Introduction to Scientific Programming

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Conditionals – An Introduction to ‘if’ statements

These slides are an modified version of material by Jennifer Kay

Doing something some of the time

\[ \text{if Boolean Expression:} \]
\[ \text{<if the boolean expression is true do this>} \]
\[ \text{<and this>} \]
\[ \text{<and this>} \]
\[ \text{<now everyone do this>} \]

Example

```python
def playWithIf(num):
    if num < 10:
        print num, "is less than 10"
        num = num + 2
        print "Hi guys!!"
    if num > 15:
        print num, "is greater than 15"
        if num < 20:
            print "wow, super!"
    print "all done"
```

Picture Example

```python
# Color the first howMany rows in pic to be myColor

def colorSomeRows (pic, myColor, howMany):
    allPix = getPixels(pic)
    for onePix in allPix:
        yValue = getY(onePix)
        if yValue < howMany:
            setColor(onePix, myColor)
```

Math vs. Python

<table>
<thead>
<tr>
<th>Math Notation</th>
<th>Python Notation</th>
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<td>!=</td>
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<td>= (is the same as)</td>
<td>==</td>
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<td>= (gets)</td>
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Things to try (beginner)

- Color top several rows of a picture
- Color bottom several rows of a picture
- Color left several columns of a picture
- Color right several columns of a picture
- Color between a low and high range of columns
- Color middle 10 Rows of a picture

Things to try (Intermediate & Advanced)

- Change all the green in a picture to pink
- Change all the pixels near green in a picture to pink
- Divide a pic into a tic tac toe board and color different parts differently
  - Make some black and white
  - Make some very red
  - Etc.
- Mirror across the vertical center
- Mirror over a diagonal

# What happens when you run mystery1
# on a picture?

def mystery1(picture):
  for pixel in getPixels(picture):
    xPart = getX(pixel)
    yPart = getY(pixel)

    if xPart < yPart:
      redpart = getRed(pixel)
      bluepart = getBlue(pixel)
      greenpart = getGreen(pixel)

      #Changing the parts
      setRed(pixel, redpart * 0.5)
      setBlue(pixel, bluepart)
      setGreen(pixel, greenpart * 2)
# What happens when you run makeSunset2 on a picture?

def makeSunset2(p):
    for px in getPixels(p):
        xPart = getX(px)
yPart = getY(px)
        if xPart + yPart < 50:
            sunsetPixel2(px)

def sunsetPixel2(p):
    b = getBlue(p)
sunsetPixel2(p,b * 0.8)
    g = getGreen(p)
    setGreen(p, g * 0.8)

Sometimes if if pattern is Correct!

def presidential3():
    age = requestIntegerInRange("How old are you", 0, 120)
isCitizen = requestString("Are you a US Citizen yes/no")
    print "Presidential check"
    if age > 100:
        print "Are you really", age, "years old?"
    if age < 35:
        print "You are not old enough to be president"
    if isCitizen!="yes" and isCitizen != "Yes"
        print "You can't be president - you are not a citizen"

Using if vs. if/else

def presidentOne(age):
    if age < 35:
        print "You are not old enough"
    if age >= 35:
        print "You are old enough"

def presidentTwo(age):
    if age < 35:
        print "You are not old enough"
    else:
        print "You are old enough"

if / elif / elif / else pattern

def choices(age):
    if age >= 35:
        print "president and vote and drive"
    elif age >= 18:
        print "vote and drive but not president"
    elif age >= 17:
        print "drive but not vote nor president"
    else:
        print "Sorry, nothing"
        print "In", 17-age, "years you can drive"
if / elif / elif

```python
# Try 34, 11, 14

def weird(num):
    if num > 33:
        print "A"
    num = num - 30
    elif num < 12:
        print "b"
        num = num + 3
    elif num == 37:
        print "c, but you're never going to print this!"
        num = num + 200
    elif num == 14:
        print "d"
        num = num + 2000
    elif num < 6:
        print "e but you never get here either"
        num = num + 20000
    print num
```

Another problem

```python
def prob6():
    x = 2
    y = 4
    z = 6
    if (x<y) and (y<z):
        print "one"
    elif (x<y) or (y<z):
        print "two"
    elif (z > x):
        print "three"
    else:
        print "four"
    print "five"
```

```python
# continued ..
    y = y - x
    if y <= x:
        print "six"
        y = y - x:
    if (y <= x):
        print "seven"
        elif x+y > z:
        print "eight"
    else:
        print "nine"
    print x, y, z
```