

Table of Contents

Chapter 1: Introduction	1
Why Solve Problems?	2
Good or Lucky	3
Lugs and Lug Nuts	5
Haven't I Learned to Solve Problems Already?	6
Brainteaser	7
Brainteaser Bright	8
The Rationale for Rationality	9
Anyone Can Figure Things Out	11
Example in Critical Thinking	12
What is Critical Thinking?	14
Knowledge Types	16
Thinking Models	17
Who Thinks Most Critically?	19
What is a Problem?	20
How Many Solutions?	21
Chapter 2: Irrational Thought	23
Are We Irrational?	24
The Burden of Proof	26
The Strength of an Argument	28
Really Stupid People	29
Really Stupid Leadership	31
The Problem, The Solution	32
Wishful Thinking	33
Poisonous Pessimism	34
Optimistically Pessimistic	36
Fatal Fallacies	37
Fun with Fallacies	38
Post Hoc	39

Science by Consensus	40
General Rule	41
Facts, Hearsay, Conjecture, and Opinions	42
Intuition and Experience	43
Biases and Other Baggage	44
Uncommon Sense	45
Chapter 3: Logic	47
What is Logic?	48
Enter an Argument	49
Complex Arguments	50
Deduction and Induction	51
If, Then	52
Simple Syllogisms	53
Sly Syllogisms	54
Boolean Bafflement	55
Cybernetic Circuits	56
Permissive Behavior	57
Truth Tables	58
What is Truth?	59
Chapter 4: Define the Problem	61
Where Do Problems Arise?	62
Picking a Problem	64
Three for the Price of One!	65
The Human Touch	66
Write It Down	67
Take a Picture	69
Put a Number On It	70
How Much Does it Hurt?	71
How Much Does it Cost?	73
Waste is not a Dirty Word	74
Delay	77
What are You Doing?	78
More Problems	79

Does a Problem Deserve Solution?	80
Just Say No	81

Chapter 5: Data Gathering83

Have You Done Your Homework?	84
Reading for Profit	85
Web Handling and Converting Founts	87
Getting What You Need	88
Special Order	90
Twenty Questions	92
The Lazy Policeman	94
Good Gravy Davy	95
Open Your Eyes	96
The Sensual Detective	98
Measuring Things	99
What Do You Think?	101
Wheat and Chaff	103
Hypothesis Generation	105
Mental Blocks	106

Chapter 6: Determine the Options107

Make a List	109
Tool Types	110
3 Ms	111
Man Clues	113
MMI	114
Machine Clues	116
Material Clues	117
Machine or Material?	118
Separating Machine and Material	120
Binary Search and Bracketing	121
Divide and Conquer	124
First and Worst	126
Exaggeration	129
Opposites	132
Finding Factors	134

Toggling	135
Envisioning	137
Bounding and Estimating	138
The Shape Tool	140
Shape Tool and Statistics	145
Science	147
Science and a List of Knobs	153
Science and the Number of Knobs	154
Statistics	155
Duncker Diagram	160
Fishbone Diagram	162
Triz	163
Kepner-Tregoe	164
Other Formal Methods	166
Chapter 7: Decide What to Do	167
Pick Your Poison	168
Why Not ROI?	169
Weighted Factors	170
Optimizing the Overconstrained	172
Reliability	175
Ethics	176
Sanity Check	178
Chapter 8: Do Plan Your Project	179
Why Have a Meeting?	180
Successful Meetings: Do's	181
Successful Meetings: Don'ts	182
CPM Charts	183
Gantt Charts	184
On Time, Under Budget	185
Paperwork	186
Old Business	187

Chapter 9: Problem Solving Pitfalls	189
The Problem with Pitfalls	191
Ill Defined Goals	192
A Rose by Any Other Name	193
Turning an Observation into a Problem	194
Time Constraints	195
No Homework	197
Tool Fixation	198
Tool Use and Misuse	200
Watermelon Way	201
Science by Consensus	202
Never Had That Before	204
Why Me?	205
What Changed? What is Different?	206
Measuring Things	208
Bias	209
Optimum Arousal	211
Non-Coulomb Friction	212
The Home Run	214
Exceptions	215
Small Samples	216
Small Effects	218
Sweet Spot	219
Confusing Cause and Effect	221
Near Miss	222
Perennial Project	223
Too Many Constraints	225
Fix it But Do Not Change Anything	227
Instabilities	228
The Widowmaker	230
Run and Hide	232
Other Red Flags: People	233
Chapter 10: The Critical Thinker	235
Preparation	236
Humility	238

Open Mindedness .....	.239
Skepticism .....	.240
Thinking .....	.242
What is Truth? .....	.243
The Critical Thinker .....	.244
Go For It .....	.245
Wisdom .....	.246

Appendices

A. Answers to Puzzles .....	.247
B. Dictionary .....	.248

Index251
--------------------	-------------

List of Figures

1.1 Can You Tie the Knot? .....	.7
1.2 Ship and Bridge .....	.12
1.3 Three Types of Knowledge .....	.16
1.4 Thinking Models .....	.17
1.5 Which Figure is Different? .....	.21
3.1 Simple Syllogism .....	.53
3.2 Invalidating a Syllogism with a Diagram .....	.54
3.3 Boolean Algebra .....	.55
3.4 Logic Circuits .....	.56
3.5 Permissives to Start an Automobile .....	.57
3.6 Motor Permissive Example .....	.57
3.7 Web Spreader and Truth Table .....	.58
4.1 Problem Solving Decision Tree .....	.80
6.1 Man, Machine, and Material .....	.111
6.2 A Roll-to-Roll Converting Process .....	.119
6.3 Binary Search and Roller Marking .....	.121
6.4 Finding the Optimum Setting .....	.122
6.5 Optimum Heading and Path .....	.123
6.6 Binary Search and Rough Wound Roll Edge .....	.124
6.7 Web Width and Cross Direction Position .....	.125

6.8	Toggling to Evaluate Spreader Options	.135
6.9	Wound Roll Edge Marking	.140
6.10	Baggy Edges on a Non-woven Calender	.141
6.11	Wrinkles on a Winder	.143
6.12	Wrinkles vs. Time	.143
6.13	Periodic Web Marks	.145
6.14	Out-of-Round Wound Roll	.146
6.15	FFT of Roller Vibration	.146
6.16	Testing Wound Roll Measurements	.156
6.17	Calender Curve Fit	.158
6.18	Duncker Diagram	.160
6.19	Fishbone Diagram and a Better Mousetrap	.162
7.1	Optimum Wound Roll Diameter	.173
8.1	Critical Path Chart	.183
8.2	Gantt Chart	.184
8.3	Evaluating Project Performance	.188
9.1	Pin Pong Ball in the Floor Puzzle	.209
9.2	Small Effects Add Up	.218
9.3	Sweet Spot	.219

List of Tables

1.1	Aliases and Uses of Critical Thinking	.14
3.1	Premise and Conclusion Indicators	.49
3.2	Deduction and Induction	.51
3.3	Syllogistic Mood Examples	.53
4.1	Simple Starting Points	.72
7.1	Weighted Factors for a Machine Purchase	.170
7.2	Table of Example Tradeoffs	.172
9.1	Goal Description Examples: Poor and Improved	.192