

## Problems, Strategies, Solutions: History of Math

DAY	WHAT	HOW
1	<ul style="list-style-type: none"> <li>• Origin of numbers</li> <li>• Base conversions</li> <li>• Introduction to Babylonian culture and the Babylonian Number System</li> <li>• Create your own number system</li> </ul>	<ul style="list-style-type: none"> <li>• Group activity where the students take turns answering the question – why are numbers important (they write it on a paper in groups and then we share them together).</li> <li>• Worksheet - switching back and forth between different bases.</li> <li>• Worksheet – converting back and forth between number systems.</li> <li>• Group project where the student apply everything they have learned about bases and the Babylonians and create their own number system including a worksheet for the class and a poster and a new civilization</li> </ul>
2	<ul style="list-style-type: none"> <li>• Finish number systems project</li> <li>• Introduction to the Ancient Chinese culture and Chinese Rod Numerals</li> <li>• Magic squares –Presentations on number systems – The students present their number systems and give out their worksheet that they created in their number system and then act as teachers as they help their fellow students if they have questions on their worksheet.</li> <li>• Presentations on number systems</li> </ul>	<ul style="list-style-type: none"> <li>• Worksheet: Chinese Rod Numerals</li> <li>• Worksheet – magic square patterns including learning about the legend of the Magic Square.</li> <li>• Create your own magic square and discover of the properties of magic squares.</li> <li>• Presentations of the student’s number systems and including teaching worksheets that they created in their number systems.</li> </ul>
3	<ul style="list-style-type: none"> <li>• Continued work with the Chinese culture including Chinese version of Pascal's triangle and binomial expansion</li> <li>• Egyptian Culture and their number system – mini lecture that is interactive with kids representing the length of the Rhind Papyrus. Worksheets on the number system, addition and subtraction and Egyptian Multiplication follow.</li> <li>• Egyptian town project</li> </ul>	<ul style="list-style-type: none"> <li>• Worksheet on binomial expansion</li> <li>• Mini lecture that is interactive with kids representing the length of the Rhind Papyrus.</li> <li>• Worksheets on the Egyptian number system, addition and subtraction and Egyptian Multiplication follow.</li> <li>• In pairs students pretend to be Egyptian landlords and figure out how long it takes for them to break even with their plots of land. They also deal with the potential of the Nile flooding and losing rent on some parts of their land.</li> </ul>
4	<ul style="list-style-type: none"> <li>• Introduction to the Greek Culture and Thales</li> <li>• Pythagorean theorem construction activity and the Proof of the Pythagorean theorem.</li> <li>• Life of Pythagoras</li> <li>• Pythagorean theorem video</li> </ul>	<ul style="list-style-type: none"> <li>• Inductive and deductive reasoning discussion - intro to proof. The students talk about what inductive and deductive arguments mean and have a little debate on good, poor and fair inductive arguments.</li> <li>• Beginning constructions where the</li> </ul>

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	<ul style="list-style-type: none"> <li>• Math history catch</li> <li>• Figurate numbers</li> </ul>	<p>students learn basic constructions and a geometric proof of the Pythagorean theorem. It is a constructions activity.</p> <ul style="list-style-type: none"> <li>• Pythagorean theorem video</li> <li>• Game that incorporates everything we have done so far where the kids have to describe terms, mathematicians and cultures and their fellow teammates have to guess. This game is played through the session and the stack of cards just grows</li> <li>• Worksheets on Figurate numbers</li> </ul>
5	<ul style="list-style-type: none"> <li>• First Test on information in the first week</li> <li>• Pythagorean theorem</li> <li>• Golden Ratio</li> <li>• Platonic Solids - as individuals and in groups – building Platonic solids</li> <li>• Donald Duck in Mathemagic Land video</li> </ul>	<ul style="list-style-type: none"> <li>• Test</li> <li>• Puzzle worksheets that use the Pythagorean theorem</li> <li>• Activities including measuring objects that are golden rectangles and body parts that fit the golden ratio. Also looking at paintings that contain the golden rectangle.</li> <li>• Building Platonic solids</li> <li>• Video: Donald Duck in Mathemagic Land</li> </ul>
6	<ul style="list-style-type: none"> <li>• Euclid</li> <li>• Euclidean algorithms for basic constructions</li> <li>• Ancient Babylonia Construction project:</li> <li>• Basic algebra intro - solving proportions using cross multiplication – worksheet to prepare them for solving similar triangles proportions</li> <li>• Similar triangles and Thales activity.</li> </ul>	<ul style="list-style-type: none"> <li>• Mini lecture of his life, basic axioms of Geometry, and <i>the Elements</i></li> <li>• Group project where the students write algorithms for the basic constructions that they learned last week</li> <li>• Students use the algorithms to do individual constructions of the incenter, orthocenter and circumcenter. They also construct their way trough Ancient Babylonia with the construction project using everything that they have learned about constructions.</li> <li>• Solving proportions using cross multiplication – worksheet to prepare them for solving similar triangles proportions</li> <li>• Group project: Students go outside and use shadows to find the height of the flag pole and other objects around the camp with similar triangles.</li> </ul>
7	<ul style="list-style-type: none"> <li>• Zeno and his paradoxes</li> <li>• Heron of Alexandria and area of triangles using his formula and his square root approximation method</li> <li>• Archimedes and the eureka boat project</li> </ul>	<ul style="list-style-type: none"> <li>• Mini lecture on Zeno and the kids work individually on Zeno’s paradoxes and other paradoxes.</li> <li>• Mini lecture on Heron and worksheets on his math</li> <li>• Mini lecture on Archimedes and then a</li> </ul>

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	<ul style="list-style-type: none"> <li>• Begin mathematician projects</li> </ul>	<ul style="list-style-type: none"> <li>• group project with pennies and floating them in boats to help represent Archimedes buoyancy and displacement of water ideas.</li> <li>• Students start to research for their mathematician papers</li> </ul>
8	<ul style="list-style-type: none"> <li>• Hypatia and conic sections</li> <li>• Mary Everett Boole and string geometry</li> <li>• Sophie Germain, Sonya Kovalevsky, and Emmy Noether</li> <li>• Maze game</li> </ul>	<ul style="list-style-type: none"> <li>• Building conic sections activity where the students make their own set of conic sections out of cones</li> <li>• An individual project where the students make string geometry project after having learned about Mary Everett Boole</li> <li>• Preparation and performance skits on Sophie Germain, Sonya Kovalevsky, and Emmy Noether – students design and act out skits on their mathematician</li> <li>• Math classes challenge each other on a giant sequence maze on Martha Washington square</li> </ul>
9	<ul style="list-style-type: none"> <li>• Finish string geometry project</li> <li>• Math related to Emmy Noether, Sophie Germain, Maria Agnesi</li> <li>• Sonya Kovalevsky and infinite series</li> <li>• Fibonacci and his sequence</li> <li>• Mayans and their number system</li> </ul>	<ul style="list-style-type: none"> <li>• Crossword puzzle on Maria's Agnesi's life</li> <li>• Worksheets on math related to Emmy Noether, Sophie Germain, Maria Agnesi</li> <li>• Kids learn in groups if an infinite series can have a sum</li> <li>• Mini lecture and worksheet about the patterns in the Fibonacci Sequence</li> <li>• Worksheets on converting Mayan numbers into our number system and vice versa</li> </ul>
10 (pi day)	<ul style="list-style-type: none"> <li>• Test Week 2</li> <li>• History of pi through the ages including important figures from all cultures</li> <li>• Story of pi video</li> <li>• Approximation of pi activities</li> <li>• Sir Cumference and the Dragon of Pi</li> <li>• Pi catch phrase</li> <li>• Pi Pneumonic</li> <li>• Pi Chain</li> </ul>	<ul style="list-style-type: none"> <li>• Test Week 2</li> <li>• Mini-lecture broken up into ancient history of pi and modern history of pi</li> <li>• Story of pi video</li> <li>• Buffon's Needle Approximation</li> <li>• C/D approximation activity.</li> <li>• Story book of Sir Cumference and the Dragon of Pi</li> <li>• Pi catch phrase – activity at the end of the day where the students compete with other classes to describe words related from things learned on pi day</li> <li>• Students attempt to figure out pneumonics for the digits in pi</li> <li>• Students create a chain that represents the digits of pi</li> </ul>
11	<ul style="list-style-type: none"> <li>• Pascal and his triangle Origins of probability</li> <li>• Experimental Probability vs.</li> </ul>	<ul style="list-style-type: none"> <li>• Mini lecture and a worksheet to discover patterns Pascal's triangle patterns</li> <li>• Origins of probability - mini-lecture on</li> </ul>

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	<p>Theoretical Probability</p> <ul style="list-style-type: none"> <li>• Fermat – mini lecture and how he is related to probability</li> <li>• Work on mathematician projects</li> </ul>	<p>where it came from</p> <ul style="list-style-type: none"> <li>• Group activity where the students do probability experiments and look at experimental probabilities and compare them to theoretical probabilities</li> <li>• Mini lecture on Fermat and how he is related to probability</li> <li>• Continue to work on projects in library</li> </ul>
12	<ul style="list-style-type: none"> <li>• Hindu-Arabic contributions to math</li> <li>• Origin of Zero</li> <li>• John Napier and Napier's bones</li> <li>• Euler and Networks</li> <li>• Baneker</li> </ul>	<ul style="list-style-type: none"> <li>• Mini lecture and a worksheet on Lattice Multiplication</li> <li>• Origin of Zero – mini lecture</li> <li>• Students make their own Napier's bones and then use them</li> <li>• Mini lecture on Euler and then do a discover worksheets on the properties of Euler's Networks</li> <li>• Mini lecture on Baneker and the students do problems that were similar to ones that Baneker solved. They work individually at first and then in groups and each student must present one of the problems at the end.</li> </ul>
13	<ul style="list-style-type: none"> <li>• Topology</li> <li>• Gauss and summing up arithmetic series</li> <li>• Galois, group theory and magic flexagons.</li> <li>• Skits on Lewis Carroll, John Venn and Charles Babbage</li> </ul>	<ul style="list-style-type: none"> <li>• Mini worksheet on basics of topology</li> <li>• Worksheet: Gauss and summing up arithmetic series</li> <li>• Mini - lecture on Galois and skit about Galois' life and group theory. Activity where the students make magic flexagons and discover how they form a group.</li> <li>• Skits on Lewis Carroll, John Venn and Charles Babbage that students design and perform</li> </ul>
14	<ul style="list-style-type: none"> <li>• Venn diagrams: worksheet on Venn diagrams</li> <li>• Syllogism game</li> <li>• Andrew Wiles and Fermat's last theorem</li> <li>• Math History Jeopardy</li> </ul>	<ul style="list-style-type: none"> <li>• Worksheet on Venn diagrams</li> <li>• Students have to find the conclusion in a game using humorous syllogisms that come from a logic textbook by Lewis Carroll</li> <li>• Video called The Proof</li> <li>• Students sum up all their have learned in a jeopardy game that covers everything they have learned over the 3 weeks</li> </ul>
15	<ul style="list-style-type: none"> <li>• Presentations on mathematicians</li> <li>• Final catch phrase game</li> </ul>	<ul style="list-style-type: none"> <li>• Students read their mathematicians papers out loud to the whole class so that everyone can benefit from what they learned.</li> <li>• Combining all the words from the whole three weeks, we play one last round of the game</li> </ul>