



Global Edition

# LAWRENCE SNYDER

**UNIVERSITY OF WASHINGTON** 

Global Edition contributions by

CHETHAN VENKATESH

M S RAMAIAH INSTITUTE OF TECHNOLOGY

### Pearson

Boston Columbus Indianapolis New York San Francisco Upper Saddle River Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montreal Toronto Delhi Mexico City Sao Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

# Fluency With Information Technology, Global Edition

## **Table of Contents**

Cover

**Preface** 

Contents

Location of VideoNotes in the Text

Online Labs

Part 1: Becoming Skilled at Computing

Part 1: Introduction

Chapter 1: Defining Information Technology Terms of Endearment

Computations Greatest Hits

Digitizing Information

Stored-Program Computers

The Switch to Transistors

Integrated Circuits

Personal Computers

The Internet

HTTP and the World Wide Web

Layered Software Development

The Great Part of the Greatest Hits

### Terms of Endearment

**Tech Support** 

Anchoring Knowledge

### Computers, Software, Algorithms

Find the Computer

Software

Algorithms

#### The Words for Ideas

Abstract

Generalize

Operationally Attuned

Mnemonic

Summary

Try It Solutions

**Review Questions** 



Multiple Choice

Short Answer

Exercises

### Chapter 2: Exploring the Human-Computer Interface Face It, Its a Computer

### A Few Useful Concepts

Feedback

Consistent Interface

New Instance

### Perfect Reproduction

An Exact Duplicate

Copying

### What We See and What We Think

Metaphors

The Desktop

The Touch Metaphor

Relationship Between Metaphors

Summary of Metaphors

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

**Short Answer** 

Exercises

### Chapter 3: The Basics of Networking Making the Connection

### **Comparing Communication Types**

**General Communication** 

The Internets Communication Properties

The Client/Server Structure

Appearing to Stay Connected

### The Medium of the Message

The Name Game of Computer Addresses

Following Protocol

Far and Near: WAN and LAN

Connecting Your Computer to the Internet

Domains and the DNS

**DNS Summary** 

#### The World Wide Web

Requesting a Web Page

The Internet and the Web

Describing a Web Page



### File Structure

Directory Hierarchy

Organizing the Folder

### Summary

### Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

## Chapter 4: A Hypertext Markup Language Primer Marking Up with HTML

### Marking Up with HTML

Formatting with Tags

Tags for Bold and Italic

Required Tags

### Lab Practice I

Firefox

**Text Editor** 

Hello, World!

Save This Page

Practicing in the Lab

### Structuring Documents

Headings in HTML

HTML Format Versus Display Format

White Space

Attributes

Brackets in HTML: The Escape Symbol

Accent Marks in HTML

### Lab Practice II

Compose and Check

Markup Validation Service

### Get Into Style with CSS

A Place for Style

Styling Background and Paragraph

**CSS Styling** 

Designing the Paradoxes Page

### Marking Links and Images

Two Sides of a Hyperlink

Structure of the Image Tag

### Referring to Files

Referring to Pages and Images



### Span, Lists, Tables, and Boxes

Span

Lists Tags

Handling Tables

The Box Model

### Cascading Style Sheets

Style in Many Places

Globally Speaking

The Cascade

### Styling with Class

A class Attribute

An Alternate Class

### Hovering Above Links

Navigation Bars

### HTML Wrap-Up

Gradient Background

Easy Enough for a Computer

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

## Chapter 5: Locating Information on the WWW The Search for Truth

### Web Search Fundamentals

How a Search Engine Works

**Multiword Searches** 

**Descriptive Terms** 

Page Rank

### **Advanced Searches**

The Logical Operator AND

Complex Queries

**Combining Logical Operators** 

Restricting Global Search

Focused Searches

### Web Searching

Selecting Search Terms

The Anatomy of a Hit

Using the Hit List

Once You Find a Likely Page



Searching Strategy Summary

Bing Search

#### Authoritative Information

Dont Believe Everything You Read

Wikipedia

What is Authoritative?

**Authoritative Sources** 

### Truth or Fiction?

Site Analysis

Tough Work

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

## Chapter 6: An Introduction to Debugging To Err Is Human

Precision: The High Standards of Computing

Be Accurate

Be Observant

### Debugging: Whats the Problem?

Debugging in Everyday Life

Debugging in Information Technology

Whose Problem is It?

Using the Computer to Debug

### A Dialog About Debugging

**Debugging Recap** 

### Fixing HTML Bugs: A Case Study

Look At the Page Closely

Focusing the Search

**Nearly Perfect** 

Debugging the JJK Page: A Postmortem

### No Printer Output: A Classic Scenario

Applying the Debugging Strategy

Pressing On

The Print Queue

Calling Tech Support?

### Ensuring the Reliability of Software

Safety-Critical Applications

Fail-Soft and Fail-Safe Software



Community Debugging Summary Try It Solutions **Review Questions** Multiple Choice Short Answer Exercises Interview with Vinton G. Cerf Part 2: Algorithms and Digitizing Information Part 2: Introduction Chapter 7: Representing Information Digitally Bits and the Why of Bytes Digitizing Discrete Information Limitation of Digits Alternative Representations Symbols, Briefly Ordering Symbols Information Representation Beyond the Physical World Memory Bits in Computer Memory Binary and Hex Binary Hex Changing Hex Digits to Bits and Back Again Digitizing Numbers in Binary Digitizing Text

Binary Numbers Compared with Decimal Numbers

Assigning Symbols

Extended ASCII: An 8-Bit Code

**ASCII Coding of Phone Numbers** 

Advantages of Long Encodings

NATO Broadcast Alphabet

**Bar Codes** 

#### UTF-8

### The Metadata and the OED

Properties of Data

Using Tags for Metadata

Structure Tags

Sample OED Entry



Why Byte?

Summary

Try It Solutions

**Review Questions** 

Multiple Choice

Short Answer

Exercises

## Chapter 8: Representing Multimedia Digitally Light, Sound, Magic

### **Digitizing Color**

Color and the Mystery of Light

Yellow = R + G?

Green Paint = Blue + Yellow

Making a Big Display

Thinking About Intensities

Black and White Colors

Decimal to Binary

Lighten Up: Changing Colors by Addition

To Increase Intensity: Add in Binary

Lighter Still: Adding with Carry Digits

### Computing on Representations

Old Photographs

Increasing Brightness and Contrast

**Binary Addition** 

Contrast

Adding Color

Summary of Digital Color

### Digitizing Sound

Analog to Digital

Advantages of Digital Sound

### Digital Images and Video

Image Compression

**JPEG** 

MPEG Compression Scheme

### Optical Character Recognition

**OCR Technology** 

### Multimedia Challenges

The Challenge of Latency

The Challenge of Bandwidth

Bits Are It

Bits: The Universal Medium



Bits: Bias-Free

Bits Are Not Necessarily Binary Numbers

Summary

Try It Solutions

**Review Questions** 

Multiple Choice

Short Answer

Exercises

## Chapter 9: Principles of Computer Operations Following Instructions

### Theres an App for That

The Usual Suspects

### Software Isnt So Hard

Deciding On What to Do

Software Layers

### Instruction Execution Engine

The Fetch/Execute Cycle

Anatomy of a Computer

Input Unit and Output Unit

Machine Instructions

### The Program Counter: The PCs PC

Address of the Next Instruction

Branch and Jump Instructions

#### Instruction Execution

Stepping Through ADD

The Clocks Ticking

Many, Many Simple Operations

### Translation

Assembly Language

Compiling

### Integrated Circuits

Miniaturization

Integration

Photolithography

### How Semiconductor Technology Works

Field Effect

Semiconducting Elements

Field Effect Transistors

Implementing ALU Operations

### Combining the Ideas

Summary



### Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

## Chapter 10: Algorithmic Thinking Whats the Plan?

### Algorithms

Writing One Letter at a Time

Homemade Algorithms

Many Questions; Fewer Questions

Writing Algorithms

Algorithms Versus Programs

Experience with Algorithms

Textbook Examples of Algorithms

Algorithms Versus Heuristic Processes

Inventing Algorithms

### AlgorithmsA Basic Concept

A Definition

#### A Closer Look

Query Evaluation

Intersecting Lists

A Familiar Solution

How Not to Match

**Different Solutions** 

### Doing the Right Thing

A Strategy

Explaining Why IAL Works

Summary on Correctness

### Summary

Try It Solutions

#### **Review Questions**

Multiple Choice

Short Answer

Exercises

Interview with Ray Kurzweil

### Part 3: Data and Information

## Chapter 11: Social Implications of IT Computers in Polite Society

The Power of the Crowd

Crowdsourcing

Be a Martian



Foldit

Civic ParticipationFreerice

Kickstarter

### Out on Good Behavior

Netiquette

Specific Guidelines for Email

Please, Dont Be Offended

### Expect the Unexpected

The Onion

Suspicious Activity

### Creating Good Passwords

The Role of Passwords

How Passwords Work

Poor Passwords

Creating Quality Passwords

Easy to Remember

Hard to Guess

Managing Passwords

### Spam

Controlling Spam

### Scams

Nigerian Widow Scam

Phishing

The End of the Phishing Story

### Protecting Intellectual Property

Licensing of Software

Open Source Software

Copyright on the Web

Violating the Copyright Law

### **Creative Commons**

Allow Copying and Distribution

What to Keep, What to Give

Creative Commons Summary

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

Chapter 12: Privacy and Digital Security Shhh, Its a Secret



### Privacy and Technology

Modern Devices and Privacy

Information Sources and Uses

Controlling the Use of Information

### A Privacy Definition

### Enjoying the Benefits of Privacy

Voluntary Disclosure

### Fair Information Practices

**OECD Fair Information Practices** 

### Is There No Privacy?

Who is Protected?

Business as Usual

Targeted by Target

Government, as Usual

### Tracking

Online Tracking

Cell Phones

### Cookies

Appearing To Stay Connected

The Right to Be Forgotten

Identity Theft

### **Digital Security**

Understanding the Problem

Terms and Jargon

What Does Malware Do?

### Prevention

Play It Safe

Safe Computing Checklist

Oops, Now Ive Done It!

Plan of Action

### Encryption

The Key to Encryption

Keys

**Encrypting Example** 

Private Key Encryption

Public Key Encryption

The Genius of PKC

The Take-Home Message

Factoring is Hard

Back to the Coffee Shop

Redundancy Is Very, Very, Very Good



Protecting Your Data

Backups and Recovery

Summary

Try It Solutions

**Review Questions** 

Multiple Choice

Short Answer

Exercises

## Chapter 13: The Basics of Spreadsheets Fill-in-the-Blank Computing

### Arranging Information

An Array of Cells

Sorting the Data

Adding More Data to the List

### Computing with Spreadsheets

Writing a Formula

Repeating a Formula

Transforming Formulas: Relative Versus Absolute

**Cell Formats** 

**Functions** 

Finding the Maximum

Displaying Hidden Columns

Charts

### **Daily Spreadsheets**

Time Zone Cheat Sheet

Solving a Problem of Personal Interest

Getting Started, Then Filling In

Finish Up

Pizza Discount Table

A Plan

The Requirements

Absolute References

Relative References

Paying Off a Loan

### Importing Data

Tab-Delimited Data

Arranging Columns

Summary

Try It Solutions

**Review Questions** 

True/False



Multiple Choice

Short Answer

Exercises

### Chapter 14: Advanced Spreadsheets for Planning What If Thinking Helps

### Designing a Spreadsheet

The Trip

**Design Guidelines** 

Initial Spreadsheet: Applying the Rules

### Conditional Formatting

Cell Value is Specifications

Formula is Specifications

Distinguish Between the United States and Canada

### Conditional Formulas

Figuring the Amount Paid

Cost in One Currency

### Naming: Symbolic Reference

**Defining Names** 

Applying Names

Make Assumptions Explicit

### What If Analysis

Direct Experimentation

Scenarios

Analyzing a Model

### Analyzing Data Using Filtering

Auto Filtering Technique

Advanced Filtering Technique

Filtering on Multiple Criteria

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

### Chapter 15: Introduction to Database Concepts A Table with a View

### Differences Between Tables and Databases

Comparing Tables

The Databases Advantage

### XML: A Language for Metadata Tags

An Example from Tahiti

Expanding the Use of XML



Attributes in XML

Effective Design with XML Tags

The XML Tree

### Tables and Entities

**Entities** 

Properties of Entities

Every One Is Different

### The Science of Tables

Relational Database Tables

Computing with Tables

Ask Any Question

Summarizing the Science

### SQL: The Language of Databases

### Structure of a Database

Physical and Logical Databases

Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

## Chapter 16: A Case Study in Database Organization The iDiary Database

### Thinking About a Personal Database

Regular Versus Irregular Data

Physical Versus Logical

The iDiary

### A Preliminary Exercise

Travels Database

Displaying the Travels with XSL

### The iDiary Database

Getting Started

Creating a First Entry (August 11)

Thinking About the Nature of Things

Developing Tags and Templates

### Using the iDiary Daily

**Archiving Photos** 

Hiding Information

Entering Data into the Database

### Summary

Try It Solutions



### **Review Questions**

Multiple Choice

**Short Answer** 

Exercises

Interview with Alan Kay

## Part 4: Problem Solving

Part 4: Introduction

### Chapter 17: Fundamental Concepts Expressed in JavaScript Get with the Program

Overview: Programming Concepts

Names, Values, and Variables

Names Have Changing Values

Names in a Program Are Called Variables

Identifiers and Their Rules

A Variable Declaration Statement

The Statement Terminator

Rules for Declaring Variables

### Three Basic Data Types of JavaScript

Rules for Writing Numbers

Strings

Boolean Values

### The Assignment Statement

Assignment Symbol

Interpreting an Assignment Statement

Three Key Points About Assignment

### Lab Practice

Scratchpad Hello, World

### An Expression and Its Syntax

**Arithmetic Operators** 

**Relational Operators** 

**Logical Operators** 

### A Conditional Statement

if Statements and Their Flow of Control

Compound Statements

if/else Statements

Nested if/else Statements

### The Espresso Program

The Logic of a Double Tall Latte

Summary

Try It Solutions



### **Review Questions**

Multiple Choice

**Short Answer** 

Exercises

### Chapter 18: A JavaScript Program The Bean Counter

### **Preliminaries**

### Background for the UI

Review of HTML Basics

Interacting with a UI

Three Input Elements

### Creating the Graphical User Interface

- 1. Create a Button Table
- 2. Delete Two Buttons
- 3. Insert Text Box
- 4. Label the Buttons
- 5. Primp the Interface

### **Event-Based Programming**

The onclick Event Handler

Click Event

Shots Button

Size and Drink Buttons

Clear Button and Initializations

Referencing Data Across Inputs

### Critiquing the Bean Counter

Numbers Versus Money

Organization

Feedback

Application

### Bean Counter Recap

Program and Test

Assess the Program Design

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

### Chapter 19: Programming Functions Thinking Big

### Anatomy of a Function

Converting Some Temperatures



Making the Call

**Definition Versus Call** 

#### Forms and Functions

### Writing Functions, Using Functions

Flipping Electronic Coins

The Body Mass Index Computation

### **Customizing Pages**

Creating Page Content

Customizing the Coin Flip

### Making a Web-Based Phone App

Design for Mobility

Referencing Functions

The Counter Assistants Structure

**Better Applications** 

Recap: Two Reasons to Write Functions

### Social Functions

Using Other Peoples Code

Making a Comment

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

### Chapter 20: Iteration Principles Once Is Not Enough

### Iteration: Play It Again, Sam

The for Loop Basic Syntax

How a for Loop Works

### JavaScript Rules for for Loops

The World-Famous Iteration

Why So Famous?

Avoiding Infinite Loops

### **Experiments with Flipping Coins**

One Trial of 100 Flips

Multiple Trials

A Diagram of Results

Nested Loops

### Indexing

Index Syntax

Index Origin



### Arrays

Rules for Arrays

Array Reference Syntax

### Its Magic

Setting Up the Array

Structuring the Page

### The Busy Animation

Using a Timer to Initiate Animation

Prefetching Images

Redrawing an Image

### Not So Busy Animation

Three Key Ideas

Summary

Try It Solutions

### **Review Questions**

Multiple Choice

**Short Answer** 

Exercises

## Chapter 21: A Case Study in Algorithmic Problem Solving The Smooth Motion Application

## The Smooth Motion Application

How the Smooth Motion Application Should Work

### Planning Smooth Motion

Apply the Decomposition Principle

List the Tasks

Decide on a Problem-Solving Strategy

### Build the Basic Web Page UI

The Structural Page

The Structural Page Heading

#### Animate the Grid

First Analysis

Second Analysis

Subtask: Define and Organize the Frames Subtask: Define and Place Initial Images Subtask: Prefetch the Frame Images

Subtask: Set Timer and Build Timer Event Handler

The Best Laid Plans . . .

**Build Controls** 

Sense the Keys

Subtask: Define and Organize the Frames



Subtask: Place the Initial Images
Subtask: Prefetch the Frames
Subtask: Build the Event Handlers

Combine the Subtasks

### Staircase Detection

Subtask: Recognizing the Staircase Subtask: Recognizing Continuity

### Assemble Overall Design

### Primp the Design

Assessment and Retrospective

### Summary

Try It Solutions

### **Review Questions**

Multiple Choice

Short Answer

Exercises

### Chapter 22: Limits to Computation Computers Can Do Almost { Everything, Nothing}

### Can Computers Think?

The Turing Test

Passing the Test

### Acting Intelligently?

**Playing Chess** 

A Game Tree

Using the Game Tree Tactically

Using Database Knowledge

**Using Parallel Computation** 

The Deep Blue Matches

Interpreting the Outcome of the Matches

### Watson

Computer Versus Humans

Technical Challenge

Summary on Watson

### Acting Creatively?

Creativity as a Spectrum

What Part of Creativity is Algorithmic?

### The Universality Principle

Universal Information Processor

Practical Consequences of the Universality Principle

### More Work, Slower Speed

Comparing IAL with NAL



### Are Best Algorithms All Fast?

NP-Complete Problems

Unsolvable Problems

Summary

Try It Solutions

**Review Questions** 

Multiple Choice

Short Answer

Exercises

### Chapter 23: A Fluency Summary Click to Close

### Two Big Computing Ideas

Information Structuring

Strategies for Nonalgorithmic Tasks

Fluency: Less Is More

Lifelong IT Learning

Pursuing New Uses

Asking for Help

Noticing New Technology

Shifting for Yourself

Try It Solutions

**Review Questions** 

Multiple Choice

Short Answer

Exercises

Interview with David Ferrucci

## **Appendix**

### Appendix A: HTML5 Reference

Required HTML Tags

HTML Tags

Worked Example: D.C. Trip Page

### Appendix B: RSA Public Key Cryptosystem

Choosing a Key

Encrypting a Message

The Decryption Method

Summarizing the RSA System

### Appendix C: iDiary: Tags and Templates

XML Database File iDiary.xml

XSL file iDiarySS.xsl



## Appendix D: JavaScript Programming Rules

Program Structure

Data Types

Variables and Declarations

Expressions

Arrays and Indexes

Statements

**Functions** 

Guidelines

Appendix E: The Bean Counter Program

Appendix F: myApps Page

Appendix G: Smooth Motion Program

Glossary

**Answers to Selected Questions** 

Index

Credits