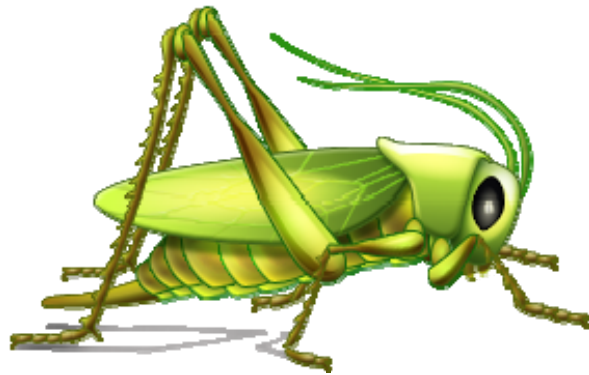


Know Your Bugs:

Run-time Errors

"Surprise Endings"



Explanation

Your program starts running... but then BAM!

Errors can be encountered during execution, causing your program to crash.

Common Bugs

- Mismatched types
- Uninitialized variables (NULL POINTER!!)
- Forgetting to return a value from subprogram

Ontario Curriculum Expectations

Computer Science

ICS2O (Grade 10):

B2.6. explain the difference between syntax, logic, and run-time errors.

ICS3U (Grade 11 university prep):

A4.1. demonstrate the ability to identify and correct syntax, logic, and run-time errors in computer programs.

A4.3. demonstrate the ability to interpret error messages displayed by programming tools, at different times during the software development process.

ICS3C (Grade 11 college prep):

A3.1. explain the difference between syntax, logic, and run-time errors in computer programs.

A3.2. demonstrate the ability to correct syntax, logic, and run-time errors in computer programs.

A3.4. demonstrate the ability to interpret error messages displayed by programming tools, at different times during the software development process.

Sample Follow-up Exercises

Example of Program with Run-time Errors in Visual Basic

```
Dim words As Integer
Dim digit As String
Dim thisString As Integer
thisString = ""
For words = 10 To 1 Step -1
    For digit = 0 To 9
        thisString &= CStr(digit)
    Next digit
    thisString &= " "
Next words
```

Example of Program with Run-time Errors in Java

```
import java.util.Scanner;
public class Palindrome
{
    public static boolean palindrome(String word)
    {
        String wordBackwards = "";

        for (int i=word.length(); i>=0; i--)
            // spell the word backwards
            wordBackwards = wordBackwards + word.charAt(i);
        if (word.equals(wordBackwards))
            // word is palindrome
            return true;
        else
            return false;
    } // end palindrome method

    public static void main(String[] args)
    {
        String word;
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a word: ");
        word = input.next();
        input.close();
        if (palindrome(word))
            System.out.println("The word is a palindrome.");
        else
            System.out.println("The word is not a palindrome.");
    } // end main method
} // end Palindrome class
```

Using an error log such as the one below, students should debug the code provided.

Sample Error Log

Type of Error	Description/Example	Correction
run-time	Variable type should be String <code>Dim thisString As Integer</code>	Dim thisString as String
run-time	Missing <i>return false</i> statement after <i>return true</i> statement in palindrome method	else return false;

Another Possible Activities

1. Have students submit code with runtime errors electronically to each other or the teacher, and then assign each student a random program to debug and get running.
2. Start your own collection of programs with runtime errors. This collection can be use for quizzes, tests, and classroom practice.
3. See the Summer Institute 2008 resource by Jaqueline Payne on debugging and verification. This resource contains a number of Turing files complete with logic, runtime, and syntax errors. (<http://www.cemc.uwaterloo.ca/events/csteachers.html>)