Problems involving quadratic equations (II)

This can go inside your calculator !

Python

```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 cm². Find the painting's dimensions.

A garden

The area of a rectangular garden of dimensions 16 meters by 24 meters will double when it is surrounded with a strip of x meters wide.

Find x.

A family of equations

Part I : example

1. Show that $3 + 2\sqrt{2} = \left(1 + \sqrt{2}\right)^2$.

2. Solve $x^2 + \left(3 + \sqrt{2}\right)x + 2 + \sqrt{2} = 0$ in **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 Δ of (E).

   b. Show that $(p - 1 + \sqrt{p})^2 = \Delta$.

   c. Consequently, deduce the solutions of (E) in **R**.

3. Are the results found in question **2.a.** coherent with those found part I ?