

History of Mathematics

MAI3309

Week 1

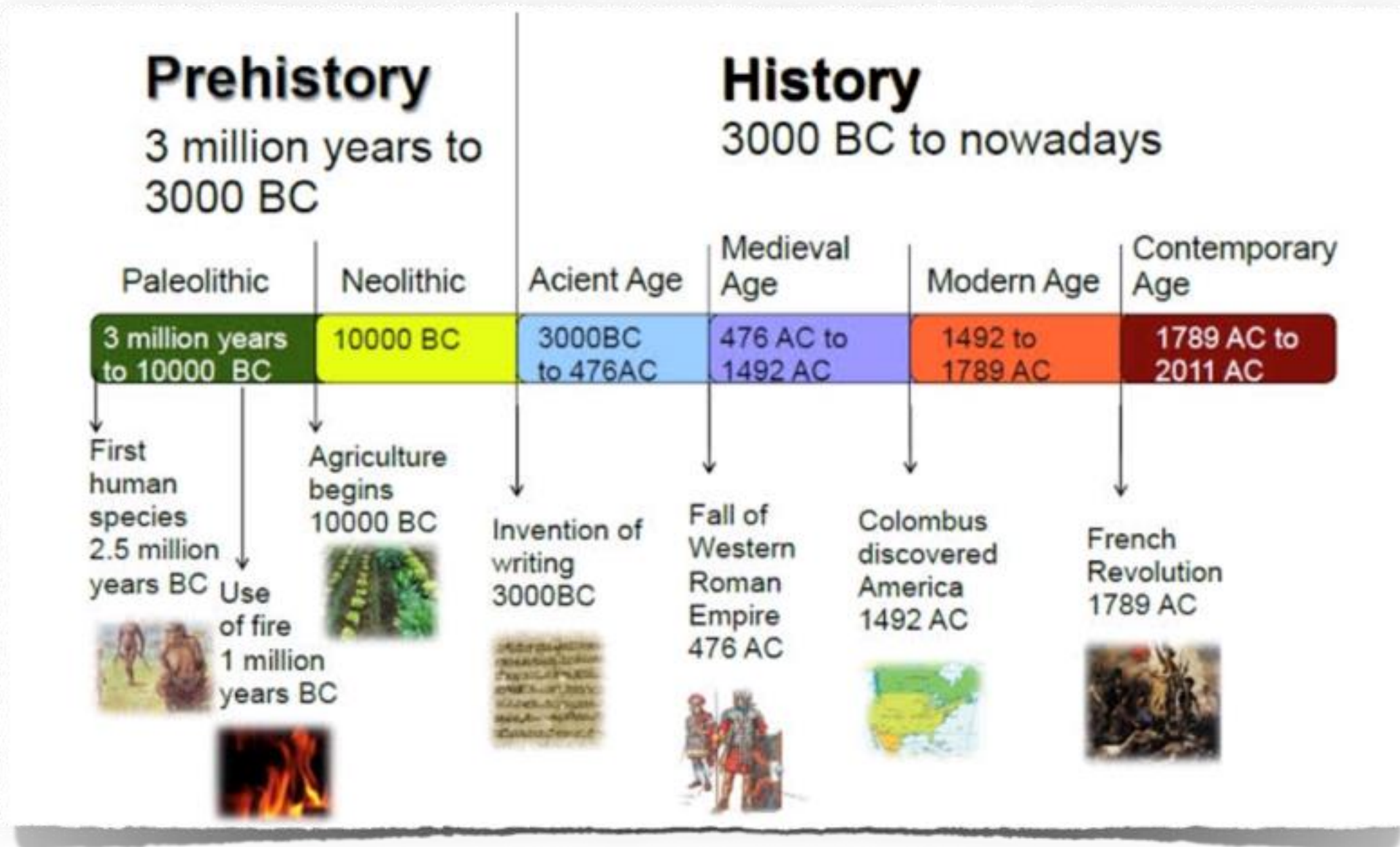


Chapter 1

Early Number Systems and Symbols

To think the thinkable — that is the mathematician's aim
C.J. KEYSER

What do we mean by “ history ”, and what does the term “ mathematics ” signify ?



Meaning of Mathematics

Mathematics

Elementary mathematics

Abstract science which investigates deductively the conclusions implicit in the elementary conceptions of spatial and numerical relations.



Oxford Dictionary

Contents

- ◆ In the beginning
- ◆ Primitive counting
- ◆ Geometric ornament
- ◆ Mysticism



1. In the Beginning

Cosmic Figures

Solar system



Nebula



Mathematics $\rightarrow$ No beginning No end

Regular polygons in the structure



Pineapple



Watermelon

Mathematics —> No beginning No end

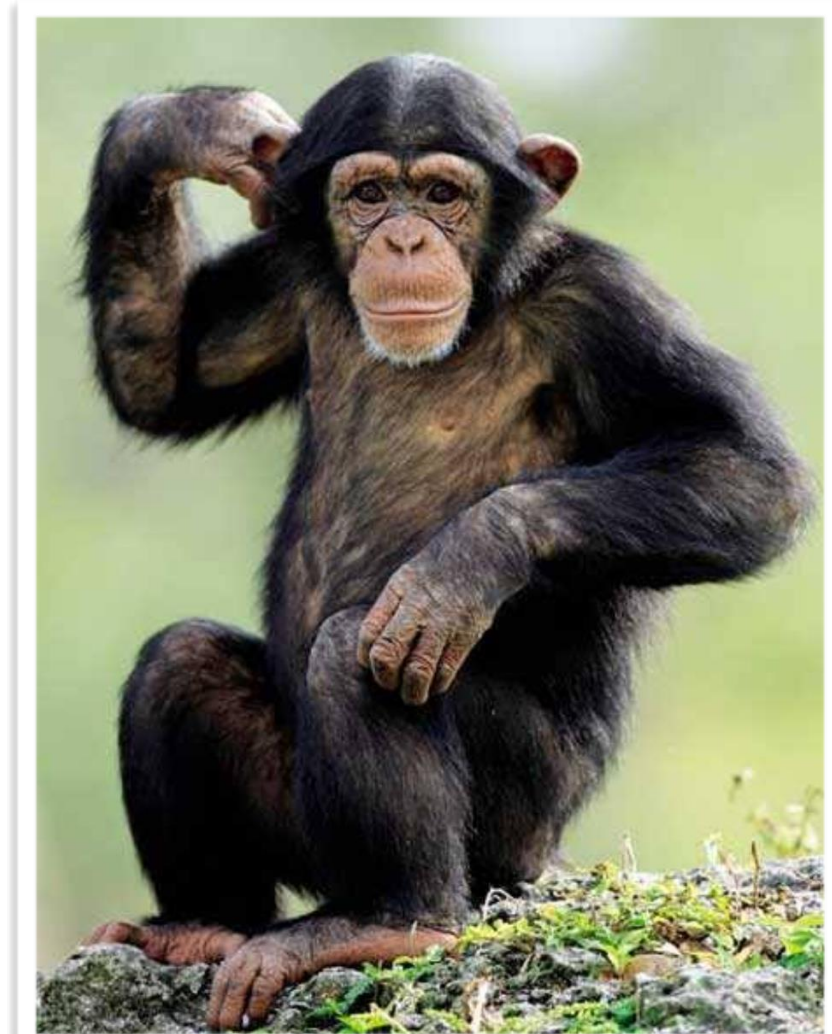
Pseudo-counting

Magpies

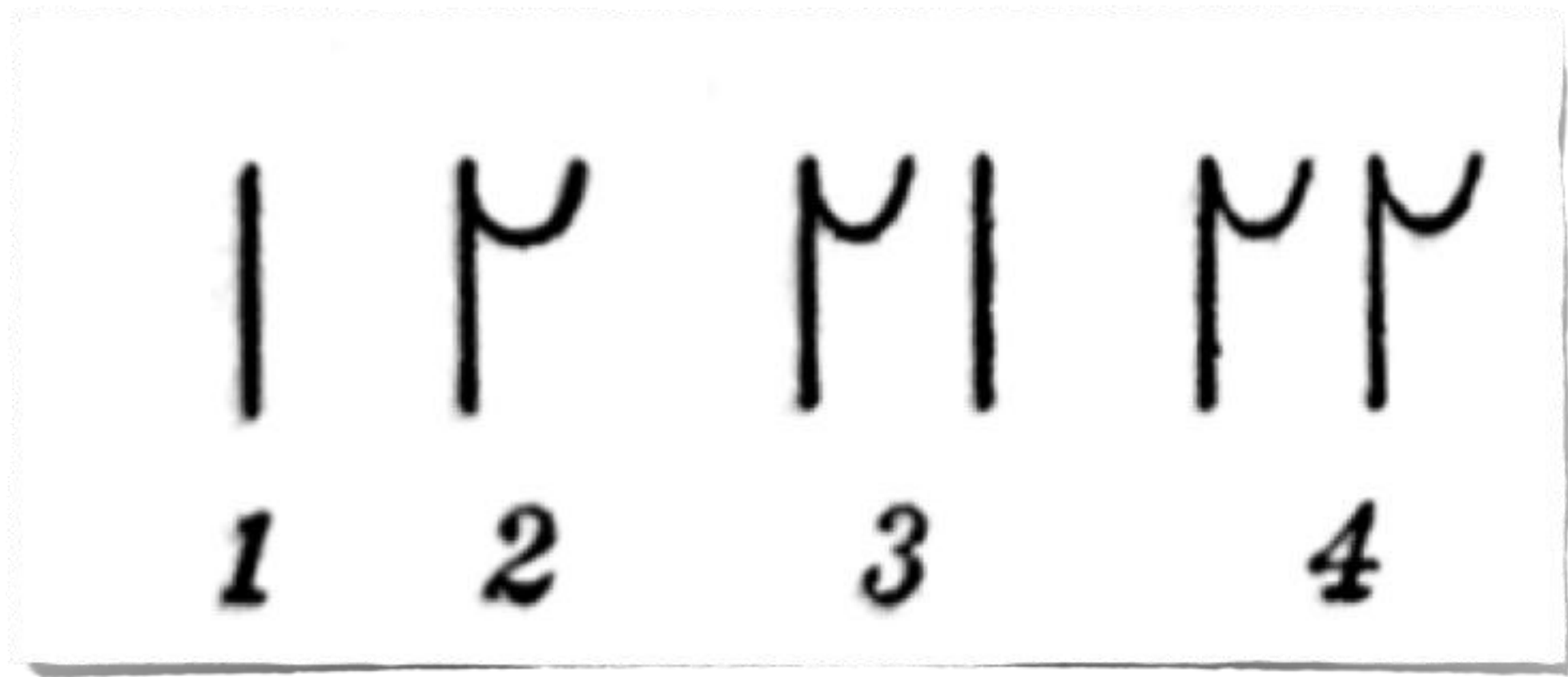


Recognize the size of a group of five or six objects

Chimpanzee



Knows five objects more than four



2. Primitive Counting

Number and Language

- Develop number sense
- Number language

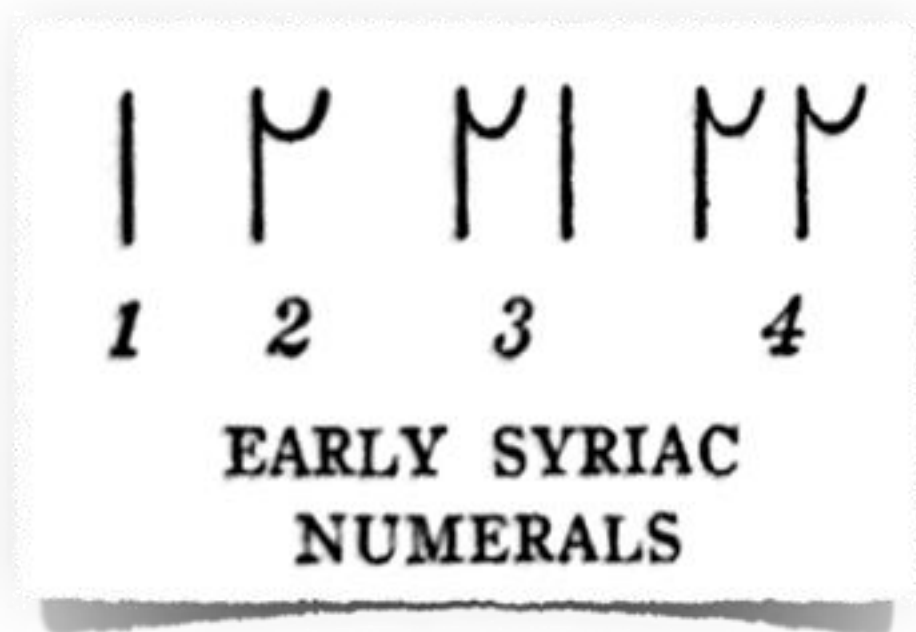


Australian Aborigines



The fingers
of the one hand

The Radix in Number Systems



Scale of two

Natives of Queensland

One

Two

Two and One

Two Twos

Early Efforts in Tallying

Herdsman



Shepherd

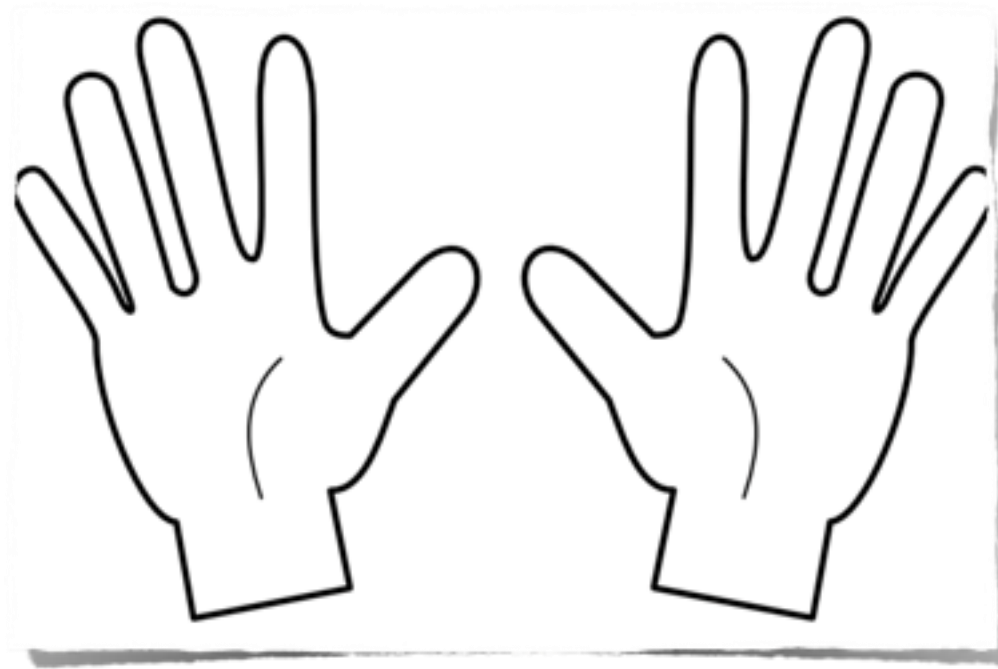


Objective Counting

longer think of a certain group of objects, nor do we demand such a group in order to count ; we think of a word in an endless series, the word coming just after "six" in the series and just before "eight." In the Malay and Aztec tongues, however, the number names mean literally one stone, two stones, three stones, and so on ; while the Niuès of the Southern Pacific use "one fruit, two fruits, three fruits," and the Javans use "one grain, two grains, three grains," all these being relics of the concrete stage of counting. When a Zulu wishes to express the number six, he says "taking the thumb" (*tatisitupa*), meaning that he has counted all the fingers of the left hand and has begun with the thumb of the right hand. For seven he says "he pointed" (*u kombile*), meaning that he has reached the finger used in pointing. After the world abandoned the



Scales of Ten



The fingers of both hands

Scales of Twenty



The fingers and toes



3. Geometric Ornament

Early Art

Geometric Forms

- painting of ruches

they are equally prominent in architecture in all parts of the world. They are found on the early monuments of Mexico, on the architectural remains of Peru, on the huts of the savage, and on the early buildings of the historic period in various parts of the Old World, especially on those devoted to the commemoration of the dead or to the worship of the gods.

The same instinct that leads to geometric decoration of religious structures shows itself in the decoration of personal ornaments and of articles intended for domestic use. This is seen in the handicraft of the Stone Age, it is found in the

rich gold work of early Egypt, and it is equally in evidence in most of the jewelry of modern times. It is not merely the instinct of symmetry that we find in these petrified thoughts of the race; it is quite as much a desire to fathom the mystery and grasp the meaning of the beauty of geometric form.



EGYPTIAN POTTERY OF THE
PRE-DYNASTIC PERIOD

It shows the earliest stage of geometric ornament on pottery. The Predynastic Period extended from c. 4000 to c. 3400 B.C. From the Metropolitan Museum, New York

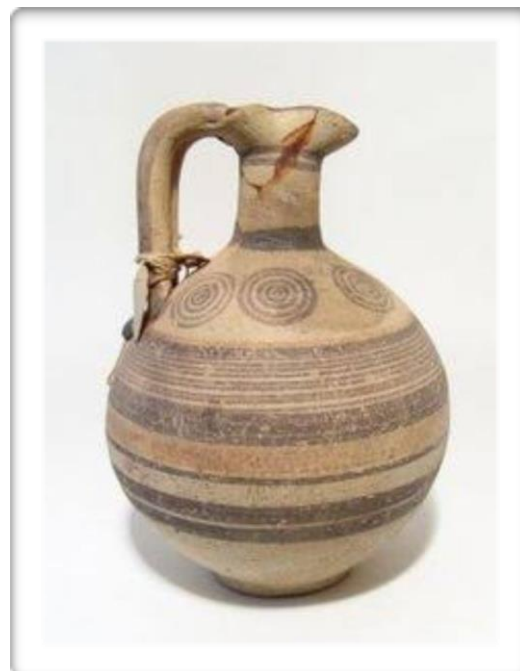
Early Pottery



CYPRUS JUG OF THE PERIOD
3000-2000 B.C.

Pottery of the Early Bronze Age,
showing the second stage in geo-
metric ornament. From the Metro-
politan Museum, New York

Early Pottery. The early pottery of Egypt and Cyprus shows very clearly the **progressive stages** of geometric ornament, from rude figures involving **parallels** to more carefully drawn figures in which **geometric design plays a more important part** and in which such **mystic symbols as the swastika are found**. Art was preparing the way for geometry.





4. Mysticism

Religious Mysticism

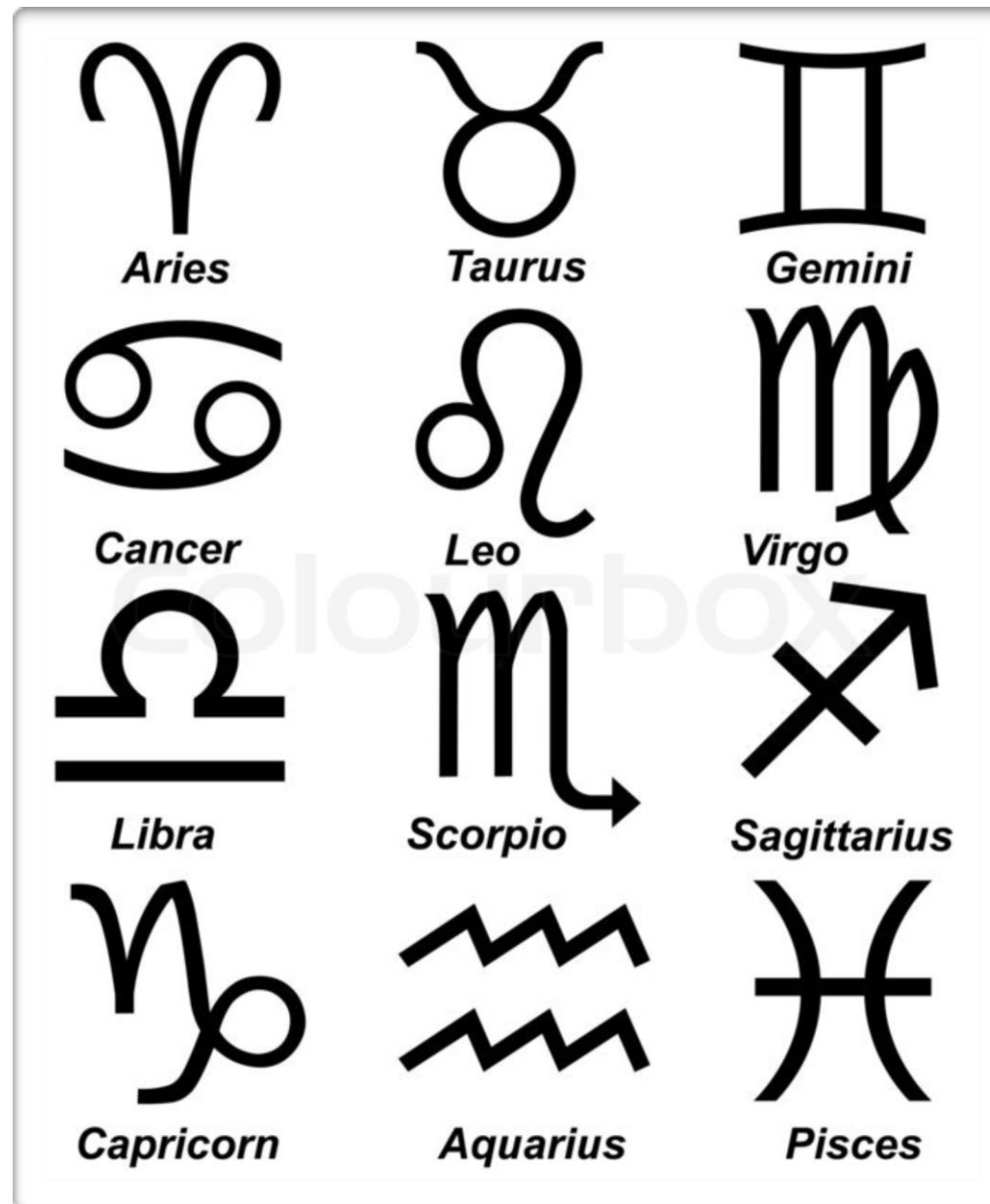
Religious Mysticism. The beginning of an appreciation of the wonders of mathematics is closely connected with the beginning of religious mysticism. Man wondered at the heavens above him; he wondered at life and he wondered even more at death; all was a mystery. He

The number four

Four corners of the earth

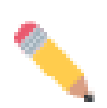
Cruciform figures

Observations of the Stars



Zodiac signs

Discussion 1



คำถามท้ายบทที่ 1:

1. สิ่งที่ใช้แบ่งยุคก่อนประวัติศาสตร์ออกจากยุคอื่น ๆ คืออะไร
2. นักมานุษยวิทยาแยกความแตกต่างระหว่างมนุษย์ในยุคก่อนประวัติศาสตร์และสิ่งมีชีวิตอื่น ๆ ได้อย่างไร
3. อะไรเป็นสาเหตุให้มนุษย์ตัดสินใจมาอยู่อาศัยรวมกันเป็นกลุ่ม
4. นักศึกษาคิดว่าคณิตศาสตร์มีจุดเริ่มต้นมาจากอะไร
5. มนุษย์ในยุคก่อนประวัติศาสตร์สามารถเริ่มนับจำนวนได้อย่างไร
6. การนับแบบรูปธรรมและนามธรรมแตกต่างกันอย่างไร