

The cover features several stylized, light green leaf motifs scattered across a pale yellow background. Each motif consists of a short stem with two leaves pointing upwards and to the right.

DECISION POINTS

**Boolean Logic for Computer Users and Beginning
Online Searchers**

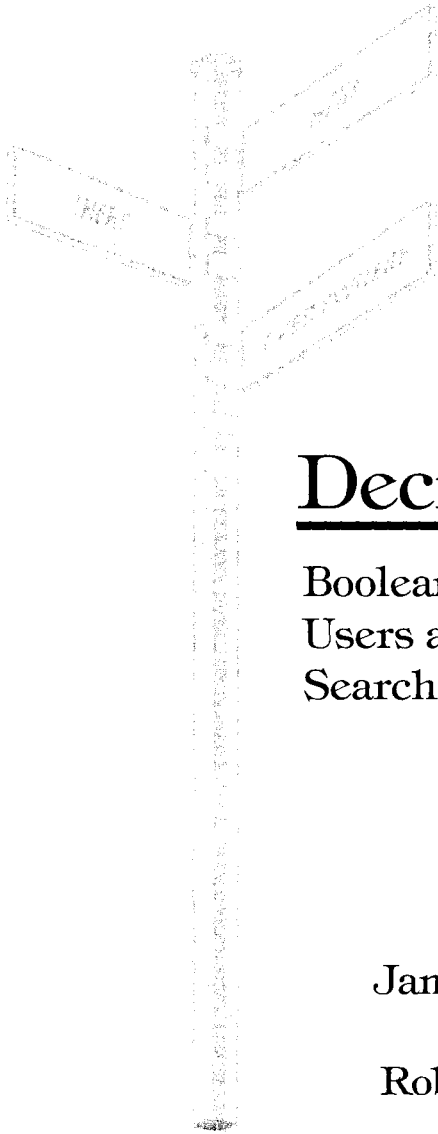
Janaye M. Houghton, Robert S. Houghton

The logo features a stylized green leaf motif to the left of the text.

Greenwood
PUBLISHING GROUP

Decision Points

This page intentionally left blank



Decision Points

Boolean Logic for Computer
Users and Beginning Online
Searchers

Janaye M. Houghton
and
Robert S. Houghton

1999
Libraries Unlimited, Inc.
Englewood, Colorado

Copyright © 1999 Janaye M. Houghton and Robert S. Houghton
All Rights Reserved
Printed in the United States of America

No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. An exception is made for individual librarians and educators, who may make copies of activity sheets for classroom use in a single school. Other portions of the book (up to 15 pages) may be copied for in-service programs or other educational programs in a single school or library. Standard citation information should appear on each page.

Libraries Unlimited, Inc.
P.O. Box 6633
Englewood, CO 80155-6633
1-800-237-6124
www.lu.com

Aquisitions Editor: Susan C. Zernial
Production Editor: Felicity Tucker
Copy Editor: Brooke Graves
Proofreader: Cherie Rayburn
Indexer: Susan Olason
Typesetter: Michael Florman

Library of Congress Cataloging-in-Publication Data

Houghton, Janaye Matteson

Decision points : Boolean logic for computer users and beginning
online searchers / by Janaye M. Houghton, Robert S. Houghton.

viii, 155 p. 22x28 cm.

Includes index.

ISBN 1-56308-672-7 (softbound)

1. Electronic information resource searching. 2. Computer logic.
3. Algebra, Boolean. I. Houghton, Robert S. II. Title.

ZA4460. H77 1999

025.04--dc21

98-53624
CIP

Contents



Introduction.....	vii
Chapter 1—Decision Points	1
George Boole and Boolean Algebra.....	1
It All Depends.....	2
Chapter 2—It All Depends. On What? Exploring Conditions and Outcomes	5
If-Then Statements: Conditions Stated Affirmatively and Negatively	8
NOT: Inversions (Opposite Outcomes)	10
If-Then Logic—The Computer Way.....	12
Chapter 3—Boolean Logic AND More	15
Boolean AND Logic and the Simple Series Circuit.....	22
AND Logic As a Search Tool on a Computer Database.....	25
Focus to Find.....	27
Syntax of Searching: Variations on Searching with AND.....	30
Advanced Searching with AND	32
Chapter 4—NAND Logic: Combining AND and NOT	35
NAND Logic Both Ways.....	38
Searching Databases with NAND Strategies	40
Chapter 5—Your Choice: OR	43
Boolean Logic: OR and the Parallel Circuit.....	47
OR Logic As a Search Tool on a Computerized Database	50
AND Gets You Less, OR Gets You More! Comparing AND and OR Search Strategies	51
Searching with Synonyms: Another Use for OR.....	53
OR Logic Using Partial-Word Searching.....	55
Chapter 6—NOR Logic: Combining OR and NOT	57
Using NOR Logic with Affirmative and Negative Statements.....	57
Searching with OR and NOT	58
Alternative Notations for NOR—Advanced	63
Chapter 7—Combining AND and OR Logic to Make One Big Decision	67
More Examples of Combined AND and OR Logic.....	69
The Final Decision.....	74
Chapter 8—Knowledge in the Information Age	75
Why Hunt?.....	76
Who Does the Hunting?.....	76
Where Do I Hunt?	76
When Do I Hunt?	77
What Do I Hunt?	78
How Do I Hunt?	78
References	79

Chapter 9—Person, Place, or Thing	81
White-Page Postal Address and Telephone Numbers	81
White-Page Email Addresses	82
Yellow-Page Example.....	82
Email Conferences	83
Newsgroup Examples	83
Liszt Newsgroups	85
Mailing Lists or Listservs.....	85
Chapter 10—Person, Place, or Thing	87
Introduction	87
Physical Libraries.....	88
Where to Search.....	88
How Do You Find Sets of Online Libraries Using the Same Search Software?.....	89
Books and Resources for K-12	90
City Libraries	90
Bookstores	96
Elementary, Middle, and High School Libraries.....	100
The Library of Congress.....	103
Chapter 11—Person, Place, or Thing	107
Virtual World Problems.....	107
The Hunt Across the Web.....	108
The Top Level of the Web: Commercial Publications	109
Encyclopaedia Britannica.....	109
Time-Warner’s Pathfinder	109
The Second Level of the Web: Professionally Reviewed Internet Sites	110
Family Filter from Alta Vista.....	111
Family Sites: Family.com	114
Adding Filters.....	116
The Third Level of the Web: Subject Catalogs or Directories.....	117
Subject Search Sites.....	120
The Base: Robots	120
Northern Lights.....	123
Automated Search Routines.....	129
Final Decision Points	129
Serving Ideas.....	130
Answer Key	133
Table of Selected Boolean Features	145
Index	149
About the Authors	155

Introduction



As time pushes our boat toward the shoreline of the twenty-first century, we can see huge waves of information and choices crashing on the rocks and sand ahead of us. When the rising wave of choices splashes over those who finally reach the beach, *Decision Points* shows us a way to sort through it all. It also gives explorers the tools they need as they move past the beach and reach far into the Internet forest beyond. This book is intended to help teachers of all disciplines, librarians, students, and learners of all ages who wish to make this effort.

The first step in benefiting from what this ocean of ideas brings ashore is to make effective decisions. In this book, making good decisions is assisted by a form of mathematics known as Boolean algebra, also called Boolean logic. This Boolean logic uses simple terms, such as AND, OR, and NOT, to aid in decision making. These simple terms, when combined, are powerful operators for solving everyday problems.

Boolean logic plays a wide range of roles. It has proven to be a superb tool for designing computers and the software that runs them and for designing a wide range of electronic devices. At their deeper levels, computers manage information by using Boolean logic to change sequences of closed and open electronic gates. *Decision Points* explores Boolean logic in a more broadly applicable way, though. This book shows that Boolean is a syntax of language for analytical thinking—a level of thinking that serves as a stepping-stone to other higher orders of thought such as comparison, inference, and evaluation. In this way Boolean thinking transforms itself into an excellent tool to aid in the making of a wide variety of decisions.

The time it takes for the amount of information in the world to double continues to shorten. Though this fact is astonishing, an even more astounding development is occurring: our access to information through improved information system designs increases even faster than the overall growth of data. Furthermore, this world of information does not merely grow; its contents continually change as information is added and removed. *Decision Points* also explores key choices in making the best use of the information processors that stretch from your desktop computer to the search engines of the global Internet.

Unfortunately, information-age learners have been known to go starving while walking along this shoreline of abundance. Our information hunter-gatherers too often return with empty nets or hunting bags full of scraps that are of little value. As early hunters had to create different plans to trap different kinds of game, so must those in the Information Age. As Stone-Age hunters had to chip away unwanted rock to make effective tools, so must information-age hunters learn to use Boolean tools to “chip” away information that is not useful. This chipping brings to light the points and edges we need to make our ideas effective.

Boolean logic can play a role at every level of these problem-solving processes. Have fun with the following examples and puzzles, and then put this useful logic to work every day in your decision making and information searching!

Decision Points presents a progression of ideas and activities defining Boolean logic, search terms, and search strategies. The concepts and explanations in chapters one through seven are designed to appeal to elementary through high school students who are introduced to the concepts of search logic for the first time. The examples given are common experiences to students in that age range. However, older students and adults new to this subject may enjoy the simplified, step-by-step progression of the first seven chapters as well.

Chapters eight through eleven are designed for upper elementary students who are avid online searchers and high school students, college students, and adults who are familiar with online searching in a general way and who wish to refine their understanding of search logic, search terms, and search strategies.

Chapter 1

Decision Points



Should you spend your allowance on model rockets or on baseball cards? Should you advertise for babysitting jobs? Should you invite everyone in your class to your party, or just your special friends? Should you go to the gym to exercise or stay home and read a book? Should you open your mail or do your budget on the computer?

These are examples of the kinds of decisions children, teenagers, and adults make every day. Any day can bring hundreds of decisions. Most decisions are small and have very little lasting effect. Others are big and have major consequences. But no matter how big or small a decision to be made is, an *informed* decision is the best way to go.

That is, before a decision is made, it is best to think about all of the possible conditions that exist and the possible outcomes of the decision. After gathering information to make a decision, each of us may arrive at a different conclusion. Yet no matter what the outcome, decisions can be made in certain ways that use patterns of logic. Somewhere in the process of gathering information, a *decision point* is reached.

Decision Points is a book that presents several themes. Boolean logic, as described later in this book, provides the framework for this development. First, everyday logic statements representing common situations are presented. These logic problems represent decisions that we commonly face. The readers are challenged to “solve” and dissect these statements and then are encouraged to create new ones. Second, simple explanations and diagrams show how electronics and computer chip technology can take similar information and place the *decision point* inside a computer. Third, Boolean logic is shown as a way to search databases in libraries and Web pages on the Internet. This logic, along with a set of search terms, will help students hunt for information more efficiently.

George Boole and Boolean Algebra

Don't let the words “Boolean Algebra” scare you! It is all about a man and a system that revolutionized the way we do work. A mathematician named George Boole (1815–1864) invented, quite by accident, the basis of logic for our modern-day computers. In an attempt to create a new form of mathematics, Mr. Boole identified certain patterns of logic that were later found to be easily translated into an electronic language—essentially, a “switch-on/switch-off” pattern.

Today, using tiny electronic switching mechanisms inside the computer, “decisions” are made with lightning speed within the central processing unit (CPU). These decisions are based on whether a tiny switch is on or off at any given time.

Computer programmers follow prescribed sets of instructions to “teach” computers how to make decisions to carry out instructions. This is called *programming*. Programming is made possible by sets of instructions called *languages*. Many of these languages are made up of the logic building blocks identified by Mr. Boole more than 100 years ago, long before computers.

The building blocks that Mr. Boole identified are AND logic, OR logic, NOT logic, NAND logic, and NOR logic. Computer decisions are made from these patterns of logic. For the purposes of this book, we have also added If-Then logic, which is basic to the understanding of Mr. Boole's logic patterns.

Mr. Boole's logic concepts are being used today to search databases for information in our schools, libraries, and businesses and to search data systems on the Internet. So let's get started exploring these concepts and see what they have to offer us every day.

It All Depends

Have you ever asked a friend or a teacher about something you would like to do in the future? Were you frustrated when you got the answer "It all depends"? As frustrating as it may seem at times, with any plan, event, or activity, certain *conditions* must exist before certain results can happen.

You probably can't remember, but you began learning this as a baby. You learned that if you cried, someone would comfort you. If you laughed, others would laugh and smile around you. You also learned that if you wanted to eat and you made sounds, someone would feed you. Later, as a toddler you learned:

If I reach for the cup, someone will give it to me.

If I crawl to the toy chest, I can get out a toy.

If I potty on the toilet, I won't be uncomfortable in my diaper.

And because of these associations, you learned to talk, reach, crawl, and use the potty. By the time you reached kindergarten, you began learning associations such as:

If I wait in line, I will get a cold drink from the water fountain.

If I raise my hand, the teacher is likely to call on me.

If I talk out of turn and interrupt, the teacher will ask me to wait my turn.

If I bring a birthday treat from home, the teacher will allow me to share it with my friends.

Older students are involved in making other decisions for themselves, based on the associations they learned in the past. For example:

If I earn the money, then I can buy a ticket to the rodeo.

If I study my lab books, then I may do well on the test.

If I attend all of the practices, then I may play at the basketball game.

You have learned that certain things must happen for an event to follow. As you saw, the *outcome* you desired (going to the rodeo, getting a good grade, playing on a team) depended on certain *conditions* coming first.

Notice the *condition* and the *outcome* for the following situations:

1. You need to earn five dollars so you can buy a ticket to the movies.

Condition

If you earn \$5.00,

Outcome

then you can buy a movie ticket.

2. You must improve your math grade to be on the B honor roll.

Condition

If you bring up your math grade,

Outcome

then you can be on the B honor roll.

3. You must volunteer 10 hours of time picking up trash along the highway for your club to win free T-shirts.

Condition

If you volunteer 10 hours picking up trash,

Outcome

then your club will win free T-shirts.

Activity #1**If-Then Statements:
Condition-Outcome**

Now try these on your own. Write them as *if-then* statements with the *condition* first and the *outcome* following. Use the preceding examples to get started. Remember to determine what must happen first and what outcome will result.

1. You need to hike five more miles to earn your 50-Mile pin for Scouts.

If _____, then _____.

2. You need to give two more pints of blood to earn a one-gallon pin from the Red Cross.

If _____, then _____.

3. You need to drop .08 seconds off your 100-meter swim time to place in the competition.

If _____, then _____.

4. You need to improve your sight-reading score by 20 percent to take First Chair in the band.

If _____, then _____.

5. You need to raise your batting average by .05 to qualify for the All-Stars.

If _____, then _____.

6. You need to improve your grade point average by .5 to be included on the Honor Roll.

If _____, then _____.

7. You need to read four more 200-page books to join the Accelerated Readers party.

If _____, then _____.

8. You need to cut 250 words from your essay to submit it to the Water Conservation Essay contest.

If _____, then _____.

This page intentionally left blank

Chapter 2

It All Depends. On What? Exploring Conditions and Outcomes



Remember the person who said to you, “It all depends”? Did you respond, “On what?” This question suggests that you need to look closely at the situation and identify what conditions will bring about the result you have in mind. Sometimes the conditions may not be identified for you, as in the following example.

For these situations, you must *imagine* what condition would precede the desired outcome. The condition is not stated in the situation statement. As you study the example, realize that different people will be able to think of various conditions that are appropriate to the same example.

Given the same situation statement, conditions may vary, but remember that the condition must be *essential* to the outcome. In other words, the condition is a *prerequisite* for the outcome; it is required. The outcome must be a direct contingency of the condition; that is, it must follow naturally.

Example:

You want to buy cotton candy at the pep rally.

Possible conditions:

If I can go to the pep rally, then I will buy cotton candy at the pep rally.

If I can find my wallet, then I will buy cotton candy at the pep rally.

If I get my allowance tonight, then I will buy cotton candy at the pep rally.

Activity #2

Finding the Prerequisite Condition

Identify a possible prerequisite condition for the following if-then situations. Remember there is no one correct answer. Various creative responses are acceptable if the condition is essential to bring about the desired outcome.

1. You want to swim today.

If _____, then I will swim today.

2. You want to win a trombone competition so you can play First Chair at the spring concert.

If _____, then I will win First Chair.

3. You want to build more on your toothpick bridge project, but you are out of toothpicks.

If _____, then I will finish my bridge.

4. You want to continue to subscribe to *Sports* magazine, but you have lost the address.

If _____, then I will renew my subscription.

5. You want to play on the library's computer today.

If _____, I will play on the computer at the library.

6. You want to play racquetball after school today, but you forgot to sign up for a racquetball court.

If _____, I will play racquetball after school.

7. You want to be a library aide, but you need five hours of orientation.

If _____, I can become a library aide.

8. You want to play in the recorder ensemble after school.

If _____, I can play in the recorder ensemble.

Activity #3

Have It Your Way: Personalized If-Then Statements

So far you have worked with situation statements that reflect goals of a student who is about your age. Now it is time to learn to write a situation statement on your own. Start this activity by thinking about a need you have or a desire you have for something to happen. Think to yourself, "I would like to _____."

Let's try some. Write down the next five ideas that come to you.

1. I would like to _____.
2. I would like to _____.
3. I would like to _____.
4. I would like to _____.
5. I would like to _____.

Now you have five "situation starters"! Think now about what is preventing you from achieving each goal, or what you still need to do to achieve each goal. You might state, "I would like to try out for cheerleading, but my grades aren't good enough." Fill in the following statements, using the five goals you just identified. You will have five situation statements when you finish.

1. I would like to _____, but _____.
2. I would like to _____, but _____.
3. I would like to _____, but _____.
4. I would like to _____, but _____.
5. I would like to _____, but _____.

Now you can clarify your situation statements by making them if-then statements. When you know what has to be done to bring about a desired outcome, you can get to work and try to make it happen! For example, "If I bring my grades up to Bs, I can be on the cheerleading squad." Write your situation statements as if-then statements on the following lines.

1. If _____, then _____.
2. If _____, then _____.
3. If _____, then _____.
4. If _____, then _____.
5. If _____, then _____.

If-Then Statements: Conditions Stated Affirmatively and Negatively

You have seen some simple situation statements and found the conditions on which the outcomes depend. You have even written some of your own. Each outcome you have seen and written so far represented a goal, event, or activity that was desired by the person stating the situation. Each condition was stated in the affirmative. That is, if something happened (*affirmation*), then the outcome could take place. Let's now look at possible conditions stated in the negative. Look for negative words such as *do not*, *don't*, *will not*, and *won't*.

Situation #1:

You need to earn five dollars so you can buy a ticket to the movies.

Condition 1 (as previous)

Outcome 1

Affirmative: If I earn five dollars,

then I *will* buy a movie ticket.

Condition 2

Outcome 2

Negative: If I *do not* earn five dollars,

then I *will not* be able to buy a movie ticket.

This situation has two possible conditions: an affirmative one (stated positively) and a negative one. Each condition yields a different outcome. Each outcome is possible, depending on the condition that comes before it. That's why **it all depends!**