Sometimes it may be good to realize before we try to solve a quadratic equation, whether or not it will have any real solutions. The key to this realization lies in the discriminant.

## The Discriminant

Def: The expression is called the ***discriminant***, which provides information about the number and type of solution(s) the quadratic equation has.

Recall *rational* and *irrational* numbers.

*Rational numbers* are any number that can be expressed as a fraction (of integers, without a 0 on bottom)

*Irrational numbers* are real numbers that are not rational, (non-fractions like )

|  |  |  |
| --- | --- | --- |
| *Discriminant:* | Nature of Solutions | Number of Solutions |
| 0 | A Rational number with multiplicity of 2 | 1 with multiplicity 2 |
| Positive  Perfect Square  Not a perfect square | Two different real number solutions  Both solutions are rational  Both solutions are irrational | 2 |
| Negative | Two different imaginary number solutions  (they will be complex conjugates of each other) | 2 |

Ex Use the discriminant to find what type of solutions (the kind and number of) each equation has. Do not solve the equation.

Discriminant

So we will have a rational number solution with multiplicity 2

Discriminant

So we will have 2 imaginary number solutions

Ex Write a quadratic equation having the given solutions.