Worlframalpha.com
Facebook Report

World map showing distribution of friends around the world.

Pie chart showing gender distribution:
- Male: 59.3% (134 friends)
- Female: 40.7% (92 friends)
(based on 226 of 240 friends)

Histogram showing age distribution:
- 20-30: 30 friends
- 30-40: 35 friends
- 40-50: 20 friends
- 50-60: 5 friends
- 60+: 5 friends
(based on 52 of 240 friends)

Pie chart showing relationship status:
- Married: 74.7% (68 friends)
- Engaged: 11.0% (2 friends)
- In a domestic partnership: 9.9% (2 friends)
- In a relationship: 8.9% (10 friends)
- Single: 8.9% (9 friends)
(based on 91 of 240 friends)
• For Tuesday: have read up through chapter 2
• Next week will start chapter 3

• New lab today: Simple Programs
• Integer division?
  o \(1/3\)
  o \(-1/3\)

• Range start at something other than 0?
  – range([start, stop[,step]])
for i in range(5):
    print (i*i)

for i in [3, 1, 4, 1, 5]:
    print (i, end=" ")

for i in range(4):
    print ("Hello")

for i in range(5):
    print (i, 2**i)

YOU APPEAR TO BE LOST IN THOUGHT...

I KNOW IT'S UNFAMILIAR TERRITORY FOR YOU. SHALL I SEND A RESCUE PARTY?
• Print out 1, 2, 3, 4
  – Using a for loop, each on a different line
  – Using a for loop, on the same line
  – Now, print out the reverse sequence by changing only the print statement (not the for statement)
Summing

sum=0
for i in range(5):
    sum = sum + i
print (sum)
• Psudocode
  – More precise than English
  – Not a programming language
  – Good for thinking

• Program to convert C to F?
  \[ F \approx \frac{9}{5}C + 32 \]
The Software Development Process

- Analyze the Problem
- Determine Specification
- Create a Design
- **Implement** Design
- Test/Debug the Program
- Maintain Program
Example Program: Temperature Converter

• Problem:
  – US student needs to know temperature in F
Example Program: Temperature Converter

• Analysis
  – temperature is given in Celsius
  – user wants it in degrees Fahrenheit

• Specification
  – Input – temperature in Celsius
  – Output – temperature in Fahrenheit
  – Output = \frac{9}{5}(\text{input}) + 32
Example Program: Temperature Converter

• Design
  – Input, Process, Output (IPO)
  – Prompt the user for input (Celsius temperature)
  – Process it: convert to Fahrenheit. $F = \frac{9}{5}(C) + 32$
  – Output the result to screen
Example Program: Temperature Converter

• Before coding write a rough draft program

• Psudocode
  – More precise than English
  – Not a programming language
  – Good for thinking
Example Program: Temperature Converter

• Pseudocode:
  – Input temperature in degrees Celsius (call it celsius)
  – Calculate fahrenheit as \((9/5)\cdot\text{celsius}+32\)
  – Output fahrenheit

• Next, convert to Python
Example Program: Temperature Converter

#convert.py
# A program to convert Celsius temps to Fahrenheit
# by: Susan Computewell

def main():
    celsius = eval(input("What is the Celsius temperature? "))
    fahrenheit = (9/5) * celsius + 32
    print("The temperature is ",fahrenheit," degrees Fahrenheit.")

main()
Example Program: Temperature Converter

• Once we write a program, we should test it!

```python
>>> What is the Celsius temperature? 0
The temperature is 32.0 degrees Fahrenheit.
>>> main()
What is the Celsius temperature? 100
The temperature is 212.0 degrees Fahrenheit.
>>> main()
What is the Celsius temperature? -40
The temperature is -40.0 degrees Fahrenheit.
>>> 
```
• Industrial-strength testing

• Maintenance
  – Documentation
  – Knowledge transfer
• Google Glass
  – http://www.youtube.com/watch?v=9c6W4CCU9M4
  – http://www.youtube.com/watch?v=t3TAOYXT840
Example Program: Future Value

• Problem:
  – Our student wants to invest money in a savings account but doesn’t know how much he’ll make over 10 years.
The Software Development Process

• Analyze the Problem
• Determine Specification
• Create a Design
• Implement Design
• Test/Debug the Program
• Maintain Program
Example Program: Future Value

• Analysis
  – Money deposited in a bank account earns interest
  – How much will account be worth in 10 years?
  – Inputs: principal, interest rate
  – Output: value of the investment in 10 years

  – Assumptions?
Example Program: Future Value

• Specification
  – User enters initial amount to invest (the principal)
  – User enters annual percentage rate (the interest)
Example Program: Future Value

• **Program** Future Value

• **Inputs**
  – principal: amount of money being invested, in dollars
  – apr: annual percentage rate expressed as decimal number

• **Output**
  – Total value of the investment 10 years in the future

• **Process**
  – Value after one year is given by $principal \times (1 + apr)$
  – This needs to be done 10 times.
Example Program: Future Value

Design

• Print an introduction
• Input the amount of the principal (principal)
• Input the annual percentage rate (apr)
• Repeat 10 times:
  – principal = principal * (1 + apr)
• Output the value of principal
Example Program: Future Value

• Implementation
  
  – Each line translates to one line of Python (in this case)
  
  – Print an introduction
    
    print ("This program calculates the future")
    print ("value of a 10-year investment.")
  
  – Input the amount of the principal
    
    principal = eval(input("Enter the initial principal: "))
Example Program: Future Value

– Input the annual percentage rate
  apr = eval(input("Enter the annual interest rate: "))

– Repeat 10 times:
  for i in range(10):

– Calculate principal = principal * (1 + apr)
  principal = principal * (1 + apr)

– Output value of the principal at end of 10 years
  print ("The value in 10 years is:", principal)
Example Program: Future Value

# futval.py
# A program to compute the value of an investment
# carried 10 years into the future

def main():
    print("This program calculates the future value of a 10-year investment.")

    principal = eval(input("Enter the initial principal: "))
    apr = eval(input("Enter the annual interest rate: "))

    for i in range(10):
        principal = principal * (1 + apr)

    print("The value in 10 years is:", principal)

main()
Example Program: Future Value

>>> main()
This program calculates the future value of a 10-year investment.
Enter the initial principal: 100
Enter the annual interest rate: .03
The value in 10 years is: 134.391637934
>>> main()
This program calculates the future value of a 10-year investment.
Enter the initial principal: 100
Enter the annual interest rate: .10
The value in 10 years is: 259.37424601
Example Program: Distance Averager

• Problem:
  – Our poor study-abroad student in Europe needs to know the average distance between three cities, in miles.
  – 1 Kilometer = 0.62 Mile