<MXCD>

<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>

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Test Case

1. 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.

2. 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

3. 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
TC43	Extraneous trailing 0
TC44	Isolated decimal point
TC45	Negation of complex terms

4. 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
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))

5. 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

6. Environmental needs

6.1.1 Hardware

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

6.1.2 Software

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

6.1.3 *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.