

CHAPTER 8

EXTRA RESOURCES

Additional Resources

1. “Flowcharts” (<http://tiny.cc/flowcharts/>): Read about the flowchart elements.
2. “Relational Operators & Strings” (<http://tiny.cc/relationaloperators/>): Learn about string comparison details.
3. “‘True’ String” (<http://tiny.cc/truestring/>): Discover how Small Basic handles the word “True.”
4. “If Rollercoasters” (<http://tiny.cc/ifcoaster/>): Learn how If statements are like rollercoasters.
5. “(=) a Comparison” (<http://tiny.cc/equalsign/>): Learn when an equal sign is a comparison, not an assignment.
6. “Mutual Exclusion” (<http://tiny.cc/mutual/>): Find out when it makes sense to use the If/Else statement.
7. “Make it Easy to Read” (<http://tiny.cc/makeiteasy/>): See why and how you can make your code easier to read.

8. “Avoiding the Else” (<http://tiny.cc/avoidingelse/>): Learn a technique used to avoid the Else clause.
9. “Example: Leap Year Checker” (<http://tiny.cc/leapyear/>): Follow the instructions to create programs that check whether a given year is a leap year.
10. “Example: Evaluating Math Functions” (<http://tiny.cc/evaluatingmath/>): Use nested If conditions to solve a math problem.
11. “What is Spaghetti Code” (<http://tiny.cc/spaghetticode/>): See an example of what spaghetti code looks like.
12. “Goto Loops” (<http://tiny.cc/goto/>): Learn more about how Goto loops work.
13. “The Goto Keyword” (<http://tiny.cc/whygoto/>): Read why Small Basic includes Goto statements.

Review Questions

1. How do you read this statement?

```
If (num <= 0) Then
```

2. Which operator checks the relationship between two values or expressions?
3. What kind of value can be true or false?
4. Which statement lets you jump to a labeled line in your program?
5. What’s the condition in this code?

```
If (score >= 95) Then  
    TextWindow.WriteLine("You got an A.")  
EndIf
```

6. When would you use an If/Else statement, and when would you use just an If statement?
7. Which of the following symbols is not a conditional operator: <, >, <>, !, or <=?
8. When would you use a Goto statement?
9. What’s the output of the following program if (a) num = 10 and (b) num = 15? Do you think the program’s correct as shown? If not, how would you fix it?

```
If (Math.Remainder(num, 2) = 0) Then  
    TextWindow.WriteLine(num + " is even.")  
EndIf  
TextWindow.WriteLine(num + " is odd.")
```

10. If x is 10, what's the value of x after you run this code?

```
If (x = 20) Then
    x = 30
EndIf
```

11. Predict the output of the following program. Run the program to check your answer.

```
x = 2
y = 0
Again:
y = y + x
TextWindow.WriteLine(y)
Program.Delay(1000)
Goto Again
```

Practice Exercises

1. What's the output of the following program? Run the program by using an input value that's less than 500 and one that's more than 500.

```
TextWindow.Write("Please enter a number between 0 and 1000: ")
num = TextWindow.ReadNumber()
If (num >= 500) Then
    TextWindow.WriteLine("This will take some time. Please wait...")
    Program.Delay(2000) ' Waits two seconds to simulate a long operation
EndIf
TextWindow.WriteLine("Continuing...")
```

2. The average body temperature for a healthy person ranges from 97.6 to 99.6 degrees Fahrenheit. Write a program that asks the user to enter their body temperature and then prints a diagnosis message as follows:
- If the temperature is lower than 97.6, display Below normal.
 - If the temperature is higher than 99.6, display Above normal.
 - Otherwise, display Normal.
3. The fastest 100 meter runner in the world is Usain Bolt, who finished the race in 9.58 seconds. Write a program that asks how many seconds it takes the user to run 100 meters and then displays one of these two messages: Congratulations! You broke the world record. or Good job. But the fastest person on Earth is still Usain!
4. While cleaning your attic you made a great discovery that shocked the world. You found a magic lamp. Rub the lamp, and then run the following program to see what the genie has to say.

```
TextWindow.WriteLine("Thank you for rubbing the lamp and freeing me!")
TextWindow.WriteLine("I've been trapped in here for 4000 years.")
```

```

TextWindow.Write("How many wishes do you want? ")
ans = TextWindow.ReadNumber()
If (ans <= 3) Then
    TextWindow.WriteLine("Your wishes will be granted.")
Else
    TextWindow.WriteLine("What a greedy creature! I'm going back into my ↵
    lamp!")
EndIf

```

5. Susan's little sister, Lucy, is learning how to count. Finish the following program for Susan to help teach Lucy. Have the program tell Lucy if her answer's correct or not.

```

Again:
TextWindow.WriteLine("")
num = Math.GetRandomNumber(10)

For I = 1 To num
    TextWindow.Write("* ")
EndFor

TextWindow.CursorLeft = 25
TextWindow.Write("How many asterisks are there? ")
ans = TextWindow.ReadNumber()
' Write an If/Else statement to check the answer and provide feedback
Goto Again

```

To keep Lucy engaged, Susan wants to give her creative feedback. When Lucy gets the correct answer, have the program display one of these messages at random: "Good work!", "Fantastic! Try another one!", or "Right on! Keep it up!" When Lucy gets a question wrong, make your program encourage her with one of these messages: "Hmm...the answer is different. Try again!", "Don't worry! You'll get it right the next time.", or "Almost! You can do it!" Help Susan update her program and teach Lucy.

6. Enter the following program and then add more questions to create a multiple choice quiz. Give it to your friends to test their knowledge. Add a score to keep track of the correct answers!

```

TextWindow.WriteLine("1) Who invented the telephone?")
TextWindow.WriteLine("    a) Benjamin Franklin")
TextWindow.WriteLine("    b) Thomas Edison")
TextWindow.WriteLine("    c) Alexander Graham Bell")
TextWindow.WriteLine("    d) Leonardo da Vinci")
TextWindow.Write    ("        Answer: ")
ans = TextWindow.Read()
If (ans = "c") Then
    ' Tell the user they got the correct answer and increase their score
Else
    ' Tell the user they answered incorrectly
EndIf

```

7. A movie theater charges \$8 for people under the age of 14 and \$12 for those 14 years or older. Before 4:00 pm, all tickets are half price. Write a program that helps the ticket taker figure out how much to charge each customer. The following is a sample output of the program:

```
Is it before 4:00 PM [y/n]? y
How old are you? 16
Please pay $6.
```

8. It's root beer time! What does the following program do? Run the program to check your answer.

```
numBottles = 10
Again:
TextWindow.Write(numBottles + " bottles of rootbeer on the wall.")
TextWindow.WriteLine("Take one down and pass it around.")
numBottles = numBottles - 1
If (numBottles > 0) Then
    Program.Delay(1000)
    Goto Again
EndIf
```

9. Commissioner Gordon pulled over the Batmobile for speeding! Write a program that asks Batman to enter how fast he was going (in miles per hour).
- If the speed's lower than 45 mph, have the program display: That's too slow. Crime is getting away!
 - If the speed's higher than 120 mph, have the program display: That's too fast! You'll roll the Batmobile!
 - Otherwise, have the program display: That's a normal speed for vigilante justice.
10. You've entered Greek mythology! Hercules will take you with him in his quest to hunt the Hydra. This monstrous serpent has three heads—one of them is keeping the Hydra alive. You have to tell Hercules which head to attack. If you select the right head, you'll destroy the Hydra and your name will be remembered forever. But be careful! If you cut off the wrong head, each of the remaining heads will sprout another one. Here's the main code for this game:

```
numHeads = 3
Again:
TextWindow.Write("Which head do you want to attack ")
TextWindow.Write ("[1-" + numHeads + "]? ")
ans = TextWindow.ReadNumber()
mainHead = Math.GetRandomNumber(numHeads)
If (ans = mainHead) Then
    TextWindow.Write ("Splendid! You've killed the Hydra. ")
    TextWindow.WriteLine ("Hercules will now take you to Hades!")
Else
```

```

numHeads = 2 * (numHeads - 1)
TextWindow.WriteLine("Oops! You've destroyed the wrong head.")
TextWindow.WriteLine("The Hydra now has " + numHeads + " heads.")
TextWindow.WriteLine("")
Goto Again
EndIf

```

Play this game several times to understand how the number of heads grows with each wrong guess! Then modify the game to have the Hydra win the battle after six wrong guesses (when the Hydra has 66 heads).

11. Open *AddTutor.sb* from this chapter's folder. This simple addition game randomly generates two numbers between 1 and 10, and then asks the user to enter the sum of the two numbers. The program then checks the answer entered by the user and displays a message to tell them whether it's right or wrong. Think of some ways to improve the game and try to add them to the program.
12. Open the file *Gamble.sb* from this chapter's folder. In this game, you press a keyboard key and the game generates a random number from 1 to 100. If the number's even, you lose \$1; if the number is a multiple of 5, you gain \$2; and if the number is a multiple of 7, you gain \$3. For example, if the number is 10, your net gain is \$1 (you lose \$1 because the number's even, but you gain \$2 because it's divisible by 5). Play the game several times to see how it works. Think of ways to improve the game and try to add them to the program.
13. Write a program in which the computer hides a ball under one of three cups and asks the user to guess that cup. The user scores 1 point for a correct guess and loses 1 point for an incorrect guess. Here's a sample run of the program:

```

Which cup has the ball [1, 2, or 3]? 1
Wrong. It was in cup 2. Score: -1

```

```

Which cup has the ball [1, 2, or 3]? 1
Correct! Score: 0

```

```

Which cup has the ball [1, 2, or 3]? 2
Correct! Score: 1

```

```

Which cup has the ball [1, 2, or 3]? 3
Wrong. It was in cup 2. Score: 0

```

```

Which cup has the ball [1, 2, or 3]?

```

14. Write a program that lets a user play a number-guessing game against the computer. The program selects a secret number between 1 and 100. The computer then makes a fair guess and asks the user to enter his guess. The guess that is closest to the secret number wins. Here's a sample run of the program:

I have a secret number between 1 and 100.

Computer guess: 23

Your guess: **50**

The secret number is 53. You win!

I have a secret number between 1 and 100.

Computer guess: 77

Your guess: **40**

The secret number is 96. The computer wins.
