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Introduction to Computer Science, Winter Semester 2017
Practice Assignment 2

Discussion: 14.10.2017 - 19.10.2017

Exercise 2-1 Flight Time

Write an algorithm to determine the flying time between two cities given the mileage between them and the average speed of the airplane.

Solution:

```
m = eval(input())
speed = eval(input())
time = m / speed

print(time)
```

Exercise 2-2 BMI
To be discussed in Tutorial

Write an algorithm that calculates your **BMI** given your **weight** and **height**.
The BMI is calculated using the weight divided by height squared, where weight is in kg and height is in meters.

Solution:

```
weight = eval(input("enter weight: "))
height = eval(input("enter height: "))
BMI = weight/(height*height)
print(BMI)
```

Exercise 2-3 Appliance Cost

Write an algorithm that calculates and prints the annual cost of running an appliance given the cost per kilowatt-hour in cents and the number of kilowatt-hours the appliance uses in a year.

Solution:

```
CostKW = eval(input())
kwUsed = eval(input())

anualCost = CostKW * kwUsed/100

print(anualCost)
```

Exercise 2-4 Planting Trees
 To be discussed in Tutorial

Write an algorithm that given the width and length of a garden in meters calculates the area of the garden together with the number of trees that could be planted on this garden area, knowing that each tree needs a space of 50 cm^2 .

Note: You can use the function `int(x/y)` that gives the integer part of the result of the division x/y . For example `int(5/2)=2`. You can also use the integer division operator `//` directly.

Solution:

```
width = eval(input())
length = eval(input())

garden_area = (width * length)
trees = int(garden_area / 0.005) # or use // for integer division

print("The area of the garden is: ")
print(garden_area)
print("Number of trees you can plant on this area: ")
print(trees)
```

Another Solution using modulus:

```
width = eval(input())
length = eval(input())

garden_area = (width * length)
trees = garden_area // 0.005

print("The area of the garden is: ")
print(garden_area)
print("Number of trees you can plant on this area: ")
print(trees)
```

Exercise 2-5 Compound Interest

Write an algorithm that will output the account **balance** each year for 3 years given the initial **balance** and **interest** rate.

The interest is calculated for one year by multiplying the current account balance by the interest rate and adding this to the balance.

Solution:

```
balance = eval(input("What is your balance: "))
interest = eval(input("What is your interest: "))
balance = balance + (balance * interest/100)
print("The balance after the first year is: ")
print(balance)
balance = balance + (balance * interest/100)
print("The balance after the second year is: ")
print(balance)
balance = balance + (balance * interest/100)
print("The balance after the third year is: ")
print(balance)
```

Exercise 2-6 Pythagorean Theorem
 To be solved in Lab

The Pythagorean Theorem states that the sum of the squares of the two sides of a right angle triangle is equal to the square of its hypotenuse. For example, 3, 4 and 5 are the sides of a right angle triangle as they form a Pythagorean Triple ($5^2 = 4^2 + 3^2$). Given 2 numbers, m and n where $m \geq n$, a Pythagorean Triple can be generated by the following formulae:

$$\begin{aligned} a &= m^2 - n^2 \\ b &= 2 \times m \times n \\ c &= \sqrt{a^2 + b^2} \end{aligned}$$

Write an algorithm that reads in values for m and n and prints the values of the Pythagorean Triple generated by the formulae above.

Solution:

```
import math # import math module, it consists of predefined math functions
m = eval(input())
n = eval(input())
a = ((m * m) - (n * n))
b = (2 * m * n)
c = (math.sqrt((a * a) + (b * b))) # math.sqrt()
print("The Pythagorean Triple consists of the following sides: ")
print(a, b, c)
```

Exercise 2-7 Get the Time

Write an algorithm that reads the amount of time in seconds and then displays the equivalent hours, minutes and remaining seconds.

- One hour corresponds to 60 minutes.
- One minute corresponds to 60 seconds.

Solution:

```
seconds = eval(input())
hours = int(seconds/3600)
seconds = seconds-(hours*3600)
minutes = int(seconds/60)
seconds = seconds-(minutes*60)

print(hours, "hours", minutes, "minutes", seconds, "seconds")
```

Another Solution using modulus:

```
seconds = eval(input())

hours = int(seconds/3600)
seconds = seconds % 3600
minutes = int(seconds/60)
seconds = seconds % 60

print(hours, "hours", minutes, "minutes", seconds, "seconds")
```

Exercise 2-8 Get the Money
 To be solved in Lab

Write an algorithm that reads the amount of money in pennies and displays the equivalent dollars, quarters, dimes, nickles and pennies.

- One dollar corresponds to 100 pennies.
- One quarter corresponds to 25 pennies.
- One dime corresponds to 10 pennies.
- One nickle corresponds to 5 pennies.

Solution:

```
pennies = eval(input())

dollars = int(pennies/100)
pennies = pennies-(dollars*100)
quarters = int(pennies/25)
pennies = pennies-(quarters*25)
dimes = int(pennies/10)
pennies = pennies-(dimes*10)
nickles = int(pennies/5)
pennies = pennies-(nickles*5)

print(dollars, "dollars")
print(quarters, "quarters")
print(dimes, "dimes")
print(nickles, "nickles")
print(pennies, "pennies")
```

Another Solution:

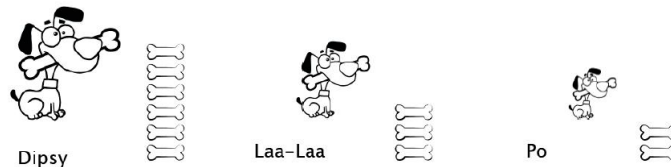
```
pennies = eval(input())

dollars = int(pennies/100)
pennies = pennies % 100
quarters = int(pennies/25)
pennies = pennies % 25
dimes = int(pennies/10)
pennies = pennies % 10
nickles = int(pennies/5)
pennies = pennies % 5

print(dollars, "dollars")
print(quarters, "quarters")
print(dimes, "dimes")
print(nickles, "nickles")
print(pennies, "pennies")
```

Exercise 2-9 Feeding Your Pets

After knowing that he will be taking the Introduction to Computer Science course in his first year in the GUC, a freshman engineering student decided to switch career and work as a veterinarian. In his first day at his new job, he was asked to feed 100 bones to three dogs; Dipsy, Laa-Laa, and Po. Dipsy eats twice as much as Laa-Laa eats. Laa-Laa eats one and a half times what Po eats.



- Think of an algorithm that, given the amount of bones, would print(out how many bones each dog will be fed.)

Solution:

```
Bones = eval(input())

Po = int(Bones / (1 + 1.5 + 3))
LaaLaa = int(Po * 1.5)
Dipsy = LaaLaa * 2

print("Dipsy will get ", Dipsy, "kg")
print("LaaLaa will get ", LaaLaa, "kg")
print("Po will get ", Po, "kg")
```

- Enhance your algorithm, by making it print(out how many bones would remain) after the distribution of the bones among the three dogs.

Solution:

```
...
RemBones = Bones - (Dipsy + LaaLaa + Po)
print("And ", RemBones, " will remain")
```

Exercise 2-10 Swaping Numbers To be discussed in Tutorial

Write an algorithm that takes as input two numbers and swaps the values of these numbers.

- Write the algorithm using a temporary variable

Solution:

```
x = eval(input())
y = eval(input())

tmp = x
x = y
y = tmp

print("The new value of x is ", x, " and the new value of y is ", y)
```

- Swap the two numbers without using a temporary variable. Is it always possible to swap any two values of any types?

Solution:

```
x = eval(input())
y = eval(input())

y = y + x
x = y - x
y = y - x

print("The new value of x is ", x, " and the new value of y is ", y)
```

No, it is only possible when dealing with numbers.

Exercise 2-11 Sum Digits
 To be discussed in Tutorial

Write an algorithm that given a 3-digit number prints out the sum of its digits.

Example: if the number is 425 then the output should be 11.

Solution:

```
number = eval(input())

d1 = int(number/100)
d2 = int(number/10) % 10
d3 = number % 10
sum = d1 + d2 + d3

print("The sum is ", sum)
```

Another Solution:

```
number = eval(input())

d1 = number % 10
number = int(number / 10)
d2 = number % 10
d3 = int(number / 10)
sum = d1 + d2 + d3

print("The sum is ", sum)
```