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| **Basic Operations**  1 **+** 2 # addition  2 **-** 1 # subtraction  2 **\*** 3 # multiplication  4 **/** 2 # division  2 \*\* 3 # raise to power  "a" **+** "b" # combines two strings  **Comparison Operations**  2 **<** 3 # less than  "a" **>** "b" # greater than  "a" **<=** "b" # less than or equal to  2 **>=** 3 # greater than or equal to  "a" **==** "b" # is equal to  2 **!=** 3 # is not equal to  **Boolean Operations**  **True and False** # both must be True  **True or False**  # at least one True  **not True**  # flips boolean value  **Input and Output**  # prints to the console  **print(**"Hello World"**)**  # prints multiple items  **print(**"a", "b", "c"**)**  # asks the user for input in console  s **=** **input(**"Enter a thing: "**)**  **Built-in Functions**  x **=** **int(**s**)** # casts a string to an int  x **= float(**s**)** # casts a string to a float  s **= str(**x**)** # casts an int to a string  x **= len(**s**)** # finds num of letters in str  x **= max(**a, b, c**)** # max of given numbers  x **= min(**a, b, c**)** # min of given numbers  x **= round(**y, d**)** # rounds y to d sig-digs  **Variables**  # assigns var x to hold the value 5  x **=** 5  # uses the value in var x  **print(**x **-** 2**)** | **Functions**  # sets up a new function, name  # it takes params p1, p2, ... as input  # it returns returnVal as output  **def** name**(**p1, p2, ...**):**  # do stuff here  **return** returnVal  # call a function name on vals a, b  result **=** name**(**a, b**)**  **Conditionals**  # only runs code in the block  # if the expression is True  **if** option **== True:**  **print(**"here"**)**  # run code in a single branch  # based on the boolean expressions  **if** option1 **== True:**  **print(**"branch 1"**)**  **elif** option2 **== True:**  **print(**"branch 2"**)**  **else:**  **print(**"branch 3"**)**  **Loops**  # loops until the test is False  i **=** start  **while** i **<** end**:**  **print(**i**)**  i **=** i **+** step  # breaks out of loop at some input  **while True:**  val **= input(**"Enter: "**)**  **if** val **==** "something"**:**  **break**  **print(**val**)**  # loops over the given range  # with start, end, step  **for** i **in range(**start, end, step**):**  **print(**i**)**  # loops over the chars in a string  **for** c **in** string**:**  **print(**c**)** |

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| **Tkinter Starter Code**  # use this to create a window to draw graphics in  **from** tkinter **import** \*  root **=** **Tk()**  width, height **=** 400, 400  canvas **=** **Canvas(**root, **width=**width, **height=**height**)**  canvas.**configure(bd=**0, **highlightthickness=**0**)**  canvas.**pack()**  # Put your code here!  root.**mainloop()**  **Tkinter Graphics**  # draws a rectangle between coords (left, top) and (right, bottom)  canvas.**create\_rectangle(**left, top, right, bottom**)**  # draws an oval in the bounding box with coords (L, T) and (R, B)  canvas.**create\_oval(**L, T, R, B**)**  # draws the given text centered at the given coordinate (x, y)  canvas.**create\_text(**x, y, **text=**"sample"**)**  # draws a line between the given points (x1, y1) and (x2, y2)  canvas.**create\_line(**x1, y1, x2, y2**)**  # draws a polygon by connecting the given points with lines  canvas.**create\_polygon(**x1, y1, x2, y2, x3, y3, ...**)**  **Tkinter Optional Parameters**  # changes the color of the drawn shape  canvas.**create\_rectangle(**left, top, right, bottom, **fill=**"red"**)**  # changes the outline color of the drawn shape  canvas.**create\_rectangle(**left, top, right, bottom, **outline=**"yellow"**)**  # changes the pixel width of the drawn line or shape's border  canvas.**create\_line(**x1, y1, x2, y2, **width=**5**)**  # changes the font of the drawn text- "font-name font-size font-style"  canvas.**create\_text(**x, y, **text=**"sample", **font=**"Times 30 bold"**)**  # changes the anchor point for the drawn text  canvas.**create\_text(**x, y, **text=**"sample", **anchor=**NW**)** |