Unit 3 Loops and Graphics

# Learning objectives

1. Use for-loops and while-loops in programs.
2. Use nested loops in programs.
3. Use while-loops to:
   1. Validate data entered from the keyboard
   2. Run a program multiple times.
   3. Carry out numerical algorithms, e.g. finding GCD and LCM
   4. Create animations that run until graphical objects collide on screen.
4. Use for-loops to:
   1. Generate tables of printed output, e.g. multiplication tables
   2. Generate graphics that have geometric patterns (e.g. string art)
   3. Create animations
5. Make computer graphics that contain:
   1. Geometric shapes
   2. Formatted text
   3. Randomized objects (e.g. starry night sky)
   4. Imported images

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| **Topic** | **Content** | **Assessments** |
| **Lesson 1:** While loops I | - The infinite loop While(True) - Trivia questions - Trivia questions w/ limited guesses | While loops practice 1 |
| **Lesson 2:** While loops II | - Compound while-conditions  - Catching the cause of a while-loop termination | While loops practice 2 |
| **Lesson 3:** For loops I | - 10 Example Programs | For loops practice 1 |
| **Lesson 4:** For loops II |  | For loops practice 2 |
| **Lesson 5:** Basic graphics | - Screen coordinates - Rectangles, ovals and lines - Graphical patterns via loops | Graphics challenges |
| **Lesson 6:** Work day | Intro to the bill-counting problem | Begin Assignment 3A |
| **Lesson 7:** Work day | Intro to the string-art problem | Work on Assignment 3A |
| **Lesson 8:** Nested loops | - LCM via nested while loops - Printing a multiplication table - Drawing a grid of blocks | Practice Exercises for Nested Loops |
| **Lesson 9:** Text graphics | - Setting font size formulaically - Setting font size & padding to fit within given bounds | Finish Practice Exercises for Nested Loops |
| **Lesson 10:** Basic animation | - The all-purpose animation loop - Moving a rigid object - Making objects grow/change shape | Start Assignment 3B |
| **Lesson 11:** Work day | - Intro to the fraction brick wall | Work on Assignment 3B |
| **Lesson 12:** Animations using while-loops & nested loops | - While-loop animations - Nested-loop animations | Work on Assignment 3B |
| **Lesson 13:** Work day |  | Work on Assignment 3B |