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# Purpose of the software

This software package, named findFactorsTools.py, allows a user to input any quadratic trinomial or binomial into its factored form, if the trinomial/binomial is factorable. Else, it returns “Not factorable”.

For example, “3x^2 - 10x - 8” → “(3x+2)(x-4)”

# Instructions for using the software

1. Open the Python document named factorTrinomialTests.py with IDLE.

2. In the Python document, press F5.

In the test cases, the trinomial/binomial must have spaces beside the signs, and in the form “ax^2 + bx + c”. For example,

factorTrinomial( “6x^2 + x - 1” ) returns “(2x+1)(3x-1)”

# Functions and procedures

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Arguments** | **What it returns or outputs** | **Team member responsible for coding it** |
| **createArray** | quadraticTrinomial  (string) | Converts equation from string into an array and returns the array | Alex |
| **findNumTerms** | array | Returns the number of terms in the equation. (Either 2 or 3) | Alex |
| **findCoefficients** | array | Returns the value of a, and/or b and/or c. If the number of terms is two, it also determines which term isn’t present (b or c) and assigns it a value of 0. | Alex |
| **findCommonFactorTwo** | numerator, denominator  (integers) | Determines the greatest common factor for two numbers (a numerator and a denominator) and returns the greatest common factor | Rena |
| **findCommonFactorThree** | coefficientA, coefficientB, coefficientC  (integers) | Calls on function **findCommonFactorTwo**and returns the greatest common factor for all terms in equation. | Saad |
| **useQuadraticFormula** | coefficientA, coefficientB, coefficientC  (integers) | Calls on **findCommonFactorThree** and uses new values of a,b, and/or c in quadratic formula to return factors | Rena |
| **factorTrinomialThreeFormula** | factorsA, factorsB, factorsC, factorsD (integers) | Uses the four factors determined by the quadratic formula to return the factored form of the quadratic expression. | Rena |
| **factorTrinomialThree** | coeA, coeB, coeC  (integers) | Determines if a quadratic trinomial is factorable, and returns the final factored form of any quadratic expression with three terms. | Rena |
| **factorTrinomialTwoB** | coeA, coeC  (integers) | Returns the factored form of a quadratic expression with a missing b-Term | Pavi |
| **factorTrinomialTwoC** | coeA, coeB  (integers) | Returns the factored form of a quadratic expression with a missing c -Term | Pavi |
| **factorTrinomial** | trinomial  (string) | Distinguishes between different types of quadratic expressions and calls on all the functions to return the factored form of any quadratic expression. | Pavi, Saad |
| **testCases** | trinomial  (string) | Calls on factorTrinomialTests.py to test on the factoring of various kinds of trinomials | Saad |

# Test cases

To ensure that the software works correctly, we will test it on these examples:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Input (str )** | **Expected output** | **Working yet?** |
|  | #QUADRATIC EXPRESSIONS WITH THREE TERMS | | |
|  | #FACTORABLE TRINOMIALS | | |
| 1. | x^2 + 3x - 4 | (x-1)(x+4) | Works |
| 2. | 3x^2 - 10x - 8 | (x-4)(3x+2) | Works |
| 3. | 6x^2 + x - 1 | (3x-1)(2x+1) | Works |
| 4. | -x^2 - x + 6 | -(x-2)(x+3) | Works |
| 5. | -2x^2 - 2x + 12 | -2(x-2)(x+3) | Works |
| 6. | -3x^2 - 7x + 6 | -(3x-2)(x+3) | Works |
| 7. | 2x^2 + 6x - 8 | 2(x-1)(x+4) | Works |
|  | #PERFECT SQUARES |  |  |
| 8. | x^2 + 6x + 9 | (x+3)^2 | Works |
| 9. | 4x^2 - 12x + 9 | (2x-3)^2 | Works |
| 10 | 2x^2 + 12x + 18 | 2(x+3)^2 | Works |
|  | #TRINOMIALS THAT CAN BE COMMON FACTORED ONLY | | |
| 11 | 2x^2 + 12x + 34 | 2(x^2+6x+17) | Works |
| 12 | -2x^2 - 12x - 34 | -2(x^2+6x+17) | Works |
|  | #UNFACTORABLE TRINOMIALS | | |
| 13 | x^2 + 6x + 17 | Not factorable | Works |
| 14 | -x^2 + 6x + 17 | Not factorable | Works |
| 15 | 2x^2 - x + 3 | Not factorable | Works |
|  | #QUADRATIC EXPRESSIONS WITH TWO TERMS | | |
|  | #BINOMIALS MISSING A C-TERM | | |
| 16 | x^2 + 3x | x(x+3) | Works |
| 17 | 2x^2 + 4x | 2x(x+2) | Works |
| 18 | 4x^2 + 8x | 4x(x+2) | Works |
|  | #BINOMIALS MISSING A B-TERM | | |
|  | #DIFFERENCES OF SQUARES | | |
| 19 | x^2 - 4 | (x-2) (x+2) | Works |
| 20 | 16x^2 - 25 | (4x-5) (4x+5) | Works |
| 21 | 32x^2 - 50 | 2(4x-5) (4x+5) | Works |
| 22 | -x^2 + 4 | -(x-2)(x+2) | Works |
| 23 | -2x^2 + 8 | -2(x-2)(x+2) | Works |
|  | #BINOMIALS MISSING A B-TERM THAT CAN ONLY BE COMMON FACTORED | | |
| 24 | 4x^2 + 8 | 4(x^2+2) | Works |
| 25 | 2x^2 + 4 | 2(x^2+2) | Works |
|  | #BINOMIALS MISSING A B-TERM THAT CANNOT BE FACTORED | | |
| 26 | x^2 + 4 | Not factorable | Works |
| 27 | 16x^2 + 25 | Not factorable | Works |