CHAPTER 4

Number Representation and Calculation



ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

4.4

Looking Back at Early Numeration Systems

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Objectives

- 1. Understand and use the Egyptian system.
- 2. Understand and use the Roman system.
- 3. Understand and use the traditional Chinese system.
- 4. Understand and use the Ionic Greek system.

ALWAYS LEARNING Copyright © 2015, 2011, 2007 Pearson Education, Inc. PEARSON Section 4.4, Slide 3

The Egyptian Numeration System

The Egyptians used the oldest numeration system called hieroglyphic notation.

Hindu-Arabic Numeral	Egyptian Numeral	Description
1		Staff
10	\bigcap	Heel bone
100	0	Spiral
1000	с Х	Lotus blossom
10,000	ſ	Pointing finger
100,000	À	Tadpole
1,000,000	Ŕ	Astonished person

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using the Egyptian Numeration System

Write the following numeral as a Hindu-Arabic numeral:



Solution: Using the table, find the value of each of the Egyptian numerals. Then add them.

= 1,020,034

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using the Egyptian Numeration System

Write 1752 as an Egyptian numeral.

Solution: First break down the Hindu-Arabic numeral into quantities that match the Egyptian numerals: 1752 = 1000 + 700 + 50 + 2

= 1000 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 10

Now use the table to find the Egyptian symbol that matches each quantity. Thus, 1752 can be expressed as

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

The Roman Numeration System

Roman Numeral	Ι	V	X	L	С	D	Μ
Hindu-	1	5	10	50	100	500	1000
Arabic							
Numeral							

The Roman numerals were used until the eighteenth century and are still commonly used today for outlining, on clocks, and in numbering some pages in books.

The Roman Numeration System

If the symbols *decrease* in value from left to right, then *add* their values to obtain the value of the Roman numeral as a whole.

If the symbols *increase* in value from left to right, then *subtract* the value of the symbol on the left from the symbol on the right to obtain the value of the Roman numeral as a whole.



ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using Roman Numerals

Write CLXVII as a Hindu-Arabic numeral.

Solution: Because the numerals decrease in value from left to right, we add their values to find the value of the Roman numeral as a whole.

CLXVII = 100 + 50 + 10 + 5 + 1 + 1 = 167

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using Roman Numerals

Write MCMXCVI as a Hindu-Arabic numeral.

Solution:



ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

The Traditional Chinese Numeration System

Traditional Chinese numerals	_	_	Ξ		五	六	t	八	አ	+	百	7
Hindu-Arabic numerals	1	2	3	4	5	6	7	8	9	10	100	1000

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using the Traditional Chinese Numeration System

Write 3264 as a Chinese numeral.



ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

The Ionic Greek Numeration System

The ancient Greeks used letters from their alphabet for numerals. The symbols are written right next to one another.

1	α	alpha	10	ι	iota	100	ρ	rho
2	β	beta	20	к	kappa	200	σ	sigma
3	γ	gamma	30	λ	lambda	300	au	tau
4	δ	delta	40	μ	mu	400	υ	upsilon
5	ϵ	epsilon	50	ν	nu	500	ϕ	phi
6	٢	vau	60	ξ	xi	600	χ	chi
7	ζ	zeta	70	0	omicron	700	ψ	psi
8	η	eta	80	π	pi	800	ω	omega
9	θ	theta	90	Q	koph	900	Π	sampi

ALWAYS LEARNING

Copyright © 2015, 2011, 2007 Pearson Education, Inc.

Example: Using the Ionic Greek Numeration System

Write $\psi\lambda\delta$ as a Hindu-Arabic numeral.

Solution:

Retrieving what each Greek numeral represents, $\psi = 700$, $\lambda = 30$, $\delta = 4$, next we add the digits left to right according to their positions.

$$\psi\lambda\delta = 700 + 30 + 4 = 734$$

Thus, $\psi\lambda\delta$ represents 734 in Hindu-Arabic numerals.