# 

QUADRATIC EQUATION

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# THEORY

## 1. Definition

In algebra, a quadratic equation (from the Latin quadratus for “square”) is any equation having the form:  where  represents an unknown, and  represent known numbers, with .

## 2. Quadratic formula

The method to solve quadratic equations by using the quadratic formula is summarized in the following table.

|  |  |
| --- | --- |
|  | |
|  | **Conclusions** |
|  | has  distinct roots |
|  | has double roots |
|  | has no real roots |

**The simplified discriminant :**

|  |  |
| --- | --- |
|  | |
|  | **Conclusions** |
|  | has  distinct roots |
|  | has double roots |
|  | has no real roots |

## 3. Vieta’s formulas

If the quadratic equation  has  solutions  then



Conversely, if  quantities  have  and , then  are  solutions of the equation: 

## 4. Signs of roots of the quadratic equation

 has two positive distinct roots 

has two negative distinct roots 

has two same sign distinct roots 

has two opposite sign distinct roots 

has one positive root only 

has one negative root only 

## 5. Biquadratic equation

A biquadratic equation is any equation having the form: 

Let ,  is equivalent to 

 has four distinct roots  has two positive distinct roots 

has three distinct roots  has one positive root and one root  

has two distinct roots  has two opposite sign distinct roots or one positive double root 

has one root  has one double root  or one negative root and one root  

has no root  has no root or two negative distinct roots 

# CONSTRUCTED – RESPONSE EXERCISES

## Problem 1: Solve the equation below:



***Solution***

Domain: 

We have: 



Thus, the solution of the given equation is .

## Problem 2. Find the value and another root of the equation if it has one root .

***Solution***

 is one of the solutions of the given equation, then we have: 



Therefore, 

Applying Viete’s formula, we have 



Thus,  and 

## Problem 3. Find all the values of that the equation has roots.

***Solution***

We have: 

If the equation has root, must be greater than or euqal to , so:



Thus, .

## Problem 4. Find all the positive integer values of that the equation has two distinct roots.

***Solution***

We have 

If the equation has two distinct roots, must be greater than 0, so



Thus, 

## Problem 5. Give the equation . Find the value of that the equation has roots , and .

***Solution***

• , we have 

• , we have: 

The equation has roots 





## Problem 6. It’s known that and are roots of the equation , where . Find .

***Solution***

By Viete’s formula, we have 



Therefore, 

## Problem 7. If are roots of , find .

***Solution***

We have 

and also, 

which gives us 

Similarly, we have: 

Hence, we only need to find the value of:



By Vieta's formula, we have that 



## Problem 8. In the quadratic equation , all roots are positive integers. Let the sum of the roots be and the product of the roots is . If , find .

***Solution***

, so the roots of the quadratic are  and 

By Vieta’s formula, we have 



As all roots are positve integers, we asume that  should be pairs of roots of the equation 

## Problem 9. Find the root of the equation: .

***Solution***

With , we have 









From that we have  are roots of the given equation.

## Problem 10. Find the root of the equation: .

***Solution***





With , we have 







From that we have  are roots of the given equation.

# MULTIPLE – CHOICE QUESTIONS