Tutorial 2

1. Complex number in rectangular form,

$$x + yj$$

can be expressed in polar form as a combination of magnitude m and phase p (in radian)

$$m \angle p$$

where

$$m = \sqrt{x^2 + y^2}$$

$$p = \begin{cases} \tan^{-1}\left(\frac{y}{x}\right) & x > 0 \\ \tan^{-1}\left(\frac{y}{x}\right) + \pi & x < 0 \end{cases}$$

Write a program to convert a given complex number to its equivalent polar form. Use `numpy.arctan()`, a trigonometric inverse tangent function ($\tan^{-1}$) from `numpy` module, which calculates the radian, given a tangent value.

```
***Complex Number in Polar Form ***
Please enter a complex number: 3+4j
The complex number in polar form
m = 5.0
p = 0.9272952180016122
*** End ***
```

2. Quadratic Equation Solution

$$ax^2+bx+c=0$$

Given quadratic equation coefficients, a, b and c, from user, calculate the solution(s) for the quadratic equation.

$$x=\frac{-b\pm\sqrt{\Delta}}{2a},\Delta=b^2-4ac$$

```
***Quadratic Equation Solver***
Please key in the following quadratic equation coefficients
a : 1.0
b : 1.0
c : -3.75
The solutions for the quadratic equations are
x1 = -2.5
x2 = 1.5
*** End ***
```

Please handle all of below cases, when the discriminant Δ is

- $\Delta>0$, the solutions are two distinct real numbers
- $\Delta=0$, the solution is only one real number
- $\Delta<0$, no solutions for real number

Bonus: Provide also solutions for $\Delta<0$, which are comprised of two distinct complex numbers.