Mathematics for the non mathematican

Favorite	☐
Archived	☐
Fleeting	☐
Area/Resource	
Project	
Type	
Review Date	
Image	
URL	
Created	@February 14, 2023 4:39 PM
Updated	@February 20, 2023 5:19 PM
Root Area	
Project Area	
Updated (short)	02/20/2023
Pulls	
Resource Pulls	
Project Archived	
URL Base	
🍳 Recipe Divider	🥗🥗🥗 RECIPE BOOK PROPERTIES 🥗🥗🥗
🍳 Recipe Tags	
📚 Book Divider	📚📚📚 BOOK TRACKER PROPERTIES 📚📚📚
📚 Author	

📚 Date Started	
📚 Date Finished	
📚 Book Status	
📚 Rating	

Chapter 1

💡 Mathematics is concerned primarily with what can be achieved by reasoning.

💡 The primary objective of all mathematical work is to help man study nature, and in this endeavor mathematics cooperates with science.

- [ ] Expand more on how mathematics is built upon itself, and axioms. It is reason built upon reason that becomes more complex.

Chapter 2

Exercises

Name a few civilizations which contributed to mathematics

💡 The babylonians, the ancient greeks, the egyptians and the hindus, made great contributions to mathematics.

What basis did the egyptians and babylonians have for believing in their mathematical methods and formulas?

💡 These civilizations relied on empirical evidence as their basis for belief. Since their mathematics had very practical aspects early on and was geared towards solving everyday problems this makes sense.

✏️ Empirical evidence: Refers to a method of study or research that is based on real world data, observations and experience. It relies on evidence as opposed to theories or speculation.

Compare Greek and pre-Greek understanding of the concepts of mathematics

💡 Prior to the greeks, maths was seen as a tool, whereas the Greeks saw mathematics as field of study in it’s own rights. Where advancements did not necessarily come from practicality but from reasoning. They came up with the concept of axioms, as they observed that certain facts about some mathematical concepts were obvious and basic. The next idea was to apply reasoning with these axioms (or facts) as premises, and to use only the most reliable methods of reasoning man possesses.

✏️ Axioms: Basic statements or assumptions that are accepted as true without having to be proved. They are deemed as self evident and serve as the basis for the axiomatic process and the mathematical system. They are essential for the development of a coherent and consistent mathematical theory as they provide a starting point for logical reasoning or deductions.

What was the greek plan for establishing mathematical conclusions?

💡 The greeks established mathematical conclusions through a rigorous process of logical deductions, which is also know as the axiomatic method.

✏️ Axiomatic method: This method involved starting with a logical base of assumptions known as axioms from which a theory would be deducted by using logical reasoning. This allows you to build mathematical theories based on logical consistency and allowed for the derivation of new results. The process involved using previously proven theories as well as basic logical rules to derive new results consistent with the axioms.

What was the chief contribution of the Arabs to the development of mathematics?

💡 The arabs made many contributions to the world of mathematics, including algebra, trigonometry, arabic numerals and geometry. They made use of their proximity to numerous civilizations and combined the practical, empirical method of study from the babylonians and egyptians with the deductive emthod of reasoning of the Greeks, combined with practical problem solving.

✏️ Practical problem solving: This method uses knowledge, resources and expertise to solve real world problems and develop solutions with practical and effective impacts.

In what sense is mathematics a creation of the Greeks rather than of the Egyptians and Babylonians?

💡 The Greeks were truly the first civilization to view maths as a field of study in it’s own right. Their deductive method of reasoning served as the basis for mathematical progress as it detached mathematical use cases from real world problems and developed more theoretical and philysophical conclusions.

- [ ] Why was theoretical and philysophical study necessary to push the boundaries of maths

Criticize the statement “Mathematics was created by the Greeks and very little was added since their time”

💡 While the Greek contributions allowed maths to develop as it’s own field it was the idea that mathematicians started working closely with scientists that in the seventeenth century that lead to major new breakthroughs and developments. This was due to the body of knowledge and method of study established by the Greeks in combination with the major increase in the need for the practical applications of Maths in the sciences.

💡 The development of calculus was a major breakthrough as it provided new tools and techniques for modelling complex systems, as well as enabled advances in physics.

The human aspect of Mathematics

💡 Mathematics is a human creation. Although the Greeks believed that Maths existed independently of human beings, the prevalent belief today is that mathematics is entirely a human produce. The concepts, the axioms and the theorems established are all created by human beings in man’s attempt to understand his environment, to give play to his artistic instincts and to engage in sobering intellectual activity.

💡 The recoginition of the human element in maths explains in large measure the differences in maths produced by different civilizations. As well as the sudden spurts by virtue of insights supplied by geniuses. The need for maths drove it’s innovation in large part.

Chapter 3

Suggest abstract political or ethical concepts

💡 This chapter deals with the power of abstraction, and the use of abstraction in mathematics among the Greeks which allowed them to develop maths as much as they did. The benefit of abstraction comes in the gain of generality, where abstracting something is paramount of given the same name to different things. This enables us to no longer makes us look at something as an individual unique object and recognizes that different objects possess the common property named in the abstraction carries with it the **implication that anything true of the abstraction will apply to the several objects.**

💡 An example of an abstract political concept is democracy. Wherein it shares common properties such as the emphasis on individuality and the right to vote, but can take shape in many forms. However you can make the argument that if these common properties are observed across two countries (which will therefore make them democratic countries) that what is true about one countries democracy can also be true for another. In ethics the concept of virtue is abstract, as it cannot be easily defined but is generally more of a set of guiding principles that are viewed as desirable traits of human nature. These traits are generally considered positive or beneficial to individuals and societies as a whole.

✏️ Abstraction is the process of simplifying or generalizing objects, events, ideas or systems as a mean to extract the fundamental concepts behind them. Abstraction is a human made concept that is a product of human language and thinking. In the context of knowledge abstraction involves seperating the keys features or characteristics of something from it's specific details or context. This allows us to apply abstract concepts across many situations or objects.

What does the statement that mathematics deals with abstractions mean, and why did it make mathematics abstract?

> Fundamental knowledge must rise above individuals and particular objects and tell us about broad classes of objects and about man as a whole. True knowledge must therefore of necessity concern abstractions. - Plato

💡 Mathematics is a human creation which is used to explain the physical world around us, mathematics deals with abstractions, because objects within the physical world very rarely have the same specifics or context, and therefore makes it very difficult to generalize on observation to another. Abstraction enables us to identify the fundamental patterns and concepts behind these objects or relationships. The creation of abstract structures enables the systematic study of these structures. Abstraction also facilitates development as new theories or ideas can be generated that may not have been immediately apparent before.

Distinguish between abstraction and idealization

✏️ Idealization is the deliberate distortion or approximation of some features within the physical world. This is the process of creating simplified models of complex objects or phenomena by assuming certain idealized conditions or properties. An example would be idealizing the world as being a perfect circle.

💡 The difference is that both of abstraction and idealization are related, abstraction is concerned with simplifying and generalizing the properties of concepts or ideas, idealization is used to simplify the objects and real world phenomena. Idealization does enable abstraction in mathematics sometimes, as we can more confidently assume the generalization of the abstract common properties.

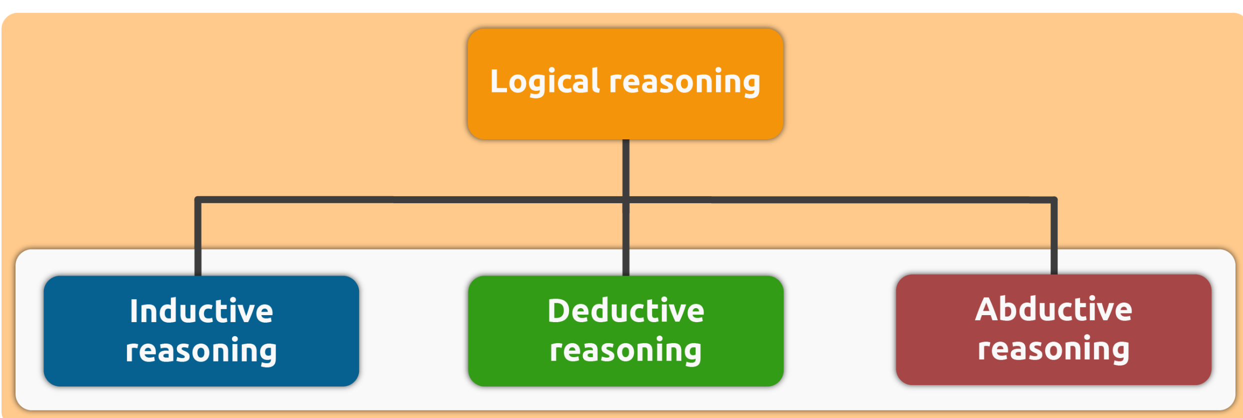
Logical reasoning

✏️ Deductive reasoning is a type of logical reasoning which relies on drawing conclusions from previous true assumptions or premises using logical principles. The conclusions that are drawn are guaranteed to be true if the underlying assumptions are true. The process of deductive reasoning begins with a general concept that is true and drawing conlusions on top of that concept in a logical manner.

✏️ Inductive reasoning is the drawing of conclusions or making generalizations based on the observations or evidence. The conclusions that are drawn are probabilistic and uncertain as opposed to guaranteed. i.e. the observed examples of a group that portray common tendencies makes these tendencies the rule within the group.

✏️ Reasoning by analogy is the process of using similarities between two things or more things to draw conclusions about new things or a situation. It is concerned a form of inductive reasoning.

✏️ Abductive reasoning also known as inference is the process of making conclusions or assumptions based on limited information. The conclusion that is drawn is not guaranteed to be true, but is deemed the most likely based on the circumstances or information at hand.



What superior features does deductive reasoning possess compared with induction and analogy?

💡 In mathematics deduction because it allows for the development of rigorous and precise arguments that are guaranteed to be true if the underlying assumptions are themselves true. This provides a high degree of certainty and reliability in mathematical proofs.

Distinguish between the validity of a deductive argument and the truth of the conclusion

💡 The validity of a deductive argument is concerned with the logical structure of the argument on not on the truth of the assumptions it is based upon. The truth of the conclusion is concerned with wether the conclusion of the argument is true within the real world.

Distinguish science and mathematics with respect to establishing conclusions