

Python/JES Quick Reference

CSE Bridge Workshop, August 2008

Variables, expressions, and output

Numbers: integers (0, 12, 17, ...), floats (0.0, 3.14, 6.02e23)
Operators: + - * / % (modulus or remainder) ** (exponentiation)
Strings: "anything in double quotes" or 'anything in single quotes'
Assignment: *variable = value*
Output: *print value*

Variable names can be almost anything that begins with a letter and contains letters, digits, and underscores (_). Exception: reserved words that have special meaning to Python like `if`, `def`, and `return` can't be used as variable names. JES and other Python-savvy editors will help out by displaying reserved words and normal identifiers in different colors.

Math Functions

Python's standard library includes many common math functions like `sqrt(x)`, `sin(x)`, `cos(x)`, `log(x)`, `abs(x)`, `max(list)`, `min(list)`, etc., as well as the constants `pi` and `e`. To access these items in regular Python, put the statement

```
from math import *
```

at the top of your file, or type it if you are running Python interactively. Most of these functions are available in JES without an explicit import, however.

Functions

Definition:

```
def function_name ( optional_parameters ) :  
    statements that make up the function body
```

The statements are not executed until the function is called; they are not executed when the function definition itself is processed.

The function can return values with a `return` statement (syntax: `return value`)

Loops and conditionals

Most of our loops use `for`, which repeats statements for each value in some collection (like all of the pixels in an image):

```
for variable in collection :  
    statements to repeat
```

To repeat statements for a sequence of numbers, use `range` for the collection:

```
for variable in range(min, max) :  
    statements to repeat
```

We can also repeat statements as long as some condition remains true (the condition is only tested once each time around the loop):

```
while condition :  
    statements to repeat
```

A condition can include operations to compare numbers or other values (`<` `>` `<=` `>=` `==` `!=`) and operators to combine logical values (`and` `or` `not`).

Statements can be conditionally executed with `if`:

```
if condition :  
    statements to execute if true
```

or

```
if condition :  
    statements to execute if true  
else:  
    statements to execute if false
```

Files and Pictures

Recipe to open an image file and display it:

```
setMediaPath()           # optional, but sets default directory
file = pickAFile()
picture = makePicture(file)
show(picture)
```

Refresh the display to show changes after altering the picture in memory: `repaint(picture)`

To write a new copy of a (possibly altered) picture to a file (uses current `setMediaPath()` directory):

```
writePictureTo(picture, filename)    # filename is a string like "pic.jpg"
```

Picture Functions

Display a color chooser to look at red, green, blue components of colors: `pickAColor()`

To show a picture variable in a window where you can examine colors and pixel values and magnify the image, select `PictureTool...` from the JES MediaTools menu.

Get a list of all pixels in a picture (usually to use in a for loop): `getPixels(picture)`. Example:

```
for pixel in getPixels(picture):
    process each pixel variable in turn
```

Get the number of rows or columns in a picture: `h = getHeight(picture)` `w = getWidth(picture)`

Get the pixel at a particular location in an image: `pixel = getPixel(picture, xpos, ypos)`

Given a pixel, find out its coordinates: `x = getX(pixel)` `y = getY(pixel)`

Get or set a pixel's colors: `r = getRed(pixel)` `setRed(pixel, value)`. Value is 0-255. Similarly for green, blue.

Get or set a pixel's colors with a color triple: `color = getColor(pixel)` `setColor(pixel, color)`

Create a color from red, green, blue values: `color = makeColor(red, green, blue)`

Create a blank picture: `pic = makeEmptyPicture(width, height)`

Look in the JES function menu for these and other functions; select a function name for help.