

An Educational Programming Language for Children

CS148 (Compiler Design)

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**Description**

Shapie is a programming language that teaches few basic concepts of programming to children. This includes formulation of simple algorithms, usage of variables and loops through drawing, positioning, and defining sizes and colors of objects such as shapes and text. These objects are placed on a grid, depending on the position defined by the programmer. It uses syntax very close to natural language – easy to understand and easy to learn.

**Features**

1. Drawing shapes (circle, square, rectangle, triangle)
2. Displaying text
3. Defining size of objects (small, big)
4. Defining position of objects (x, y)
5. Defining color of objects (red, orange, yellow, green, blue, violet, pink, brown, black, white, gray)
6. Defining multiple objects in one statement

**Instruction Set:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Keyword** | **Parameters** | **Description** | **Syntax/Rules** |
| to | to **<color>**  to **<size>**  to **<position>** | assignment operator  precedes a color, size or position | Color triangle1 **to** green. |
| in | in **<position>** | precedes a position | Put a triangle **in** (1,1). |
| background | background **to** **<color>** | background color of output screen  precedes the assignment operator and color | Color **background** to blue. |
| named | named **<string>** | defines object name | Put a triangle **named** “triangle1”. |
| above | above **<object name>** | places object above another object | Put a circle **above** triangle1. |
| below | below **<object name>** | places object below another object | Put a square **below** triangle1 named “square1”. |
| before | before **<object name>** | places object to left of another object | Put a rectangle **before** square1. |
| after | after **<object name>** | places object to right of another object | Put a circle **after** square1. |
| everywhere | **<object>** everywhere | places objects in random positions | Put small circles **everywhere**. |
| Put | Put **a <object>**  Put **<size> <object>**  Put **<object>** | displays object | **Put** a rectangle. |
| Color | Color **<object name> to <color>** | defines color of object | **Color** triangle1 to blue. |
| Resize | Resize **<object name> to <size>** | defines size of object | **Resize** circle2 to big. |
| Place | Place **<object> to/in <position>** | define position of object | **Place** circle2 to (1,2). |
| If | If **<object name> is <size>/<color>: <statement>.** | defines a condition that must be met before doing a statement is executed  can stand alone without the else keyword. | **If** circle2 is big; Place circle2 in (4,5). |
| else | Else: **<statement>.** | defines alternative statement to be executed if a condition is not met  can only be used alongside keyword if. | Ifcircle2 is big: Place circle2 in (4,5).  **Else:** Place circle2 in (3,4). |
| is | **<object name>** is **<size>/<color>/<shape>/<object name>** | checks equivalence between an object and a specified constant.  can only be used with if keyword. | Ifcircle2 **is** big: Place circle2 in (4,5). |

**Constants:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Constants** | **Value** | **Usage** | **Syntax/Rules** |
| a | 1 | defines number of shapes as 1 | Put **a** triangle. |
| circle |  | defines shape of object as a single circle | Put a **circle**. |
| square |  | defines shape of object as a single square | Put a **square**. |
| rectangle |  | defines shape of object as a single rectangle | Put a **rectangle**. |
| triangle |  | defines shape of object as a single triangle | Put a **triangle**. |
| circles |  | defines shape of object as circle with multiple quantities | Put small **circles**. |
| squares |  | defines shape of object as squares with multiple quantities | Put **squares**. |
| rectangles |  | defines shape of object as rectangles with multiple quantities | Put **rectangles**. |
| triangles |  | defines shape of object as triangles with multiple quantities | Put small **triangles**. |
| small |  | defines size of object as small | Put a **small** triangle. |
| big |  | defines size of object as big | Put a **big** triangle. |
| red | red | defines color of object as red | Put abig **red** triangle. |
| orange | orange | defines color of object as orange | Put abig **orange** triangle. |
| yellow | yellow | defines color of object as yellow | Put abig **yellow** triangle. |
| green | green | defines color of object as green | Put abig **green** triangle. |
| blue | blue | defines color of object as blue | Put abig **blue** triangle. |
| violet | violet | defines color of object as violet | Put abig **violet** triangle. |
| pink | pink | defines color of object as pink | Put abig **pink** triangle. |
| white | white | defines color of object as white | Put abig **white** triangle. |
| black | black | defines color of object as black | Put abig **black** triangle. |
| gray | gray | defines color of object as gray | Put abig **gray** triangle. |
| brown | brown | defines color of object as brown | Put abig **brown** triangle. |

**Default Values**

Position: center of output screen

Size: small

Color: black

Background: white

**Rules**

1. Statements must start with a function call or a conditional keyword, “If” and “Else”.
2. Statements must end in a period (.).
3. First letter of function names must be capitalized.
4. Texts should be enclosed in double quotes.

**Sample Code**

Color background to yellow.

Put small white hearts everywhere. //displays a random number of small white hearts in random positions

Put circles everywhere. //displays a random number of circles in random positions, sizes, and colors since size and color are not defined

Put 3 small blue triangles in (1,0),(2,0),(3,0).

Put a small blue square named "square1" in (2,0).

Put a big red "Hello World!" named "redText". //displays "Hello World!" in the center of the output screen

Place redText to (1,1).

Put a big triangle above square1 named "triangle1".

Color triangle1 to green.

Resize triangle1 to small.

\*Comments (in muted text) are not supported. They are written for documentation purposes only.

1. How to start programming

There are no lines of code to signify start of the program. The programmer may start writing the statements immediately.

1. How to end programming

Similarly with starting the program, there are no lines of code that would signify the end of the program. As long as the programmer follows the rule of putting a period after each and every statement, then there will be no problems.

1. How to create conditional statements

Conditional statements are created using the keywords **If** and **Else**. The keyword **is** is used to check the equivalence between the specified object and its succeeding constant or object.

Example:

If circle2 is big: Put squares everywhere.

Else: Put triangles everywhere.

1. How to iterate instructions

Iterative statements are represented using the **everywhere** keyword. The keyword **everywhere** signifies that the user wants multiple objects of the same kind at different positions.

Example:

Put triangles everywhere.

1. How to compile the program

The program is compiled at run-time.

1. How to run the program

The program is run by clicking the run button in the IDE.

**Sample IDE:**

