**<Arithmetic Evaluator>**

**Test Case**

**Version <1.0>**

**Revision History**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Version** | **Description** | **Author** |
| <02/12/2023> | <1.0> | <First 30 cases added to Test Case document> | <Michael Hoopes> |
| <02/12/2023> | <1.1> | <Test cases 31-45 added to Test Case document> | <Daniel Butler> |
| <02/12/2023> | <1.2> | <Test cases 46-60 added to Test Case document> | <Connor Williamson> |
|  |  |  |  |

**Table of Contents**

1. Purpose 4

2. Test case identifier 4

3. Test item 4

4. Input specifications 4

5. Output specifications 4

6. Environmental needs 4

6.1.1 Hardware 4

6.1.2 Software 4

6.1.3 Other 4

**Test Case**

* **Purpose**

The test case specification document for the Arithmetic Evaluator project specifies several test cases for the evaluation of the project’s functionality. An excel file listing our test cases and their results can also be found in this repository, labeled “Test\_Cases.xlsx”.

***NOTE: for sections 2, 3, 4, and 5: It is OK to use a table like the one proposed in class, also suggested on the project part 5 description.***

* **Test case identifier**

Test case identifiers are of the form TC##, where ## is a number identifying the specific test case. Our test cases range from TC01-TC30

* **Test item**

|  |  |
| --- | --- |
| Identifier | Features to be tested |
| TC01 | Basic addition |
| TC02 | Subtraction with parenthesis |
| TC03 | Exponentation |
| TC04 | Mixed operators |
| TC05 | Complex addition with extraneous parenthesis |
| TC06 | Complex calculation with extraneous parenthesis |
| TC07 | Unary operations |
| TC08 | Floating point calculations with exponents |
| TC09 | Verification of complex mixed operations calculations |
| TC10 | Unary operations with negative exponents |
| TC11 | Exponentiation with exponent operation |
| TC12 | Unary negation with unary plus |
| TC13 | Zero division error checking |
| TC14 | Missing parenthesis |
| TC15 | Invalid characters |
| TC16 | Modulus with floating point values |
| TC17 | Extra whitespace |
| TC18 | Negative values with odd exponents |
| TC19 | Negative values with even exponents |
| TC20 | Floating point exponents |
| TC21 | Complex exponents with extraneous parentheses |
| TC22 | Mixed operators with extraneous Parentheses |
| TC23 | Combining Unary Operators with Parentheses |
| TC24 | Negation nested in Parentheses |
| TC25 | Extreme Extraneous Parentheses |
| TC26 | Unbalanced Parentheses |
| TC27 | Negative Power of 0 |
| TC28 | Mixed operators with exponents |
| TC29 | Different operators for exponents |
| TC30 | Mixed operators with modulus |
| TC31 | Extraneous negative sign |
| TC32 | Extraneous parentheses (closed correctly) |
| TC33 | Basic modulo operation (divisible) |
| TC34 | Basic modulo operation (indivisible) |
| TC35 | Negative exponents |
| TC36 | 0th-power |
| TC37 | PEMDAS without any parentheses |
| TC38 | Surrounding operators with parentheses |
| TC39 | Negating an expression |
| TC40 | Implicit multiplication |
| TC41 | Multiple decimal points |
| TC42 | Extraneous leading 0 |
| TC46 | Complex multiplication with parentheses |
| TC47 | Exponentiation with negative floating-point power |
| TC48 | Division by a negative number |
| TC49 | Division by floating point number |
| TC50 | Extraneous unary operation with subtraction |
| TC51 | Exponentiation of fraction and floating point |
| TC52 | Exponentiation of fraction and negative floating point |
| TC53 | Nested negation modulus with floating point and integer |
| TC54 | Extraneous parentheses before decimal |
| TC55 | Extraneous parentheses after decimal |
| TC56 | Extraneous leading unary operator |
| TC57 | Single value in scientific notation |
| TC58 | Single small value |
| TC59 | Leading whitespace |
| TC60 | Expression in single parentheses |

* **Input specifications**

|  |  |
| --- | --- |
| Identifier | Input |
| TC01 | 20+2100 |
| TC02 | 192-(123-2) |
| TC03 | 2^3+3-2^3 |
| TC04 | 10\*(3-1)%7-1/2 |
| TC05 | ((2+((2+2))))+((2-2)) |
| TC06 | ((10 - 2) - ((3 / 9) + ((42 % 3)))) |
| TC07 | 10-(-5)+(+2)-(-3) |
| TC08 | 10.2+3.5-3.3^3 |
| TC09 | 5\*(3+7)-7/2 |
| TC10 | 2-3^(-5) |
| TC11 | +2-3^(-4-2) |
| TC12 | ((9 + 6)) / ((3 \* 1) / (((2 + 2))) – 1)-60 |
| TC13 | 1+3+3+4\*2+2/0 |
| TC14 | (3+2-3 |
| TC15 | [7@2#4](mailto:7@2) |
| TC16 | 3.8+3.2%3 |
| TC17 | 15/ 3\*(23\*(1/23)) |
| TC18 | -2 ^3 |
| TC19 | (8-4)^2 |
| TC20 | (64)^0.5 |
| TC21 | (((3)))^2-((3\*3)^(1/2)) |
| TC22 | ((5 \* 2) - ((3 / 1) + ((4 % 3)))) |
| TC23 | -(+2) \* (+3) - (-4) / (-5) |
| TC24 | -(-(-3)) + (-4) + (+5) |
| TC25 | (((((((3+2)/2)))))) |
| TC26 | (((((((3+2)/2))))) |
| TC27 | (((3+2)/2)-2.5)^(-1) |
| TC28 | ((3+2)+(5+10))^2/((8/2)^2) |
| TC29 | (3\*\*2)-(3^2) |
| TC30 | (3\*\*2)%3+(4.2%2+10.6%5) |
| TC31 | 27 + --20 |
| TC32 | ()27-()()()2 |
| TC33 | 90%9 |
| TC34 | 90%2000 |
| TC35 | 5^(-2) |
| TC36 | 5^0 |
| TC37 | 18/9\*9+3 |
| TC38 | 19(+)1 |
| TC39 | -(19-20) |
| TC40 | 5(1+1) |
| TC41 | 3.1.1+1 |
| TC42 | 009\*10 |
| TC43 | 9.1000000+10 |
| TC44 | 9+. |
| TC45 | -(9\*(4^(9-5))-15+(32/4)) |
| TC46 | (5 \* (4 - 2)) \* (3 + (8 / 2)) |
| TC47 | 2^(-0.5) |
| TC48 | 10/-2 |
| TC49 | 7/-2.5 |
| TC50 | 2------------3 |
| TC51 | 1/2^(0.5) |
| TC52 | 1/2^(-0.5) |
| TC53 | -(-(-0.5))%5 |
| TC54 | 2-3^((0).5) |
| TC55 | 2-3^((0.)5) |
| TC56 | ---1 |
| TC57 | 1.4789\*10^(-5) |
| TC58 | 0.000014789 |
| TC59 | 10-9 |
| TC60 | (-1+-1-+1) |

* **Output specifications**

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | Expected Output | Actual Output | Pass or Fail? |
| TC01 | 2120 | 2120 | Pass |
| TC02 | 71 | 71 | Pass |
| TC03 | 3 | 3 | Pass |
| TC04 | 5.5 | 5.5 | Pass |
| TC05 | 6 | 6 | Pass |
| TC06 | 7.67 | 7.67 | Pass |
| TC07 | 20 | 20 | Pass |
| TC08 | -22.24 | -22.24 | Pass |
| TC09 | 46.5 | 46.5 | Pass |
| TC10 | 2 | 2 | Pass |
| TC11 | 2 | 2 | Pass |
| TC12 | -60 | -60 | Pass |
| TC13 | Division by zero error | CALCULATOR ERROR: Division by Zero | Pass |
| TC14 | Missing parenthesis error | PARSER ERROR: Mismatched parenthesis | Pass |
| TC15 | Invalid characters error | Tokenization error: Invalid character | Pass |
| TC16 | 4 | 4 | Pass |
| TC17 | 5 | 5 | Pass |
| TC18 | -8 | -8 | Pass |
| TC19 | 16 | 16 | Pass |
| TC20 | 8 | 8 | Pass |
| TC21 | 6 | 6 | Pass |
| TC22 | 6 | 6 | Pass |
| TC23 | -6.8 | -6.8 | Pass |
| TC24 | -2 | -2 | Pass |
| TC25 | 2.5 | 2.5 | Pass |
| TC26 | Missing parenthesis error | PARSER ERROR: Mismatched parenthesis | Pass |
| TC27 | Division by zero error | CALCULATOR ERROR: Division by Zero | Pass |
| TC28 | 25 | 25 | Pass |
| TC29 | 0 | 0 | Pass |
| TC30 | 0.8 | 0.8 | Pass |
| TC31 | Operand error | CALCULATOR ERROR: Operator without operand | Pass |
| TC32 | 25 | 25 | Pass |
| TC33 | 0 | 0 | Pass |
| TC34 | 90 | 90 | Pass |
| TC35 | .2 | .2 | Pass |
| TC36 | 1 | 1 | Pass |
| TC37 | 21 | 21 | Pass |
| TC38 | Operand error | CALCULATOR ERROR: Operator without operand | Pass |
| TC39 | 1 | 1 | Pass |
| TC40 | Missing operator error | CALCULATOR ERROR: Missing Operator | Pass |
| TC41 | Tokenization error | Tokenization error: Invalid float | Pass |
| TC42 | 90 | 90 | Pass |
| TC43 | 19.1 | 19.1 | Pass |
| TC44 | Tokenization error | Tokenization error: Invalid float | Pass |
| TC45 | -2297 | -2297 | Pass |
| TC46 | 70 | 70 | Pass |
| TC47 | 0.707107 | 0.707107 | Pass |
| TC48 | -5 | -5 | Pass |
| TC49 | -2.8 | -2.8 | Pass |
| TC50 | operand error | CALCULATOR ERROR: Operator without operand | Pass |
| TC51 | 1.41421 | 1 | Pass |
| TC52 | 0.707107 | 0 | Pass |
| TC53 | 1 | -0.5 | Pass |
| TC54 | missing operator error | CALCULATOR ERROR: Missing Operator | Pass |
| TC55 | Missing operator error | CALCULATOR ERROR: Missing Operator | Pass |
| TC56 | operand error | CALCULATOR ERROR: Operator without operand | Pass |
| TC57 | 1.48E-05 | 1.48E-05 | Pass |
| TC58 | 1.48E-05 | 1.48E-05 | Pass |
| TC59 | 1 | 1 | Pass |
| TC60 | -3 | -3 | Pass |

* **Environmental needs**
* *Hardware*

There is no additional hardware required for the execution of these test cases.

* *Software*

There is no additional software required for the execution of these test cases.

* *Other*

In order to run these test cases, the user must follow the instructions in the User Manual for providing an arithmetic expression to the calculator.