

Mechanics of Functions (Addendum)

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PrimeFactorizations.js

Some thought questions and exercises:

- The solution relies on a single Boolean called **first**. What problem is **first** solving for us?
- During our trace of `constructFactorization(180)`, `factor` assumed the values of 2, 3, 4, and 5. 2, 3, and 5 are prime numbers and therefore qualified to appear in a factorization? How does the implementation guarantee 4 will never make an appearance in the returned factorization?
- What is returned by `constructFactorization(1)`? How could you have changed the implementation to return `"1 = 1"` as a special case return value?
- Trace through the execution of `constructFactorization(363)` as we did for `constructFactorization(180)`.
- Our implementation relies on a parameter named `n` to accept a value from the caller, and then proceeds to destroy `n` by repeatedly dividing it down to 1. Does this destruction of `n` confuse `PrimeFactorizations`'s `for` loop? Note that its counting variable is also named `n`.

Exercise: Generating Prime Factorizations

- A more computationally intense problem is to generate the prime factorization of a positive integer n .
- An integer is prime if it's greater than 1 and has no positive integer divisors other than 1 and itself.
 - ✓ 5 is prime: it's divisible only by 1 and 5.
 - ✓ 6 is not prime: it's divisible by 1, 2, 3, and itself.
- Some prime factorizations:

```
501 = 3 * 167
502 = 2 * 251
503 = 503
504 = 2 * 2 * 2 * 3 * 3 * 7
505 = 5 * 101
506 = 2 * 11 * 23
507 = 3 * 13 * 13
508 = 2 * 2 * 127
509 = 509
510 = 2 * 3 * 5 * 17
511 = 7 * 73
512 = 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2
```

PrimeFactorizations.js

```
/*
 * Function: constructFactorization
 * -----
 * Computes the prime factorization of the supplied
 * number and returns that factorization as a string.
 * The incoming parameter called n is assumed to be
 * positive.
 */
function constructFactorization(n) {
  var result = n + " = ";
  var first = true;
  var factor = 2;

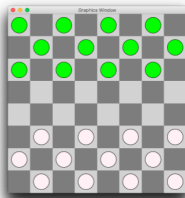
  while (n > 1) {
    if (isDivisibleBy(n, factor)) {
      if (!first) result += " * ";
      first = false;
      result += factor;
      n /= factor;
    } else {
      factor++;
    }
  }

  return result;
}
```

Exercise: Drawing A Checkerboard

- For the rest of lecture, we'll collectively design and decompose (and to the extent we have time, implement) a graphics program that draws the initial configuration for a game of checkers.

```
/**
 * Function: DrawCheckerboard
 * -----
 * Defines the entry point to the entire program, and subdivides
 * the entire problem into three parts: creating and presenting
 * a properly sized window, drawing a standard checkerboard within it,
 * and then layering 24 checkers on top of that board.
 */
function DrawCheckerboard() {
  var gw = GWindow(BOARD_WIDTH, BOARD_HEIGHT);
  drawBoard(gw);
  drawCheckers(gw);
}
```



DrawCheckerboard.js

```
/*
 * File: DrawCheckerboard
 * -----
 * Presents the graphics program that draws a standard checkerboard
 * and places the 24 checkers (12 orange, 12 blue) in their initial locations.
 */
import 'graphics';

// Constants
const BOARD_WIDTH = 500;
const BOARD_HEIGHT = 500;
const BOARD_DIMENSION = 500;
const SQUARE_WIDTH = BOARD_WIDTH / BOARD_DIMENSION;
const SQUARE_HEIGHT = BOARD_HEIGHT / BOARD_DIMENSION;
const LIGHT_SQUARE_COLOR = 'lightgray';
const DARK_SQUARE_COLOR = 'darkgray';
const PLAYER_ONE_COLOR = 'blue';
const PLAYER_TWO_COLOR = 'orange';
const CHECKER_RADIUS = 0.35 * SQUARE_HEIGHT;
```

DrawCheckerboard.js

DrawCheckerboard.js

DrawCheckerboard.js

File Edit View Window Help
DrawCheckerboard.js

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