# **Robots in the Classroom Table Of Contents**

Chapter 1: What is a Program?	1
1.1 Computer Languages	
1.2 RobotBASIC	
1.3 The Output or Terminal Screen	
1.4 Drawing Lines	
1.5 Running Programs	
1.6 Saving and Retrieving Programs	
1.7 Errors in a Program	
1.8 Adding to the Program	
1.9 Connecting Lines (the easy way)	
1.10 The Robot Simulator	
1.11 Summary	
1.12 Exercises	
Chapter 2: Variables	13
2.1 What is a Variable?	
2.2 Case Sensitivity	
2.3 Rectangles	
2.4 Using Variables	
2.5 User Input	
2.6 Circles and Ellipses	
2.7 Using the Robot	
2.8 Exercises	
Chapter 3: Loops	23
3.1 Efficiency	
3.2 The WHILE-WEND Structure	
3.3 The REPEAT-UNTIL Structure	
3.4 A Counting-Structure (FOR-NEXT)	
3.5 Implementing the FOR-NEXT Structu	ıre
3.6 Implementing a WHILE-WEND Loop	
3.7 Implementing a REPEAT-UNTIL Loc	
3.8 Summary	- <b>r</b>

3.9 Exercises

### Chapter 4: Decisions

4.1 Bumper Switches

4.2 The IF-THEN Structure

- 4.3 The IF-ENDIF Structure
- 4.4 The IF-ELSE-ENDIF Structure
- 4.5 The IF-ELSEIF Structure
- 4.6 Designing a Program
- 4.7 Explaining the Program
- 4.8 Debugging the Program
- 4.9 Improving the Program
- 4.10 Adding Randomness
- 4.11 Summary
- 4.12 Exercises

### Chapter 5: Modules

- 5.1 Subroutines and Labels
- 5.2 The Gosub Command
- 5.3 Advantages of Modular Programming
- 5.4 Organizing a Program
- 5.5 Analyzing the Program
- 5.6 The HELP System
- 5.7 Summary
- 5.8 Exercises

### Chapter 6: Using the Mouse\_\_\_\_

### 

**49** 

- 6.1 Moving Objects with the Mouse
- 6.2 The Main Program
- 6.3 The Power of Modularity
- 6.4 Module Definitions
- 6.5 Finding if the Mouse is Over an Object
- 6.6 Drawing and Erasing Objects
- 6.7 Principles of Animation
- 6.8 Summary
- 6.9 Exercises

Chapter 7: Following a Line677.1 Line Following7.2 Line Sensors7.3 Binary Numbers7.4 The rSense() Function7.5 Developing an Algorithm7.6 A Simple Approach7.7 Another Debugging Tool7.8 Making the Robot Remember7.9The Value of Simulation7.10 Finding the Line7.11 Compromises7.12 Summary7.13 Exercises	
Chapter 8: Finding an Object838.1 Vision Commands8.2 The rLook() Function8.3 The rBeacon() Function8.4 Using Simulated Sensors8.5 Finding an Object8.6 Moving to the Object After it is Found8.7 Knowing the Object Has Been Found8.8 Printing Anywhere You Want8.9 Testing the Program8.10 Enhancing the Program8.11 Summary8.12 Exercises	
Chapter 9: Navigating a Maze939.1 Creating a Maze9.2 Moving Into the Maze9.2 Moving Into the Maze9.3 The rFeel() Function9.4 Proceeding Through the Maze9.5 Improving the Program9.6 Array Variables9.7 A Practical Example9.8 Real World Robots9.9 Correcting for Wheel Slip9.10 Summary9.11 Exercises	

#### Chapter 10: Beacon Navigation 107

**10.1 Celestial Navigation** 10.2 What is a Beacon 10.3 Math is Essential 10.4 Using the Derived Equations 10.5 Your Future in Robotics 10.6 Summary

**10.7 Exercises** 

#### Chapter 11: Robotic Arms 117

11.1 Real Robotic Arms

11.2 Choosing the Motors

11.3 Joint Options

11.4 End-effectors and Grippers

11.5 Arm Mathematics

11.6 A Simulated Arm

11.7 Programming the Arm

11.8 Summary

11.9 Exercises

## **Chapter 12: Walking Robots**

133

12.1 Programming with Poses

**12.2 Minimal Requirements** 

12.3 Compromises

12.4 Sensors

12.5 Controlling the Joints

12.6 The DrawRobot Subroutine

12.7 Moving Several Joints Simultaneously

12.8 The Robot Can Fall

12.9 Finding the Balance Point

12.10 Autonomous Decisions

12.11 Maintaining Balance

12.12 A YouTube Video

12.13 Summary

12.14 Exercises

#### **Appendix A: Solutions to Exercises** 145 166 Index