included in the programme. Teacher can assign the topics to different groups or allow students to choose their topics. Students then discuss their topics both in the lesson and after the lesson. Teacher can also join their discussions to make sure students are on the right track. Students are required to present their findings in their own ways at the end of the programme.

Programme Details

Teacher can make use of the following information and resources to plan each lesson.

Lesson	Activity / Content	Learning & Teaching Resources
Pre-lesson Preparation	A pre-lesson worksheet is given to students about equation of straight line.	Pre-lesson Worksheet
1	Teacher reviews the pre-lesson worksheet and summarizes that geometry objects like straight lines can be represented by equations.	Lesson Worksheet 1
	Teacher introduces basic concepts of locus. Students then try to solve the problems about locus in the worksheet.	
2	Teacher introduces the basic use of Desmos[1].	Lesson Worksheet 2 Tablets / Desktops
	Students practise using Desmos with the tasks in the worksheets.	
3	Four different investigation topics are given to different groups. For each topic, students are required to learn some basic knowledge, then investigate the use of Desmos and prepare a presentation on their findings. The topics are: 1. *Polynomials and Roots* 2. *Functions and Transformations* 3. *Completing the Square* 4. *Parametric Equations*	Lesson Worksheet 3 (4 Topics)
	Teacher can ask students to discuss the questions on the worksheets. The investigation may not be finished within the lesson. Students need to continue afterwards.	
4	Students continue with their discussions. Teacher meets with each group to see whether students get correct findings. Teacher also give feedback or further questions about the investigation topics.	
	After meeting with the teacher, students can start thinking about how they should present their findings.	
5-6	Students present their findings. Teacher provides feedback and summarize students' findings.	
Extended Learning Activity	An extension worksheet is given to students. The worksheets introduce 3-dimensional coordinate system.	Extension Worksheet
	Online resources are provided, so students can learn to plot 3-dimensional curves and surfaces.	

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[1] https://www.desmos.com/calculator