

# Problems involving quadratic equations (II) (solutions)<sup>1re</sup>Euro

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**This can go inside you calculator !**

## Python

```
from math import sqrt # import the square root function

a = float(input("Enter a : ")) # get the value entered by the user,
# convert it to a floating point number and store it into a
b = float(input("Enter b : ")) # same
c = float(input("Enter c : ")) # same

delta = b ** 2 - 4 * a * c # calculate the discriminant

print("delta = ", delta) # display it

if delta < 0: # if it's stricly negative
    print("No solution in R :)") # no solutions

elif delta == 0: # else, if it's equal to zero
    print("One solution in R :)") # one solution
    print(-b / (2 * a)) # which we display

else: # else (so delta must be strictly positive)
    print("Two solutions in R :)")
    print((-b - sqrt(delta)) / (2 * a), "and", (-b + sqrt(delta)) / (2 * a)) # display
```

## A painting

The width of a rectangular painting exceeds its height by 7 cm and its area is 288 cm<sup>2</sup>.  
Find the painting's dimensions.

## A garden

The area of a rectangular garden will double when surrounded with a strip of x meters wide.  
Find x.

## A family of equations

### Part I : example

1. Show that  $3 + 2\sqrt{2} = (1 + \sqrt{2})^2$ .
2. Solve  $x^2 + (3 + \sqrt{2})x + 2 + \sqrt{2} = 0$  in  $\mathbf{R}$ .

### Part II : generalization

1. Show that given any real numbers  $a, b$  et  $c$  :

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$$

(one can start by expanding  $((a + b) + c)^2$  or directly expand  $(a + b + c)(a + b + c)$ ).

2. Let  $p$  be a real number such that  $p > 1$ , and (E) the following equation :

$$x^2 + (p + 1 + \sqrt{p})x + p + \sqrt{p} = 0$$

- a. Calculate the discriminant  $\Delta$  of (E).
  - b. Show that  $(p - 1 + \sqrt{p})^2 = \Delta$ .
  - c. Consequently, deduce the solutions of (E) in  $\mathbf{R}$ .
3. Are the results found in question **2.a.** coherent with those found part I ?