COURSE 1
— MAP101 —
e-training

Myanmar Universities
UGA students - France

2018
Session 4

Exercise 1

Compound interest is the addition of interest to the principal sum of a loan or deposit, or in other words “interest on interest”. It is the result of reinvesting interest, rather than paying it out, so that interest in the next period is then earned on the principal sum plus previously accumulated interest. Compound interest is standard in finance and economics. From https://en.wikipedia.org/wiki/Compound_interest.

- Example 1: assume a principal amount of 1000 euros is deposited in a bank paying an annual interest rate of 6% \( (r = 0.06) \). Then, denoting by \( S_k \) the new amount after \( k \) years, we successively have

\[
\begin{align*}
S_0 &= 1000 & \text{initial amount} \\
S_1 &= S_0 + 0.06 \times S_0 = S_0 \times (1 + 0.06) & \text{amount after 1 year} \\
S_2 &= S_1 + 0.06 \times S_1 = S_0 \times (1 + 0.06)^2 & \text{amount after 2 years} \\
S_3 &= S_2 + 0.06 \times S_2 = S_0 \times (1 + 0.06)^3 & \text{amount after 3 years} \\
S_4 &= S_3 + 0.06 \times S_3 = S_0 \times (1 + 0.06)^4 & \text{amount after 4 years} \\
\vdots
\end{align*}
\]

I wrote the following two Scilab implementations of this process.

```scilab
// file S04exo1.sce
// EXAMPLE 1a
S = 1000; // initial amount
r = 0.06; // annual rate 6%
p = 8; // number of years
for i = 1 : p
    S = S * (1+r);
end
disp(S) // final amount // after p years
```

```scilab
// file S04exo1.sce
// EXAMPLE 1b
S = 1000; // initial amount
r = 0.06; // annual rate 6%
p = 8; // number of years
k = 1;
while k < p
    S = S * (1+r);
    k = k+1;
end
disp(S) // final amount // after p years
```

Result in the console :

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Result in the console :

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But, unfortunately, the two results are different, so that I certainly made a mistake in one of these two Scilab scripts (or both).

1. Can you fix this error (or these errors) ?

- Example 2: assume now that the same principal amount of 1000 euros is deposited in a bank paying an **annual** interest rate of 6% \( (r = 0.06) \), compounded each three months
Denoting by $S_k$ the new amount after $k$ months, we successively have

\[
\begin{align*}
S_0 &= 1000 & \text{initial amount} \\
S_1 &= S_0 = 1000 & \text{no interest after 1 month} \\
S_2 &= S_0 = 1000 & \text{no interest after 2 months} \\
S_3 &= S_0 + 3 \times \frac{0.06}{12} \times S_0 = S_0 \left( 1 + 3 \frac{0.06}{12} \right) & \text{cumulative interest for 3 months} \\
S_4 &= S_3 \\
S_5 &= S_3 \\
S_6 &= S_3 \left( 1 + 3 \frac{0.06}{12} \right) = S_0 \times \left( 1 + 3 \frac{0.06}{12} \right)^2 \\
&\vdots 
\end{align*}
\]

Consider the following two (uncompleted) Scilab implementations of this process.

\begin{verbatim}
// file S04exo1.sce
// EXAMPLE 2a
S = 1000; // initial amount
r = 0.06; // annual rate 6%
n = 3; // period of n months
p = 8; // 8 years
Nm = ...; // Number of months
for i = 1 : Nm
   if modulo(i, n) == 0 then
      S = ...;
   end
end
disp(S) // final amount
\end{verbatim}

\begin{verbatim}
// file S04exo1.sce
// EXAMPLE 2b
S = 1000; // initial amount
r = 0.06; // annual rate 6%
n = 3; // period of n months
p = 8; // 8 years
Nn = ...;
// Nn = Number of periods of n months during the p years
for i = 1 : Nn
   S = ...;
end
disp(S) // final amount
\end{verbatim}

2. Please, complete these two scripts (precisely, complete the “…”) 

3. Experiment this process for $n = 12$, $n = 6$, $n = 3$, $n = 1$. 

4. And now, a very difficult question: with the same data, how many years are needed to get a final amount equal to 2000 when interests are compounded monthly?

For this question, complete the following script.

\begin{verbatim}
// file S04exo1.sce
// EXAMPLE 2c
S = 1000; // initial amount
r = 0.06; // annual rate 6%
N = 1; // period of 1 month
i = 0; // month number i=0
while ...
   S = ...;
   i = i + 1
end
mprintf("%d months are needed = %.2f years", i, i/12)
\end{verbatim}
Exercise 2

1. In which region of France have these photos been taken? What is the name of this flower?

2. What is this flower useful for?

3. What are Notes and the Fragrance pyramid in perfumery?

4. The following fragrances all contain lavender. Most of them are for man, or for man and woman, but only one is for woman. Can you find this perfume dedicated to women?

5. Below are some famous perfumes and famous brands. Can you associate them?

| (A) Kenzo | (B) Yves Saint Laurent | (C) Lancôme | (D) Jean-Paul Gaultier | (E) Hermès |
| (F) Givenchy | (G) Nina Ricci | (H) Guerlain | (I) Dior | (J) Chanel |
Solution : @WAYBPCWDXEVFFTGSHS@?Q@@U@AR
But unfortunately, this solution has been coded according to the Caesar code with a key equal to the date of birth in March of Zin Zar.

6. All these perfumes (above) are fragrances for women, except one for men. Which one?

7. Fragrance N°5 is probably (one of) the most famous and best-selling perfume in the world. Coco Chanel (1883-1971) was a French fashion designer and business woman.
7-a) What is the exact creation date of this perfume? And why precisely that day?

7-b) How many ingredients are needed to make this fragrance?

7-c) What is its main and crucial ingredient? What unique place does this ingredient come from?

7-d) What inspired the simple shape of the bottle of this perfume?

7-e) Where did Coco Chanel (essentially) live?

8. La petite robe noire (Guerlain) — https://www.youtube.com/watch?v=3rotn5D93vs Why this name “La petite robe noire”?

9. Shalimar (Guerlain, 1921, 1925) — Why this name “Shalimar”? 
10. Among perfumes, we can distinguish (in French) “Eau de cologne”, “Eau de toilette”, “Eau de parfum”, “Parfum”.
Can you explain the difference between these different names?

11. What do we call a “nez” (a nose) in the French perfume industry?

12. Can you mention (at least) one way to extract the aromas of plants, flowers, ...?

Exercise 3

1. What is the strategy used by Gaston to find the secret number? Can you explain why Gaston is sure to find this secret number with just 7 questions.
2. Now, we come back to exercise 3 of session 3 (where we try to find a mysterious number). Complete the following Scilab script.

```scilab
// file S04exoGameMysteriousNumber.sce

// Title to start the game
mprintf("\t|-------------------------------------|\n")
mprintf("\t| THE GAME OF THE MYSTERIOUS NUMBER |\n")
mprintf("\t|-------------------------------------|\n
")

// Mysterious number chosen randomly by Scilab (between 0 and N)
N = 100;
mysteriousNumber = int(N*rand(1,"uniform"));

ans = input("Are you ready to play (y/n)? ","string")
if ans == "y" then
    mprintf("Nice, so we start ... \n")
    mprintf("you have to find a mysterious number between 0 and %d\n",N)
    n = 1;
    proposedNumber = input(" proposed number ? ")
    while proposedNumber ≠ mysteriousNumber
        if ....... then
            mprintf("your number is too big, try again : ")
        .......
        else
            mprintf("your number is too small, try again : ")
        ......
    end
    n = n+1;
end
mprintf("Great ! you win after %d attempt(s)", n)
end
```