Καθηγητής Πληροφορικής
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EXERCISES CHAPTER 7

EXERCISE 1

Fill the missing words in the following sentences:

1. A list of instructions – commands that are grouped under a common name is called a _____.
2. The main advantage of a procedure is that we can _____ it by its name at any point of the program execution without having to write again its full set of commands.
3. To create a public procedure, we should define it inside the _____ .
4. The definition of the procedure begins with _____ command followed by its name and finishes with _____ command.
5. The _____ of a procedure must not contain any spaces.
6. There are 3 categories of procedures: regular, parametric and _____.
7. The _____ procedures do not use any parameters as input.
8. Parametric procedures use symbolic names to represent their inputs that are called parameters or _____.
9. A _____ procedure is possible to use more than one parameter as input.
10. A variable is a _____ name which is given to a location of computer memory in which we can store a value.
11. The _____ of a variable can be changed during the program execution.
12. When we want to _____ the value of a variable, we should place in front of its name the colon (:) symbol.
13. When we want to _____ a new value to a variable, we should place in front of its name the quotation marks " symbol.
14. By using the _____ command, we can assign a new value to a variable.
15. The super procedures are a category of procedures that _____ other sub-procedures.

EXERCISE 2

What information will be displayed on the screen after the execution of the following commands?

A

```
make "animal "lion
show :animal
make "lion "tiger
show "lion
show "animal
make "animal "dog
show (se [I have a] :animal)
```

B

```
make "X 3
show 12 + 5 * :X
make "X :X + 2
show 2 * 5 - :X * 4
make "X 8
show 14 + 2 + :X / 2
show 10 + power :X 2
```

EXERCISE 3

What information will be displayed on the screen after the execution of the following commands?

A

```
make "X 36
show :X
make "Y 8
show :Y
show sqrt :X
show :X - :Y
show power :Y 2
show (se [X =] :X)
make "Y :X + 1
show (se :X :Y)
```

B

```
make "NAME "Maria
show :NAME
make "WORD "Hello
show :WORD
show (se :WORD :NAME)
show (se :WORD "students)
make "num 25
show (se[Students C1] :num)
show (se[Students C2] :num + 2)
show (se[Total] :num + :num + 2)
```

EXERCISE 4

A) Write the instructions with which you can **assign your name** to a **variable** called NAME and then display your name in the command centre.

B) Write the instructions with which you can **assign your full name** (first name & last name) to a variable called FULLNAME and then display your full name in the command centre.

C) Write the instruction with which you can **display your full name** in the command centre, using the variable created before and forming the following message «My name is … …»

EXERCISE 5

Given the next set of commands, try to explain the following questions:

```
make "A 1
repeat 10
  [show :A
   make "A :A + 1]
```

A) What values will be displayed on the screen after the execution of this set of commands?

B) What is the purpose of the command **`make "A :A + 1`**

EXERCISE 6

Create the following parametric procedures:

A) Procedure named ***rectangle*** that accepts two parameters as input, which are the length of two vertical sides, and creates a rectangle based on these parameters.

B) Procedure named ***staircase*** that accepts three parameters as input, which are the number of steps, the height and the width of each particular step, and creates a staircase based on these parameters.

Evangelos C. Zioulas *(IT Teacher)*

EXERCISE 7

Create the following parametric procedures:

A) Procedure named ***Square_Area*** that calculates the area of a square where side length A is given as input (1 parameter) to the procedure.

B) Procedure named ***Triangle_Area*** that calculates the area of a triangle where side length A and height Y are given as input (2 parameters) to the procedure.

C) Procedure named ***Equation*** that displays the root of a linear equation ***Ax+B=0***, when A and B are given as input (2 parameters) to the procedure.

EXERCISE 8

Change the parametric procedures created in the previous exercise, and display their final results accompanied with the following messages:

Call example	Message displayed on the screen
Square_Area 10	The area of a square of side length 10 is 100
Triangle_Area 5 10	The area of a triangle of side length 5 and height 10 is 25
Equation 3 6	The root of the equation is -2

EXERCISE 9

Create the following parametric procedures:

A) Procedure named ***Messages*** that accepts a number as input and displays the message «**C' Gymnasium**» on the screen as many times as that number indicates.

B) Procedure named ***Multiplication*** that accepts a number as an input and displays all its products of numbers 1 to 10 on the screen.

EXERCISE 10

A) Fill the gaps in the following **parametric procedure** named ***polygon***, so that when we give a value to the variables **:sides** and **:length**, the procedure will be able to design the corresponding polygon.

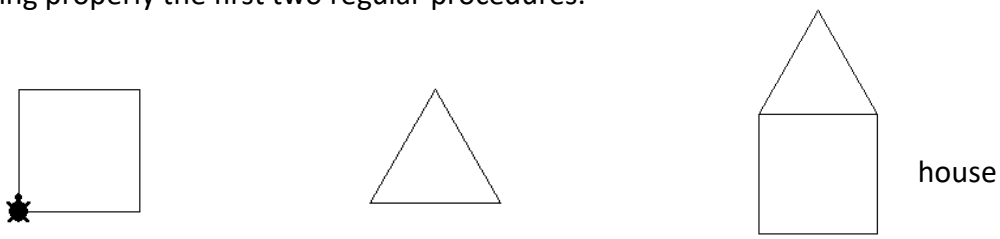
```
to polygon :sides :length
      pd
      repeat ____ [fd _____ rt _____]
end
```

B) How should we call the polygon procedure in order to design each one of the following shapes?

- **i.** A triangle with side length 100 pixels
- **ii.** A square with side length 120 pixels
- **iii.** A hexagon with side length 80 pixels

EXERCISE 11

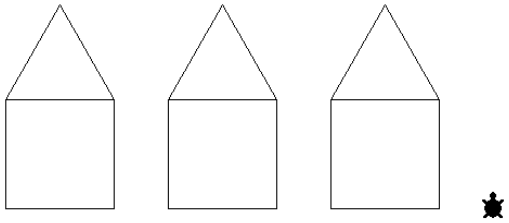
Define the **regular procedures *square*** and ***triangle*** that design a square and a triangle respectively with a side length of 150 pixels. Then define the **super procedure *house*** that implement the following shape of house calling properly the first two regular procedures.



house

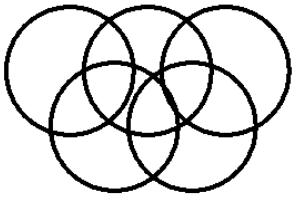
EXERCISE 12

Given the previous procedures ***square***, ***triangle*** and ***house***, define a new **parametric procedure** named ***neighborhood***, which accepts as input the number of houses and designs the following drawing (a chain of houses). You can assume that the distance between two consecutive houses is 50 pixels.



Example of Calling:
neighborhood 3

EXERCISE 13

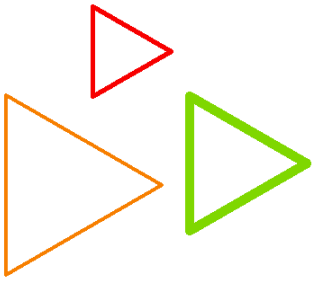


- Create a **regular procedure** named ***circle,*** which designs a circle in the screen (side length of the circle is 1 pixel).
- Then, based on the circle procedure, try to create a **super procedure** named ***olympics,*** which designs the near shape.

Notes: A) You should use a size 4 pen to design each circle.
B) The first circle of the shape should begin in [-150, 100] coordinates
C) After designing the shape, the turtle must be invisible

EXERCISE 14

- Create a **parametric procedure** named ***triangle***, which designs a triangle in the screen. The procedure accepts three parameters as input: the side length, the pen size and the pen color.
- **How can we call the procedure defined previously in order to design:**
  a) A red (code 15) triangle with side length 100 and pen size 5
  b) A green (code 55) triangle with side length 150 and pen size 10
  c) An orange (code 25) triangle with side length 200 and pen size 4

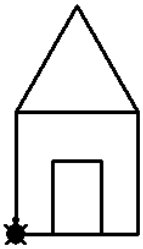


EXERCISE 15

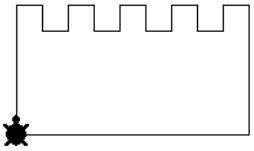
Create each one of the following **regular procedures** that design the corresponding shapes:

- ***tower,*** which creates a tower with sides 150x30 pixels and pen size 3.
- **gate,** which designs a gate with side length 100 pixels, a door with 60x40 pixels and pen size 3.
- **wall,** which designs a wall of 100 pixels height and 5 loopholes with side length 20 pixels.

tower

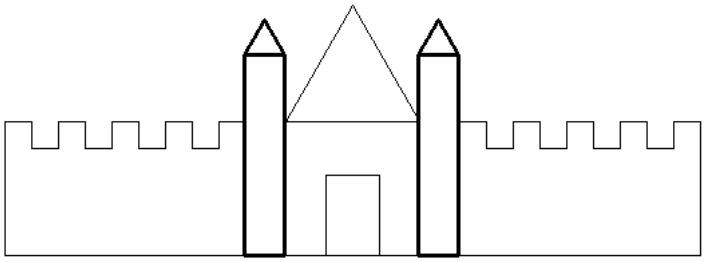


gate



wall

Based on the previously created regular procedures, try to create a **superprocedure** named ***castle,*** which designs the following shape in the middle of the page (the turtle must be hidden at the end).



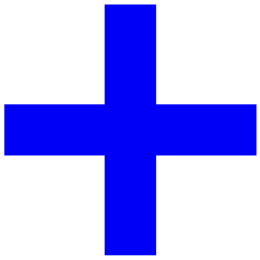
EXERCISE 16

A) Create a **parametric procedure** named ***rectangle*** where the dimensions are 200x40 pixels. This procedure accepts one parameter as input that is the pen color, and designs a rectangle that is filled with this color.

B) Based on the *rectangle* procedure, create a new **parametric super procedure** named ***cross,*** which accepts the pen color as input, and designs the cross shape illustrated below (the turtle at the end must be invisible).

C) Based on the *cross* procedure, create a new **parametric super procedure** named ***letterX,*** which accepts the pen color as input, and designs the X shape illustrated below (the turtle at the end must be invisible).

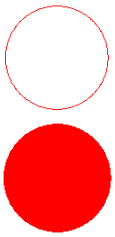
rectangle



cross

letterX

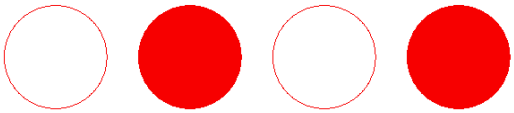
EXERCISE 17



A) Create a **parametric procedure** named ***empty_circle***, which accepts as input the pen color and designs an empty circle with side length 1 pixel.

B) Create a **parametric procedure** named ***full_circle,*** which accepts as input the pen color and designs an circle filled with that color. The circle must have side length 1 pixel.

C) Based on the previously created procedures, create a new **parametric super procedure** named ***circles,*** which accepts the pen color as input and designs the following shape.



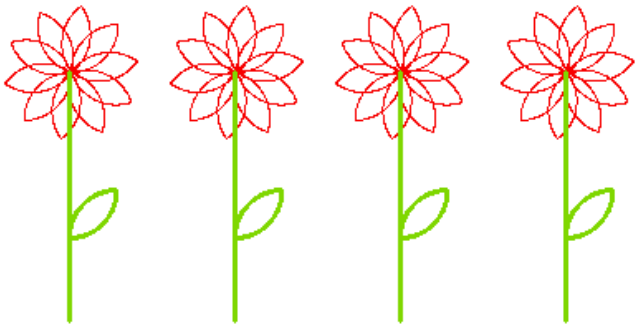
EXERCISE 18

A) Create a **regular procedure** named ***quadrant***, which designs the quadrant of a circle with side length 0,5 pixel.

B) Based on the previous procedure, create a **super procedure** named ***petal***, which designs the petal of a flower.

C) Based on the previous procedures, create a **parametric super procedure** named ***flower,*** which accepts 2 parameters as input: the number of petals and the color of petals. The twig of the flower should have a length of 150 pixels, pen size 3 and pen color green. The petal of the flower should be located 100 pixels away from the centre of the flower.

D) Based on the previous procedures, create a **parametric super procedure** named ***garden,*** which accepts 3 parameters as input: the number of flowers, the number of their petals and the color of their petals. The distance between two neighboring flowers should be 100 pixels.



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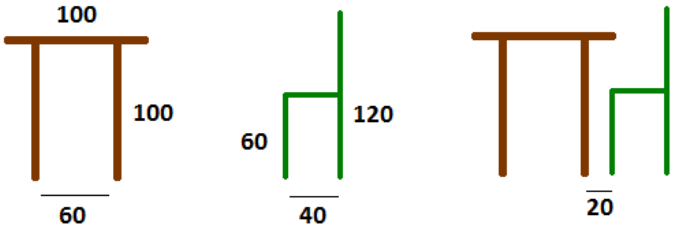
EXERCISE 19

A) Create the following **regular procedures** named ***table*** and ***chair,*** which design the corresponding shapes on the screen. Both procedures at the end, must return the turtle back to its initial point (bottom left corner of the shape).

B) Based on the previous procedures, create a new **super procedure** named **furniture**, which designs the shape illustrated below.

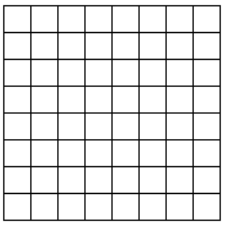


Notes: A) The dimensions of the shapes are shown above.
B) The table should have brown color (code 29) and pen size 6.
C) The chair should have dark green color (code 69) and pen size 4.

EXERCISE 20

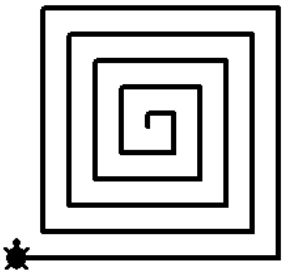
A) Create a **parametric procedure** named ***square,*** which accepts the side length as input and designs a square on the screen.

B) Based on the previous procedure, create a **parametric super procedure** named ***chess,*** which designs the near shape that contains 8x8 cells. The procedure accepts as an input the side length of one cell.



EXERCISE 21

Create a **parametric procedure** named ***spiral***, which designs a spiral like the one illustrated in the near image. The procedure accepts 3 parameters as input:



- the **length** of the initial line of the spiral (that is the first line inside the spiral).
- the **step** that defines how longer each new line will be in relation to the previous one.
- the total **number** of spiral sides.