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Array

Represents an array. In the Jack language, arrays are instances of the `Array` class. Once declared, the array entries can be accessed using the usual syntax `arr[i]`. Each array entry can hold a primitive data type or any object type. Different array entries can have different data types.

<u>function `Array` **new**`(int size)`:</u> constructs a new array of the given size.

<u>method void **dispose**`()`:</u> disposes this array.

Output

A library of functions for displaying text on the screen.

The Hack physical screen consists of 512 rows of 256 pixels each. The library uses a fixed font, in which each character is displayed within a frame which is 11 pixels high (including 1 pixel for inter-line spacing) and 8 pixels wide (including 2 pixels for inter-character spacing). The resulting grid accommodates 23 rows (indexed 0..22, top to bottom) of 64 characters each (indexed 0..63, left to right). The top left character position on the screen is indexed (0,0). A cursor, implemented as a small filled square, indicates where the next character will be displayed.

<u>function void **moveCursor**`(int i, int j):`</u> moves the cursor to the `j`-th column of the `i`-th row, and erases the character displayed there.

<u>function void **printChar**`(char c):`</u> displays the given character at the cursor location, and advances the cursor one column forward.

<u>function void **printString**`(String s):`</u> displays the given string starting at the cursor location, and advances the cursor appropriately.

<u>function void **printInt**`(int i):`</u> displays the given integer starting at the cursor location, and advances the cursor appropriately.

<u>function void **println**`():`</u> advances the cursor to the beginning of the next line.

<u>function void **backSpace**`():`</u> moves the cursor one column back.

Screen

A library of functions for displaying graphics on the screen. The Hack physical screen consists of 512 rows (indexed 0..511, top to bottom) of 256 pixels each (indexed 0..255, left to right). The top left pixel on the screen is indexed (0,0).

<u>function void **clearScreen**`():`</u> erases the entire screen.

<u>function void **setColor**`(boolean b):`</u> sets the current color, to be used for all subsequent `drawXXX` commands. Black is represented by `true`, white by `false`.

<u>function void **drawPixel**`(int x, int y):`</u> draws the (x,y) pixel, using the current color.

<u>function void **drawLine**`(int x1, int y1, int x2, int y2):`</u> draws a line from pixel (x1,y1) to pixel (x2,y2), using the current color.

<u>function void **drawRectangle**`(int x1, int y1, int x2, int y2):`</u> draws a filled rectangle whose top left corner is (x1,y1) and bottom right corner is (x2,y2), using the current color.

<u>function void **drawCircle**`(int x, int y, int r):`</u> draws a filled circle of radius $r \leq 181$ around (x,y), using the current color.

Jack OS API, www.nand2tetris.org

Keyboard

This class allows reading inputs from a standard keyboard.

function char **keyPressed()**: returns the character of the currently pressed key on the keyboard; if no key is currently pressed, returns 0. Recognizes all ASCII characters, as well as the following keys: newline (128=String.newline()), backspace (129=String.backspace()), left arrow (130), up arrow (131), right arrow (132), down arrow (133), home (134), end (135), page up (136), page down (137), insert (138), delete (139), ESC (140), F1-F12 (141-152).

function char **readChar()**: waits until a key is pressed on the keyboard and released, then echoes the key to the screen and returns the character of the pressed key.

function String **readLine(String message)**: displays the message on the screen, reads from the keyboard the entered text until a newline character is detected, echoes the text to the screen, and returns its value. Also handles user backspaces.

function int **readInt(String message)**: displays the message on the screen, reads from the keyboard the entered text until a newline character is detected, echoes the text to the screen, and returns its integer value (until the first non-digit character in the entered text is detected). Also handles user backspaces.

Memory

This library provides two services: direct access to the computer's main memory (RAM), and allocation and recycling of memory blocks. The Hack RAM consists of 32,768 words, each holding a 16-bit binary number.

function int **peek(int address):** returns the RAM value at the given address.

function void **poke(int address, int value):** sets the RAM value at the given address to the given value.

function Array **alloc(int size):** finds an available RAM block of the given size and returns a reference to its base address.

function void **deAlloc(Array o):** de-allocates the given object (cast as an array) by making it available for future allocations.

Sys

A library that supports various program execution services.

function void **halt()**: halts the program execution.

function void **error(int errorCode)**: displays the given error code in the form "ERR<errorCode>", and halts the program's execution.

function void **wait(int duration)**: waits approximately duration milliseconds and returns.