Lesson 1  Number, Part I

Rules and Definitions

Rules

“Rules that we use in math are about any things and some things, without specification of definite particular things.”   Alfred North Whitehead

Numbers are rules. The main numerals we use in mathematics to represent numbers include 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. See also Lesson 1C.

Definitions

- inductive reasoning: The process of discovering rules. Scientific endeavors are inductive. Discovery of new mathematical relationships requires inductive reasoning.
- deductive reasoning: The process of applying rules. Mathematics is deductive. There are mathematical rules yet to be discovered.
- numeral: A symbol or symbols used to express the idea of number.
- abstract: dealing with properties and ideas of things, just because they are things, regardless of feelings, emotions, and sensations we might connect with them. An idea that can describe an infinite number of concrete objects. For example, the number 3 is an abstract idea that can describe 3 bears, 3 trucks, 3 cars, etc.
- concrete: In mathematics, a word used to describe real objects. Abstract ideas are always based on real things.

1A  What is mathematics?

Before we begin our study of number, let’s look at some ways of defining mathematics. Mathematics is many things wrapped into one, so it is not easy to

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• The science which investigates the means of measuring quantity (L. Euler, *Elements of Algebra*, 1765).
• The foundation of exact thought as applied to natural phenomena (A.N. Whitehead, *An Introduction to Mathematics*, 1911).
• Mathematics is the classification and study of all possible patterns (W. W. Sawyer, *Prelude to Mathematics*, 1955).
• A study of space and quantity (Kline, *Mathematics and the Physical World*, 1959).

Whitehead said mathematics is abstract, meaning it deals with properties and ideas of things just because they are things, regardless of feelings, emotions, and sensations we might connect with them. It doesn’t matter how I feel about baby bears; if there are 3 in a family, there are 3, and no other value works. Math helps us know that if we search for truth, we can often find it.

Because math reveals truth to us, it naturally leads to the question, “Is there a Source of truth?” In other words, mathematics points us to God. Only the fool says in their heart “there is no God” (Psalm 14:1). If you have foolish thoughts like this, and have not yet accepted God’s saving gift of faith (Ephesians 2:8-9), please consider doing that right now! Believe and repent, then be baptized in the name of God’s son, Jesus Christ, who gave His own life for the remission of sins, and you will receive the gift of the Holy Spirit (Acts 2:38-39).

When we trust Christ as our Savior, we can know more things, but not every thing, about our origins, about what we are supposed to be doing right now, and about what will happen in the future (Proverbs 1:7). We can see the unity and diversity found in the Holy Trinity, where Scripture proclaims God is Father, Son and Holy Spirit. We see what is general (God) in what is particular (Father, Son, Spirit), and what is unchangeable in what is changing. We should not be surprised that God’s attributes, like his divine nature and eternal power, are revealed in mathematics. Romans 1:20 says His invisible attributes like these are clearly seen in creation, so we have no excuse for denying God’s existence.

The word *Godhead* is also used to describe God’s divine nature, reflecting the Trinity, which in turn reflects God’s perfect example of unity and diversity. In Christ we see the fullness of the Godhead bodily (Colossians 2:9), meaning Christ is truly divine, but also truly human. God’s divine nature is also abstract, because He exists apart from our feelings about Him. If our feelings, emotions, and sensations were required for God to exist, then He would be nothing more than an idol made by human hands. But Scripture is clear that God does not need us to create Him. He is the one who gives life and breath to all things (Acts 17:29).

God has made it obvious that unity and diversity exist. Being able to describe it though can lead to confusion, and you should not feel the least
Mathematics is considered the “language of science.” It is a tool for studying God’s creation. Since God has an abstract nature, it makes sense that He would design our brains with the ability to use an abstract tool to help us learn about how His creation operates. Humans, and no other organisms, were created in God’s image (Genesis 1:26). He designed us to be creative, like Him! And, as the famous scientist, Johannes Kepler said, when we study His creation, we “think God’s thoughts after Him,” giving us, and no other organisms, the ability to manage His creation (Genesis 1:28).

Mathematical tools, because they are abstract, supply just what is needed for a scientific description of creation. These tools will help you be the best you can be at using and managing God’s creation. Do you want to be a good manager of His creation or a bad one? You should want to be a good manager, which means you never again need to ask “what do I need to know math for?”

Let’s finish this introduction to mathematics with one more definition of mathematics, which we will use for the rest of the course:

> Mathematics is the language of science and a God-given tool for measuring and classifying pattern and shape.
> 
> Dr. Shormann

1B Mathematical Periods in History

Not much is known of the pre-Flood world. After the Flood, Babylon grew, later to be dispersed by God. The oldest known mathematical documents are from the Babylonians.

**Egyptian and Babylonian** - (2500 B.C. to A.D. 260) It is difficult to say what knowledge was transferred to the Babylonians from the pre-Flood world.
We have no historical documents of mathematical computations prior to them. Some things we know they had include a system of weights and measures, a calendar, the ability to calculate perimeter, area and volume, and financial and commercial methods for raising taxes and trade purposes. One reason mathematics stagnated for them is because they worshiped the creature, not the Creator (Romans 1:25).

**Pythagoreans** - Pythagoras (572-492 B.C.) is credited with developing the Pythagorean Theorem (Lesson 7), although the Babylonians also knew about it. Pythagoras had a religious following of people who worshiped the reflection of God (mathematical order), rather than God himself. They worshiped numbers, and believed the universe could be explained by the set of counting numbers! The Pythagorean cult disintegrated when they discovered the simple fact that the $\sqrt{2}$ could not be represented by a fraction of two integers. Now that’s weird!

**Greeks** - (600 B.C. to A.D. 450) The Greeks did much great work on human reasoning, but went too far in idolizing it. For example, things that didn’t make sense, like infinity and irrational numbers, were basically ignored. This is why they shied away from arithmetic and algebra, and focused more on geometry. In fact, the two tools they used for geometry were a compass (not a magnetic compass, but the kind you use to make circles) and a straight edge (like a rule, but without numbers). Their pursuit of geometry helped to develop our understanding of mathematics’ abstract nature.

**Chinese, Inca, Mayan, American Indian** - (1030 B.C. to A.D. 1700) Supposedly isolated from the mainstream of mathematical development, they nevertheless had their own decimal numeral systems. These display vestiges of their Babylonian ancestry, such as widespread use of the sexagesimal (base 60) numeral system, which we still use today (60 seconds in a minute, 60 minutes in an hour).

**Hindus and Arabians** - (200 B.C. to A.D. 1200) The Hindu-Arabic numeral system is named after the Hindus, who probably invented it, and the Arabs, who passed the system on to western Europe. They also invented negative numbers and the numeral zero around the time of Christ’s birth, about the same time the Mayans from South America did. Perhaps these civilizations were less-isolated than some think?

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**1C  Thinking about Number**

“A number is an idea.” *John Saxon*

A number is an abstract idea that applies in an infinite number of situations. We use numerals as symbols representing the idea of numbers. If something is
abstract, it can be applied the same way to describe many things, like the number 2, or 2+2, etc. Earlier we discussed 3 bear cubs. The bear cubs are real, but the number 3 is not. You cannot go to a farm and pluck 3’s off a tree like they were apples! Numbers, like math itself, are abstract rules. “Threeness” is an idea than can be applied to a variety of situations; 3 bears, 3 apples, 3 joyful thoughts, etc. It does seem strange that one thing, a number, can describe many things. It is strange, but it obviously works! The abstract nature of the Creator (one God, three persons) reminds us we should not be surprised to find aspects of His creation that have abstract qualities, too.

**Practice Set 1**

A calculator is not necessary for any problems in Practice Set 1.

1. Match the definition of mathematics with its author. Choices include: Euler, Kline, Sawyer, Shormann, Whitehead

   A) The classification and study of all possible patterns = ________________________.

   B) A God-given tool for measuring and classifying patterns and shapes = ____________________.

   C) The science which investigates the means of measuring quantity = ________________.

   D) A study of space and quantity = ____________________.

   E) The foundation of exact thought as applied to natural phenomena = ____________________.

2. Mathematics helps us know that if we search for ___________, we can often find it.

3. God’s divine nature is also ________________, because He exists regardless of our feelings and beliefs about Him.
4. Fill in the blanks in this table on different ways to describe unity and diversity.

<table>
<thead>
<tr>
<th>Unity</th>
<th>Diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>God</td>
<td>Fully Divine, Fully Human</td>
</tr>
<tr>
<td>General</td>
<td>Concrete</td>
</tr>
<tr>
<td>Eternal</td>
<td>Finite</td>
</tr>
<tr>
<td>Continuous</td>
<td>Many</td>
</tr>
</tbody>
</table>

5. Mathematics is considered the language of _______________.

6. The first major post-Flood civilization was
   A) Babylon   B) Greece   C) Egypt   D) China

7. This group is known for worshiping numbers.  
   A) Greeks   B) Mayans   C) Arabians   D) Pythagoreans

8. The Hindus, Arabians, and Mayans all started using the number ____ around the time of Christ's birth.  
   A) 17   B) 0   C) 7   D) 1

9. The ________________ were famous for ignoring infinity and irrational numbers.  
   A) Greeks   B) American Indians   C) Chinese   D) Hindus   E) Incas

10. Evidences that God scattered the Babylonians as described in Genesis 11 include ancient civilizations' widespread use of the sexagesimal, or base ________, numeral system.

11. John Saxon said “A number is an ________________.”