

Jill's Solutions

1. Read Burton §1.1-1.2. Summarize the mathematical topic discussed in these sections using at most two sentences.

This section is about early forms of numerical representation. Most of the examples are not positional and representation is limited to that of whole numbers: 1,2,3,... and maybe zero.

2. For each item/numerical system mentioned in this section, state the rough time period, an approximate location, and a brief description of the numerical system.

(a) Ishango Bone (pictured on page 5)

- i. time period: 20,000 years ago
- ii. location: central Africa
- iii. description: numbers represented as tally marks, material: bone.

(b) **Inca** quipus

- i. time period: 1200-1533 AD
- ii. location: Peru
- iii. description: powers of 10 represented by knots in string. positional. implied zero but no symbol for it. How many different **types** of knots? 2 or 9 depending on your definition “different.” material: cord.

(c) Mayan symbols

- i. time period: 300-900 AD
- ii. location: Mexico and Central America
- iii. description: positional base 20-ish, three symbols (dot, line, shell) to represent 1, 5 and zero. material: stone

(d) Egyptian Hieroglyphs (pages 13-14)

- i. time period: as early as 3500 BC a base 10 symbolic system allowing for the representation of arbitrarily large numbers
- ii. location: Egypt
- iii. description: base 10 symbolic (not positional), a new symbol for each power of 10. material: stone. Note, the oldest Egyptian papyrus is estimated to be from 2560-2550 BC found in 2013.

(e) Hieratic Symbols (pages 15-16)

- i. time period: developed 3000-2000 BC
- ii. location: Egypt
- iii. description: a cursive version of the hieroglyphs for the purpose of writing on papyri. The number of **distinct** symbols increased. For example, in hieroglyphs, the integers 1 to 9 were represented by tally marks where hieratic used 9 different symbols. Similar expansion happened for the representation of 10 - 90. material: papyrus.

- (f) Alphabetic System (page 16-17)
 - i. time period: 500-400 BC
 - ii. location: ancient Ionia (in present day Turkey) Why is it called a **Greek** system? The language/writing is in ancient Greek.
 - iii. description: base 10. symbolic, not positional. Individual letters to represent numbers 1-9, 10,20,...,90, 100, 200,...900. (Explains numerology!) material: papyrus