
Group Without a Name

Arithmetic Expression Evaluator

Test Case Document

Version 1.0.4

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Test Case Document	Date: 11/28/2023
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Revision History

Date	Version	Description	Author
11/28/2023	1.0	Creation of document	Charlie Gillund
11/30/2023	1.0.1	Updated parts 2,3,4,5	Charlie Gillund
12/3/2023	1.0.2	Updated Output Specification Test Cases	Drew Meyer
12/3/2023	1.0.3	Added results of test cases and fixed errors within document	Charlie Gillund
12/3/2023	1.0.4	Added some extra test cases and refined some areas of document.	Jake Bernard

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Test Case

1. Purpose

The purpose of the *Test Case Document* is to provide an overview of the test cases used to evaluate the effectiveness of the Arithmetic Expression Evaluator. These test cases are designed to evaluate the functionality of each facet of the program.

2. Test case identifiers

There are four different test case identifiers for the following tests.

The first identifier (**BF**) stands for basic function and tests a basic function based on the requirements document. These are all tested using the eval function.

The second identifier is (**ER**) which stands for an error test case to ensure that errors are handled correctly and produce the right output according to the requirements document.

The third identifier (**M**) is the menu functions such as help, history, and exit.

The fourth identifier (**AT**) were a series of tests run directly on the parsing module with the "auto-tester" program (see *Section 6.1.2*).

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3. Test items

We test both required basic functionality specified in the requirements document (addition, subtraction, multiplication, division, modulo, exponentiation, constants) and the basic error cases from the requirements document (invalid operator, invalid parentheses, invalid expression, etc.), along with requirements unique to our own implementation and features (menu navigation, history usage, implicit multiplication, etc.)

4. Input specifications

All input is either text input done through the program itself, or is done using a custom-made testing program which works directly with the parsing module. Text input in the program usually either corresponds to menu navigation or evaluation of expressions.

5. Output specifications

The expected outputs and the test outputs are in the table below. The outputs for the menu functions is the menu or screen they output or the function of actually closing the program. The output for expressions should be a number or a specific error string.

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Test Case ID	Test Case Description	Input	Expected Output	Actual Output	Pass/Fail
M-01	Tests the help menu function	help	"The Help Menu"	"The Help Menu"	Pass
M-02	Tests the history menu function	history	"The History Menu"	"The History Menu"	Pass
M-03	Tests the exit menu function	exit	"Exits Program"	"Exits Program"	Pass
M-04	Retrieve from history	eval 1 + 0 then history then 1	Expression: 1 + 0 Result: 1.00	Expression: 1 + 0 Result: 1.00	Pass
M-05	Retrieve from later in history	eval 1 + 0 then eval 2 - 8 then eval 5 + 5 then history then 2	Expression: 2 - 8 Result: -6.00	Expression: 2 - 8 Result: -6.00	Pass
BF-01	Test Addition	eval 3+4	7.00	7.00	Pass
BF-02	Test Subtraction	eval 4-1	3.00	3.00	Pass
BF-03	Test Multiplication	eval 5*3	15.00	15.00	Pass
BF-04	Test Exponentiation	eval 2^4	16.00	16.00	Pass
BF-05	Test Exponentiation(alt)	eval 3**3	27.00	27.00	Pass
BF-06	Test Modulo	eval 12%10	2.00	2.00	Pass
BF-07	Test Negative Numbers	eval -3+9	6.00	6.00	Pass
BF-08	Test Division	eval 9/3	3.00	3.00	Pass
BF-09	Test Parentheses / Implicit Multiplication	eval 9(3*3)	81.00	81.00	Pass
BF-10	Test Order of Operation	eval 3/3*(2+1)	3.00	3.00	Pass
BF-11	Precision and Rounding	eval 10 / 3	3.33	3.33	Pass
BF-12	Associativity	eval 2^3^2	512.00	512.00	Pass
BF-13	Zero Exponent	eval 2^0	1.00	1.00	Pass
BF-14	Negative Exponent	eval 2^-2	0.25	0.25	Pass
BF-15	Exponentiation with parentheses	eval 2^(3+2)	32.00	32.00	Pass
BF-16	Modulo with Negative Numbers	eval -2%3	-2.00	-2.00	Pass
BF-17	Nested Parentheses	eval ((2+3)*2)	10.00	10.00	Pass
BF-18	Fractional Exponent	eval 4^(1/2)	2.00	2.00	Pass

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ER-01	Division by Zero	eval 9/0	Error: Division by zero encountered in expression	Error: Division by zero encountered in expression	Pass
ER-02	Modulo by Zero	eval 3%0	Error: Modulo by zero encountered in expression	Error: Modulo by zero encountered in expression	Pass
ER-03	Invalid Operator	eval 3\$9	Error: Unusable character '\$' at position 1	Error: Unusable character '\$' at position 1	Pass
ER-04	Unmatched Parentheses (Left)	eval (9+3	Error: Parentheses in expression are not balanced	Error: Parentheses in expression are not balanced	Pass
ER-05	Unmatched Parenthesis (Right)	eval 9+3)	Error: Mismatched parentheses at position 3	Error: Mismatched parentheses at position 3	Pass
ER-06	Fractional Exponent (Negative Base)	eval -4^(1/2)	Error: Expression generated NaN during evaluation	Error: Expression generated NaN during evaluation	Pass
ER-07	Large Numbers and Overflow	eval 10^100	Error: Exceeds floating point size limit (generated infinity during evaluation)	Error: Exceeds floating point size limit (generated infinity during evaluation)	Pass
ER-08	Invalid Menu Function	string	Input was not understood, please try again	Input was not understood, please try again	Pass
AT-01	Empty Parentheses	()	Error: Empty parentheses at position 0	Error: Empty parentheses at position 0	Pass
AT-02	Scientific Notation 1	(2 ** (17/18)) / 10000	1.92e-04	1.92e-04	Pass
AT-03	Scientific Notation 2	1 / 101	9.90e-03	9.90e-03	Pass
AT-04	Negative Scientific Notation 1	9 / -1007	-8.94e-03	-8.94e-03	Pass
AT-05	Negative Scientific Notation 2	-1 * 12 ^ (-6)	-3.35e-07	-3.35e-07	Pass
AT-06	Implicit multiplication 1	1(2)3(4)5	120.00	120.00	Pass
AT-07	Implicit multiplication 2	1(2 - 1)3 + 5(4 * 2)5 - (1)8	195.00	195.00	Pass
AT-08	Implicit multiplication 3	(7)((((8))))	56.00	56.00	Pass
AT-09	Extraneous parentheses 1	((1))) + (2)	3.00	3.00	Pass
AT-10	Extraneous parentheses 2	(2 - ((1 + (1))))	0.00	0.00	Pass
AT-11	Hidden divide by zero	1 / (2 - ((1 + 1)))	Error: Division by zero encountered in expression	Error: Division by zero encountered in expression	Pass
AT-12	Mod by value cast to zero	6 % (1 / 1000)	Error: Modulo by zero encountered in expression	Error: Modulo by zero encountered in expression	Pass
AT-13	Two methods of	(2 ** 3) - (2 ^ 3)	0.00	0.00	Pass

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	exponentiation				
AT-14	Extraneous negation 1	-----9	-9.00	-9.00	Pass
AT-15	Extraneous negation 2	-1(- (9 + 2 * (- (3 -- 1))))	1.00	1.00	Pass
AT-16	Leading zeroes 1 (and Jake's birthday)	09/25	0.36	0.36	Pass
AT-17	Leading zeroes 2	0000001	1.00	1.00	Pass
AT-18	Leading zeroes 3	9 + 001	10.00	10.00	Pass
AT-19	Number following number	1 + 001 2 + 1	Error: Number follows number at position 8	Error: Number follows number at position 8	Pass
AT-20	Operator following operator	19 - + 2	Error: Binary operator '+' incorrectly placed at position 5	Error: Binary operator '+' incorrectly placed at position 5	Pass
AT-21	Delicious misuse of constant characters	pie	Error: Unknown word "pie" in expression	Error: Unknown word "pie" in expression	Pass
AT-22	Correct, possibly irrational, use of constants	pi(e)	8.54	8.54	Pass
AT-23	Extremely long expression	51 - - 3 + 18 - 9 + 2 - (3*6(9 - 8)) + - (24 % 13) - 7 ** 2 + (80/4) - 1	0.00	0.00	Pass
AT-24	Single unary operator	-	Error: Operator at the end of expression	Error: Operator at the end of expression	Pass
AT-25	Single unary operator (repeated)	-----	Error: Operator at the end of expression	Error: Operator at the end of expression	Pass
AT-26	Unary operator follows number	1 -	Error: Operator at the end of expression	Error: Operator at the end of expression	Pass
AT-27	ASCII Sword	---)000000007	Error: Operator precedes right parenthesis at position 3	Error: Operator precedes right parenthesis at position 3	Pass

6. Environmental needs

6.1.1 Hardware

N/A

6.1.2 Software

An "auto-tester" program was created to be able to run through many tests at once (using string comparisons for values) and to output the results to a .CSV file.

6.1.3 Other

N/A

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7. Special procedural requirements

N/A

8. Intercase dependencies

N/A