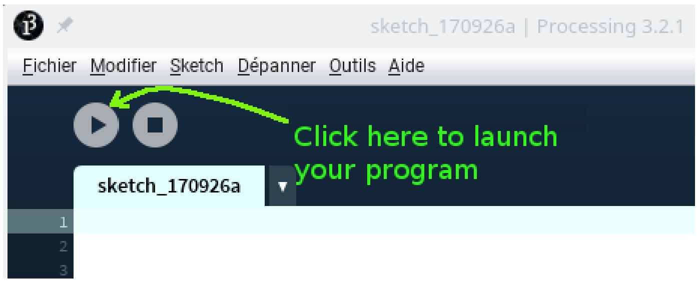
Computer Class 1

To install `Processing`, it is enough to download a Zip archive from the official website (search "Processing" in a search engine) and run `processing.exe` or `processing-java.exe`. If you have problems to install it on your platform, you can also download the virtual machine below and run it with `virtualbox` :
`cedric.cnam.fr/~porumbed/vbox/antixLinux.zip`

1 Nice drawings without loops

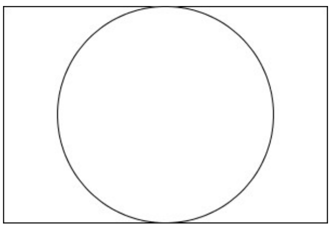
Start `Processing` and you will find a nice window as below. Type the code below and execute it using of the "start" button.

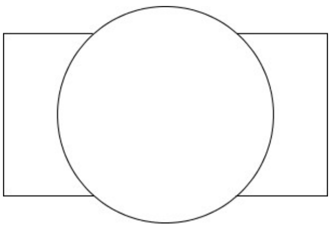
```
size(700,700);
line(0,0,700,700);
line(0,700,700,0);
```



Exercice 1 Modify the previous program and add the instruction `noFill()`, followed by `rect(100,100,500,500)`. What does the new program print ?

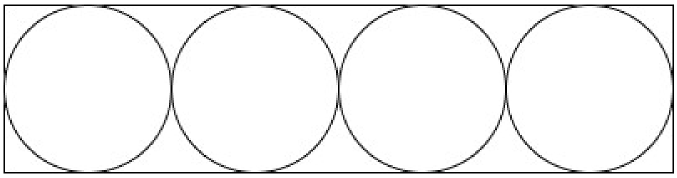
Exercice 2 Use the instructions `ellipse(...)` et `rect(...)` to draw a circle inside a rectangle like in the bottom-left image.





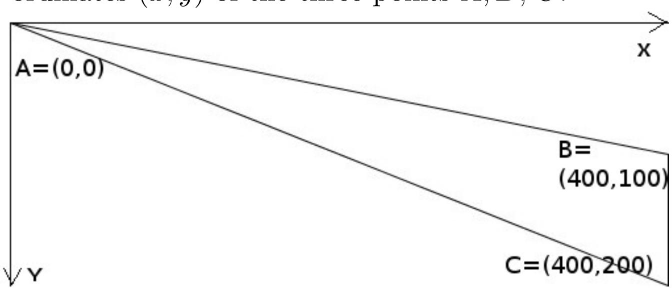
Exercice 3 Modify the previous program to get a drawing that looks like the upper-left image. You can either increase the size of the circle or decrease the size of the rectangle (but be careful not to to move its center).

Exercice 4 Modify the previous program to get a drawing that looks like the image below.



Exercice 5 Suppose that the above rectangle has size 400×100. Thus, its area is $400 \cdot 100 = 40000$. A circle has an area of πr^2. Compute and print the area of the surface inside the rectangle but outside all four circles. **Note :** In `Processing`, write `PI` to refer to π.

Exercice 6 Consider figure below and notice the coordinates (x, y) of the three points A, B, C.



Declare three variables `ab`, `ac` and `bc`. Use the Pythagorean theorem to assign to these three the lengths of the segments AB, AC and BC ; for BC, there is no actually need of Pythagoras. **Note :** To get the square root of x, we can call `sqrt(x)`. Display the three variables (lengths).

Exercice 7 Heron's formula can calculate the area of a triangle knowing only the lengths of the edges. Declare and initialize a perimeter variable $p = AB + AC + BC$ and a half-perimeter variable $s = \frac{p}{2}$. Calculate the area of the triangle using the formula [1]

$$area = \sqrt{s \cdot (s - AB) \cdot (s - AC) \cdot (s - BC)}$$

1. The area of a triangle can also be calculated as the product between the height and the base (BC) of the triangle. We get $400 \cdot 100/2 = 20000$. You will observe a rounding error in the calculation based on the formula of Heron.

Exercice 8 Write a program that draws a triangle using 3 calls to `line(...)`. The coordinates of the vertices $((x0, y0), (x1, y1), (x2, y2))$ are stored in 6 variables whose values are hard coded at the beginning of the code.

Exercice 9 Modify the previous program to make it use two arrays x and y. For instance, instead of $x0$ we will write $x[0]$. These is how these arrays can be rapidly initialized (hard coded at the beginning of the program)

```
size(500,500);
int [] ax = {10, 400, 50};
int [] ay = {10, 200, 80};
```

Exercice 10 Compute the area of the triangle using the above Heron's formula. You can compute first the length of each edge using the Pythagorean theorem, for instance :

float `len01`$= sqrt((x[1] - x[0])^2 + (y[1] - y[0])^2)$.

Exercice 11 Modify the above exercise to draw a pentagon instead of a triangle and to calculate its area using a similar (generalized) method based on Heron's formula. The coordinates of the five points can be hard coded in two arrays x and y as follows :

```
size(500,500);
int [] ax = {10, 400, 50, ..., ...};
int [] ay = {10, 200, 80, ..., ...};
```

Exercice 12 Write a `for` loop to print 15 times the text `Hi everybody!!!` using `println(...)`.
Exercice 13 Write a `for` loop to draw 35 rectangles of size 200×100 placés à at random places on the canvas. **Indication :** `rect(random(100),random(100),50,20)` draw a rectangle of size 50×20 at a random positions whose coordinates are between 0 and 100. Launch several times the code line below.

```
    rect(random(100),random(100),50,20)
```