Diploma Programme subject outline—Group 5: mathematics			
School name	ELA GREEN SCHOOL	**School code**	060876
Name of the DP subject *(indicate language)*	Mathematics: analysis and approaches		
Level *(indicate with X)*	Higher [X] Standard completed in two years [ ] Standard completed in one year * [ ]		
Name of the teacher who completed this outline	Raja Shekhar Reddy Malapati	**Date of IB training**	2 Oct -30 Oct 2019
Date when outline was completed	4 January 2022	**Name of workshop** *(indicate name of subject and workshop category)*	Mathematics: Analysis and approaches (Cat 2)

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

- Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.
- This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.
- This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.
- If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

	Topic/unit (as identified in the IB subject guide) *State the topics/units in the order you are planning to teach them.*	Contents	Allocated time One class is 45 minutes. In one week there are 6 classes.	Assessment instruments to be used	Resources *List the main resources to be used, including information technology if applicable.*
Year 1	Number and Algebra	Numbers – rounding – scientific form Sequences in general - Series Arithmetic sequences Geometric sequences Applications of G.S. – Percentage growth) The Binomial Theorem – (a+b)n Deductive proof Methods of proof Mathematical induction Complex numbers – basic operations Polynomials over the Complex field The complex plane De Moivre's theorem Roots of $z^n=a$ Systems of linear equations	39 hours	**Using formative assessment in the classroom.** Just by simple definition the word formative is coined out of the word information. Formative assessment is one way of providing detailed actionable feedback to the students focusing on part of a unit that has been covered or even the entire topic that they have through. This feedback is very important because it will give them the opportunity to reflect and take action based on their learning experience within that unit. Formative assessment can take multiple forms: quiz, video, a conversation teacher-student, an application to a new situation, can be written, oral, multimedia and in this way adapt to different types of intelligence.	Subject guide, syllabus, class expectations and procedures discussed, notation list, formula booklet. ● CASIO CG 20 (graphic display calculator – GDC). Oxford IB Diploma Programme: IB Mathematics: analysis and approaches, Higher Level IB Question Bank IB exchange https://www.christosnikolaidis.com/en/ Emulator Desmos Geogebra **Good Websites for Inspiring Mathematics!** ● Nrich Maths: https://nrich.maths.org/ ● Pacific Institute for the Mathematical Sciences: http://www.mathtube.org/

	Functions	Lines (or Linear functions) Quadratics (or Quadratic functions) Functions, domain, range, graph Composition of functions: fog The inverse function: f -1 Transformations of functions Asymptotes Exponents – the exponential function a^x Logarithms – the logarithmic function $\log_a x$ Exponential Equations Polynomial functions Sum and Product of roots Rational functions – Partial fractions Polynomial and rational inequalities Symmetries of f(x) – More transformations Modulus equations and inequalities	32 hours	Informs learning by: **1.** feedback: differentiation of teaching approaches for the range of student in a classroom will occur more promptly and naturally. **2.** active learning: students must be intellectually engaged by asking questions, testing ideas, answering questions, connecting topic(s) of lesson to previously learned material, and consider extensions and difficulties. **3.** reflection: concepts & skills are retained more robustly when students think back on the activity/lesson and verify that it makes sense to them; mind maps are an effective reflection tool. ● Students are honest. Since the marks don't "count", they do not take the trouble to cheat or ask to be excused. You can get a real impression of where they are at. You can even get them to mark each other's work - they are often quite good at this. ● It's quicker to	● Vi Hart: http://vihart.com/, https://www.youtube.com/user/Vihart ● Plus Maths: https://plus.maths.org/content/ ● Numberphile: http://www.numberphile.com/ https://www.youtube.com/user/numberphile ● YouCubed: https://www.youcubed.org/tasks/ ● Math Science Music: https://mathsciencemusic.org/ ● ESPN Sport Science: http://www.espn.com/espn/sportscience/index ● Teach It Maths: https://www.teachitmaths.co.uk/investigations ● Dan Meyer's 3-Act Math: https://docs.google.com/spreadsheets/d/1jXSt_CoDzyDFeJimZxnhgwOVsWkTQEsfqouLWNNC6Z4/pub?output=html ● Math Factor Podcast: https://itunes.apple.com/gb/podcast/the-math-factor/id81854832 ● Yummy Maths: http://www.yummymath.com/ ● NASA – Explore Space Through Math https://www.nasa.gov/audience/foreducators/exploringmath/home/ ● Qedcat: https://www.qedcat.com/ ● Mathematical Intelligencer: http://www.springer.com/mathematics/journal/283 ● Math in the Movies:

	Trigonometry (part of the topic)	3D Geometry Triangles – Sine and Cosine rules Applications in 3D Geometry – Navigation The trigonometric circle – Arcs and Sectors sinθ, cosθ, tanθ on the unit circle Trigonometric identities and equations Trigonometric functions More trigonometric equations – identities Inverse trigonometric functions	20 hours	organise at most schools, as summative assessments must be carefully scheduled in advance so as not to collide with assessments from other subjects. But a quick formative assessment doesn't need any warning or special timing. ● I can focus the assessment on the particular skill or concept which I am interested in. I don't need to cover every concept or skill or achieve a balance of the categories (knowledge, communication, etc) which is necessary in a summative assignment. **Formative assessment** I conduct Formative assessment almost in every class. While introducing the new concept, I check the prior learning.	https://www.qedcat.com/moviemath/ ● Wolfram Alpha: https://www.wolframalpha.com/ ● Pamoja Maths http://ibmathpamoja.edublogs.org/category/internal-assessnebt/exploration-ideas/ ● Great Maths Teaching Ideas: http://www.greatmathsteachingideas.com/ ● Itune Math podcasts: https://itunes.apple.com/gb/podcast/the-math-factor/id81854832 “Jing” is a free download that students can use to make quick (5 minute max) , effective videos that can be shared with teachers and students. It can be used to complete homework, enrich a problem, or ask questions. The best part is that it captures the students writing as they work on their laptops. https://www.techsmith.com/jing-tool.html We use Desmos a lot. It has a feature called Desmos Activity Builder that allows the teacher to create and develop specific units of instruction and enrichment. https://www.desmos.com/ Online Graphing Calculators: https://www.desmos.com/calculator Parlay is a neat way to record observations and conversations in the classroom. https://parlayideas.com/ Recognizing there are many graphing software’s available, FXGraph is very visually pleasing and has excellent

	Calculus **(part of the topic)**	The limit lim f (x) – The derivative f ´(x) Derivatives of known functions – Rules Tangent line – Normal line at some point xo The chain rule Monotony – max, min Concavity – points of inflection Optimisation Implicit differentiation (without kinematics) Rate of change problems The indefinite integral Integration by substitution Further integration by substitution Integration by parts The definite integral - Areas between curves Further areas between curves - Volumes	35 hours	I start every class by checking the understanding of the concepts taught in the previous class. Solving a problem, a discussion or investigation from the Oxford text book.	annotation capabilities. http://www.efofex.com/fxgraph.php This is a superb software for statistical analysis. https://fathom.concord.org/ Google Classroom - allows the easy distribution of materials and assignments and provides a forum for class discussion. Google forms - I have used this to build short formative assessments into everyday lessons. This has provided a very efficient way of providing feedback on student examples. It has a nice ' Most missed questions' feature allowing you to quickly identify and deal with misunderstandings and misconceptions. GIZMOS - this provides students with an interactive applet that allows them to explore and develop mathematical concept and theorems for themselves. It has built in investigations and lesson plans that can be edited. It is a great way of providing students with a visual representation of mathematical models and problems. Geogebra - free graphing software and much more. Can be downloaded or added as a Google add-in. Allows students to graph and explore various concepts visually. It has a very intuitive design that allows teachers to quickly build investigations by the use of sliders. Can also be used for Statistics

Year 2	Calculus (Continued)	Continuity and differentiability L'Hôpital's rule Kinematics (+last paragraph of 5.14) Differential equations Maclaurin series – Extension of Binomial Theorem	20 hours	**Summative assessment** at the end of every unit. End of semester exams and Prefinals/ Mocks before final exams.	
	Vectors	Vectors: Geometric representation Vectors: Algebraic representation Scalar (or Dot) product – angle between vectors Vector equation of a line in 2D Vector equation of a line in 3D Vector (or Cross) product Planes Intersections among lines and planes Distances	31 hours		

	Statistics and Probability	Basic concepts of Statistics Measures of central tendency – Measures of spread Frequency tables – Grouped Data Regression Elementary Set Theory Probability Conditional probability – Independent events Tree diagrams Distributions – Discrete random variables Binomial distribution – B(n,p) Normal distribution – N(μ,σ) Continuous random variables Counting – Permutations – Combinations	33 hours		

	The toolkit and the mathematical exploration (Year 1 & 2 Combined)	Investigative, problem-solving and modelling skills development leading to an individual exploration. The exploration is a piece of written work that involves investigating an area of mathematics.	30 hours		

2. IB internal assessment requirement to be completed during the course

Briefly explain how and when you will work on it. Include the date when you will first introduce the internal assessment requirement to your students, the different stages and when the internal assessment requirement will be due.

I shall introduce exploration (IA) in grade 11 in the month of August. I shall make them understand the assessment criterion and also mark a few samples. Create mind maps as a group and then start working individually. In the second semester of grade 11, students shall choose a topic of their interest and get it approved and work on the data collection and the math part. They shall be given time in school to discuss further. By new year they shall complete the mathematics part and submit the draft by 1 Feb for which I shall give a written feedback and they would have to submit the find IA copy as per the deadlines given.

The deadline for submission of the Draft IA in Mathematics is 1st Feb
The following timeline with mini deadlines should help students achieve a timely and meaningful draft.

Due date	***What's due***	***Notes***
DP 1 Semester 1 &2 Aug-March **DP 1 Semester 2 April-May** **DP 2 Semester 1 August**	**Topic and brief outline of your Exploration 2 x A4 only**	Introduction, Sample marking, Mind Maps, Going throuh Assessed samples. 1. Stimulus +In the form of a photo or link to a video 2. Brainstorming of ideas +In the form of a mind map (drawn or digital version) or sketch note 3. Review of literature on your topic +Minimum 3 research papers on your topic +Source for primary/ secondary data - validity checked +source supporting your line of inquiry +Write a summary of 100-150 words on each source
July	**Exploration Introduction no more than one A4 page**	**Introduction**: Introduce research question to audience (which is your peers); embed the stimulus and mind map into this introduction; make reference to research - note the citations in the exemplars; introduce how you will use Mathematics **Aim**: Aim is what is being explored **Rationale**: Rationale is why have you chosen this topic **Page specification** : Spacing 1 1/2 lines; Paragraphs - 1 space; all variables in italics Font - New Times Roman Size 12; language English UK, d a spell check for Introduction; ADD page number bottom right hand

		corner
Aug	**Methodology**	We will use the same document we had for Exploration checkpoint 2 (Introduction) Methodology or it may be called collection of data procedures or action plan. This will depend on your topic. This section may be 1/2 page, 1 page or several pages BUT it must explain completely how you will go about your exploration.
Sep	**Detailed plan and more research into the mathematics**	This copy will receive a mark out of 20 - Summative task Upload your exploration with the following parts: - Suggested Length: 4-5 pages -Include your introduction, contents page and the detailed plan for your Exploration. 1. Title page (see attached) 2. Table of contents (see attached) 3. Introduction / Aim / Rationale (one page) 4. Methodology - Demonstrate a clearer picture of the detailed mathematics. What examples/ scenario can you devise to ***demonstrate your understanding of the mathematics***? Get deeper into some of the calculations. 5. A new page with heading Collection of data (or similar depending on topic) 6. References (use MLA 8 format) - last page - Start your Bibliography page. List books, journal articles, websites that have contributed meaningfully.
Oct	***Interim deadline***	Data collection started
Nov	***Interim deadline***	Data presented in tables and graphical form
1st Jan	***Complete mathematics***	The main body of your Exploration, with all the relevant mathematical calculations. Remember to (i) Define any variables (ii) Explain any unfamiliar symbols, notation or terminology (use MathType or similar – e.g. use of ^ and / is penalized heavily)
1st Feb	***Complete draft***	This is the only draft of your Exploration that your teacher is allowed to comment on, so make sure it is as complete as possible.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Exploration	Inquirer :It includes a research that develops their natural curiosity, Knowledgeable: students will explore “concepts, ideas, and issues that have global and local significance” Thinkers: they are going to use all their skills Communicators: They will have to write a report to the teacher and their peers. Principled: students have to be honest and show integrity in the work Open – minded: this depends on their exploration subject Risk –takers: they do not know beforehand the steps necessary to achieve their goal Reflective: They would be thinking about what they have learned in the classroom and how to use it in real life situation, making the link between theoretical mathematics and real-life mathematics.

Topic	Contribution to the development of the ATL’s
Exploration	**Thinking:**

	• Creative Thinking - stimulus, development of ideas • Critical Thinking - Peer assessment, critique of previous research on chosen topic • Transfer - Able to link areas of mathematics with chosen topic and develop ideas even more Activity to encourage students to develop and use the research skills and critical thinking skills required for the Exploration. In small groups, create a History of Mathematics timeline. Discovering mathematics through inquiry leads to a deeper understanding and greater enjoyment. Group presentations to list possible activities that build on students' research and collaboration skills. E.g. Calculus – Newton v Leibniz; Pythagoras' Theorem in Greece (570-495 BC), Mesopotamian or Egyptian Theorem (2000-1600 BC), China - Gougu Theorem (220-202 BC) and India – Baudhayana Theorem (800-500 BC).

Mathematics in Action:

1. Discuss how mathematics can be applied to various jobs in other subjects. (Transdisciplinary)
2. Mathematics in modelling the effects of a drug.
3. Mathematics in weather predictions.
4. History of mathematicians - Construct timeline. (Awareness project)

3. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
Number and Algebra: Sequences, Series and proof.	I initiate discussions by asking the following questions • Is zero the same as "nothing"? • Is mathematics a formal language? • How accurate is a visual representation of a mathematical concept? • Do the names that we give things impact how we understand them? For instance, what is the impact of the fact that some large numbers are named, such as the googol and the googolplex, while others are represented in this form? • Is all knowledge concerned with identification and use of patterns? Consider Fibonacci numbers and connections with the golden ratio. • How do mathematicians reconcile the fact that some conclusions seem to conflict with our intuitions? Consider for instance that a finite area can be bounded by an infinite perimeter. • How have technological advances affected the nature and practice of mathematics? Consider the use of financial packages for instance. • Is mathematics invented or discovered? For instance, consider the number e or logarithms–did they already exist before man defined them? • Is mathematical reasoning different from scientific reasoning, or reasoning in other Areas of Knowledge? • Is it possible to know about things of which we can have no experience, such as infinity? • How have notable individuals shaped the development of mathematics as an area of knowledge? Consider Pascal and "his" triangle. • What counts as understanding in mathematics? Is it more than just getting the right answer? • What is the role of the mathematical community in determining the validity of a mathematical proof? Do proofs provide us with completely certain knowledge? What is the difference between the inductive method in science and proof by induction in mathematics?

4. Approaches to learning

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Number and Algebra: Sequences, Series and proof.	I shall ask my students higher-order questions to encourage higher-order thinking. Also, I shall plan time for students to think about their answers to questions, rather than engaging in rapid questions and answers that do not give students time to think deeply about their responses. I shall create an atmosphere in the classroom where the "group's collective as well as individual thinking is valued, visible, and actively promoted as part of the regular, day-to-day experience of all students. **Thinking** In this unit, we will • ask students to formulate a reasoned argument to support their opinion or conclusion • give students time to think through their answers before asking them for a response • ask open questions, • set students a task which required higher-order thinking skills (such as analysis or evaluation) • help students to make their thinking more visible (for example, by using a strategy such as a thinking routine) • ask questions that required the use of knowledge from a different subject from the one you are teaching • include a reflection activity • make a link to TOK **Communication** In this unit, we will • ask students to explain their understanding of a text or idea to each other • ask students to formulate arguments clearly and coherently • encourage all students to contribute to discussions

5. International mindedness

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
Algebra: The Binomial Theorem	Overview of the Topic: This topic will be covered in the first unit on the first year. The topic consists of arithmetic and geometric sequences. How understanding the concept, utilizing sequencing, and how to calculate using sequences is important and used in the real world. In the topic we will also discuss Pascal's Triangle and how it is used in mathematics as well as other areas such as art. Throughout the course we will discuss the history of mathematics from around the world. We will relate how the past is influencing the future mathematics achievements. We will start out learning about the history of Pascal's Triangle. How did he get credited for the mathematical breakthrough? Did it appear in the world before Pascal? If so, why was it named after Pascal? Where else in the world was Blaise Pascal's work done around the time of his discovery? This discussion will set up future conversations when we learn about Pythagoras, Newton, and so on. Learning Objectives: At the end of this topic, students will be able to: 1. Recognize geometric and arithmetic sequences 2. Solve problems involving sequencing 3. Be able to accurately describe different areas of a sequence 4. Use technology to calculate sequences 5. Calculate binomials using Pascal's Triangle 6. Have a deeper understanding of the history of math, Pascal, and uses of mathematics in other fields of expertise Link to International-Mindedness: Students will learn how mathematics is used in a variety of professions and how math was used around the world. Through individual and group research projects and presentations (ATL: Research, communication, thinking, self-management and social skills), students will learn about mathematics in building, art, military strategy, city planning, and many other areas. Students will get real world application to many of the mathematics they are learning and examples of how it is used all over the world. Students will also learn how certain people received credit for work and whether they deserve to have their name used or if it was used in other parts of the world before the discovery was credited through debates. Assessment Objectives: At the end of the topic, students are able to demonstrate the following. 1. Knowledge and understanding: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts by describing how mathematics is used in different professions and areas 2. Communication and interpretation: transform common realistic contexts into mathematics; comment on the context through short essays and presenting findings and participation in discussions. Justification for Choice of Topic: I chose this topic because it opens students up to understanding how mathematics was used in our past and how it can shape our future. Students will practice researching topics and writing short papers which will help them with their internal assessment in the future. It also allows me to collaborate with the history and English departments for interdisciplinary curriculum. Students will also be able to reflect how the math they are learning today has been relevant for many years all over the world. Resources: Library research database

6. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Statistics: Concepts and Presentation of Data	Overview of the Topic: This topic covers the organization and presentation of data. Students will be able to gather information and display their finding in a number of different mediums. Students will then describe their findings to a class and tell what they have learned about their topic of interest in this section. Students will use technology such as computers, Word, Excel, graphing calculators, and others, to gather their data and display it in an easy to read and understand format. Learning Objectives: At the end of the topic, students will be able to 1. Distinguish different types of data and tell when to use them 2. Interpret data and find key points within data such as central tendency, quartiles, percentiles, and so on 3. Present data in a professional and easy to understand format 4. Use different graphs and charts to display the same set of data 5. Use equations to predict the possibility of different future events given a set of data 6. Apply data in many different real world situations Links to the IB Learner Profile: During our study about statistics we will explore and discuss the use of statistics to push an agenda (how statistics is used to manipulate information in your favour). Students will examine different examples of how statistics is skewed in mediums such as magazines, news articles, politics, and advertisements and write analysis reports. We can also show examples of how statistics can show two different sides of the same information. This is a good time to discuss using mathematics appropriately and to not mislead others into thinking a certain way. This will develop their ATL –Research, communication, thinking, social and self-management skills while showing them how to be principled, balanced, and knowledgeable (IB learner profile attributes) about their topics as well as others' topics. Assessment Objectives: At the end of the topic, students are able to demonstrate the following. 1. Problem solving: recall, select and use their knowledge of mathematical skills, thereby identifying why there are certain trends in data and what could cause a large or small variance within the data 2. Communication and interpretation: Transform common realistic contexts into mathematics, using technology to evaluate data and displaying results in an organized manner 3. Technology: use technology, accurately, appropriately and efficiently both to explore new ideas and to solve problem by gathering data from volunteers in their community and computing data to indicate trends, intervals, mean, variance and standard deviation 4. Reasoning: construct mathematical arguments through use of precise statements, that is, summarizing and drawing conclusions from a data set

7. Resources

Describe the resources that you and your student will have to support the subject. Indicate whether they are sufficient in terms of quality, quantity and variety. Briefly describe what plans are in place if changes are needed.

We have sufficient resources.
Oxford text book
IB question bank
IB exchange
Emulator
Desmos
Geogebra

https://www.christosnikolaidis.com/en/

Mathematics in nature
Patterns

https://www.youtube.com/watch?v=Ig9RUaJe00c

Paterns in Nature
Mother Nature's handiwork

https://www.youtube.com/watch?v=u_CaCie8R4U

Towers of Hanoi

http://towersofhanoi.info/Play.aspx

We shall discuss and do the needful if changes are to be made.

Here is a list of textbooks used: HL textbooks

1. Haese and Harris
Mathematics Series: Mathematics for the International Student (IB Diploma)
Mathematics HL CORE (3rd edition)
Authors: David Martin, Mark Humphries, Michael Haese, Sandra Haese and Robert Haese
ISBN-13: 978-1-921972-11-9
Year Published: 2012

2. Haese and Harris
Mathematics HL (Core) EXAM PREPARATION & PRACTICE GUIDE 3rd Edition
ISBN: 978-1-921972-13-3
Year Published: 2012

3. Haese & Harris
Mathematics HL (Options) (textbook & CD)
ISBN: 978-1-921972-32-4

4. Gyorgyi Bruder & William Larson
Math HL Option Sets , Relations & Groups
ISBN: 9781921917202

5. Mathematics Higher Level for the IB Diploma
Cambridge
Authors: Paul Fannon, Vesna Kadelburg, Ben Woolley and Stephen Ward
ISBN: 9781107661738

6. Pearson Baccalaureate Higher Level Mathematics Revised 2012 edition for the IB Diploma
Wazir, Garry et al.
ISBN 978-0-435074-96-8
Publisher Pearson Education, March 2012.

7. IB Mathematics Higher Level Course Book: Oxford IB
Diploma Programme
Josip Harcet, Lorraine Heinrichs, Palmira Mariz Seiler and Marlene Torres Skoumal
ISBN: 978-0-19-839012-1 / ISBN 978-0-19839011-4
Publication date: 16/08/2012

8. Mathematics for Higher Level-IBID Press (4th edition)
by Fabio Cirrito (Editor), Nigel Buckle (contributor), Iain Dunbar (contributor)
ISBN 9781921917103
Published 2007 by IBID Press, Shannon Books, Victoria, Australia.

9. Mathematics Higher HL Option 8 IBID Publications
William Larson
ISBN 187665988-2

10. IB Mathematics Higher Level: CALCULUS
Oxford IB Diploma Programme
Josip Harcet, Lorraine Heinrichs, Palmira
Mariz Seiler and Marlene Torres Skoumal
ISBN: 978-0-19-19-830484-5
Publication date: 2014

11. Mathematics Higher Level for the IB Diploma
Exam Preparation Guide, Cambridge
Authors: Paul Fannon, Vesna
Kadelburg, Ben Woolley and Stephen
Ward ISBN: 978-1-107-67215-4

Haese & Harris:
https://www.haesemathematics.com/international-baccalaureate-diploma-2019

Hodder:
https://www.hoddereducation.co.uk/mathematics#&eb=96&c=2&se=1197&limit=true&type=3

IBID:
https://www.ibid.com.au/maths/

Kognity:
www.kognity.com

Oxford:
https://global.oup.com/education/secondary/curricula/ib-diploma/mathematics/?region=international&fbclid=IwAR3Jciqk3EEbBTd3d9rQrVC57I-UV_Q2ncPX9eMaOsdt_KBK5DlcQUJzmis

Pearson: https://www.pearsonglobalschools.com/index.cfm?locator=PS2m4o

Mathematics Reading List

The Music of the Primes: Why an Unsolved Problem in Mathematics Matters
by Marcus Du Sautoy (Author)
Publisher: Harper Perennial
ISBN-10: 1841155802 ISBN-13: 978-1841155807

Finding Moonshine: A Mathematician's Journey Through Symmetry
by Marcus Du Sautoy (Author)
Publisher: Harper Perennial
ISBN-10: 0007214626 ISBN-13: 978-0007214624

The Man Who Loved Only Numbers: The Story of Paul Erdos and the Search for Mathematical Truth
by Paul Hoffman (Author)
Publisher: Fourth Estate Ltd
ISBN-10: 1857028295 ISBN-13: 978-1857028294

Zero: The Biography of a Dangerous Idea
by Charles Seife (Author)
Publisher: Souvenir Press Ltd
ISBN-10: 0285635948
ISBN-13: 978-0285635944

An Imaginary Tale: The Story of "i" (the Square Root of Minus One)
by Paul J. Nahin (Author)
Publisher: Princeton University Press
ISBN-10: 9780691027951 ISBN-13: 978-0691027951 ASIN: 0691027951

The Magic of Maths (INTL PB ED): Solving for x and Figuring Out Why
by Arthur Benjamin (Author)
Publisher: Basic Books
ISBN-10: 0465098746 ISBN-13: 978-0465098743

1089 and All That: A Journey into Mathematics
by David Acheson (Author)
Publisher: Oxford University Press, U.S.A.
ISBN-10: 0199590028 ISBN-13: 978-0199590025

The Maths Gene: Why everyone has it, but most people don't use it
Keith Devlin

GOD created the integers
The mathematical breakthroughs that changed history
Stephen Hawking
A History of Pi
by Petr Beckmann (Author)
Publisher: Barnes & Noble Inc
ISBN-10: 0880294183 ISBN-13: 978-0880294188

"e": The Story of a Number
by Eli Maor (Author)
Publisher: Princeton University Press
ISBN-10: 0691141347 ISBN-13: 978-0691141343

A History of Pi
by Petr Beckmann (Author)
Publisher: St Martin's Press
ISBN-10: 0312381859 ISBN-13: 978-0312381851

The Code Book: The Secret History of Codes and Code-breaking
by Simon Singh (Author)
Publisher: Fourth Estate
ISBN-10: 1857028899 ISBN-13: 978-1857028898

A Short History of Nearly Everything (Bryson)
by Bill Bryson (Author)
Publisher: Black Swan
ISBN-10: 1784161853
ISBN-13: 978-1784161859

History Mathematics 3e
by Carl B. Boyer (Author), Uta C. Merzbach (Contributor)
Publisher: Jossey-Bass
ISBN-10: 0470525487 ISBN-13: 978-0470525487

Mathematics: From the Birth of Numbers
by Jan Gullberg (Author), Peter Hilton (Author)
Publisher: W W Norton & Co Ltd
ISBN-10: 039304002X ISBN-13: 978-0393040029

Does God play Dice: The new mathematics of Chaos
Ian Stewart

How not to be Wrong: The Power of Mathematical Thinking - Jordan Ellenberg

Algorithms to Live By: The Computer Science of Human Decisions - Brian Christian and Tom Griffiths

Concept-Based Mathematics: Teaching for Deep Understanding in Secondary Classrooms - Jennifer Wathall

17 Equations that changed the world
Ian Stewart

The Indian Clerk
David Leavitt

Mathematics, The Loss of Certainty
Morris Kline

The Equation that couldn't be Solved
How Mathematical Genius Discovered the Language of Symmetry
Mario Livio

Making thinking visible - Ritchhart, Church and Morrison

Mathematical mindsets - Jo Boaler

Thinking about the nature of inquiry:

Mathematical diversions - Martin Gardner

How to cut a cake - Ian Stewart

Mathematics: the new Golden Age - Keith Devlin

How to lie with statistics - Darrell Huff

The pleasures of counting by Tom Kôrner

Images of Infinity by Ray Hemmings
What If?: Serious Scientific Answers to Absurd

Hypothetical Questions by Randall Munroe

Embedding Formative Assessment: Practical Techniques for K-12 Classrooms - Dylan Wiliam

Practical Statistics by Mary Rouncefield and P. Holmes

Flatland by Edwin Abbott Abbott
Flatland – including both films produced from the book.

Simon Singh - code book and big bang
Rob Eastaway (why do buses come in threes)

50 mathematical ideas you really need to know
Tony Crilly

The Man who knew Infinity - Robert Kanigel

Godel, Escher, Bach - Douglas Hofstadter

The Colossal Book of Mathematics - Martin Gardner

Euclid in the Rainforest - Joseph Mazur

Four Colours Suffice - Robin Wilson

What is mathematics really? - Reuben Hersh

The Mathematical Principles of Natural Philosophy - Isaac Newton

Mathenauts: Tales of Mathematical Wonder - edited by Rudy Rucker

Magical Mathematics - Persi Diaconis & Ron Graham

Games of Life - Karl Sigmund

Articles
Critical Thinking Why Is It So Hard to Teach?
Daniel T. Willingham

Grinstead and Snell's Introduction to Probability
The CHANCE Project1 Version dated 4 July 2006
Mathematics for literacy - Jan de Lang

VIDEOS

Proof is a 2000 play by the American playwright David Auburn.

The play concerns Catherine, the daughter of Robert, a recently deceased mathematical genius in his fifties and professor at the University of Chicago, and her struggle with mathematical genius and mental illness. Catherine had cared for her father through a lengthy mental illness. Upon Robert's death, his ex-graduate student Hal discovers a paradigm-shifting proof about prime numbers in Robert's office. The title refers both to that proof and to the play's central question: Can Catherine prove the proof's authorship? Along with demonstrating the proof's authenticity, the daughter also finds herself in a relationship with 28-year-old Hal. Throughout, the play explores Catherine's fear of following in her father's footsteps, both mathematically and mentally and her desperate attempts to stay in control.

According to my `secret formula', the following works of mathematical fiction are similar to this one:

1. *A Beautiful Mind* by Sylvia Nasar / Akiva Goldsman
2. *Continuums* by Robert Carr
3. *Murder, She Conjectured* by Alex Kasman
4. *The Housekeeper and the Professor (Hakase No Aishita Sushiki)* by Yoko Ogawa
5. *The Five Hysterical Girls Theorem* by Rinne Groff
6. *It's My Turn* by Claudia Weill (director)
7. *Uncle Petros and Goldbach's Conjecture* by Apostolos Doxiadis
8. *The Three Body Problem* by Catherine Shaw
9. *The Wild Numbers* by Philibert Schogt
10. *Towel Season* by Ron Carlson