
Kansas Instruments™ (not really)

**Arithmetic Expression Evaluator in C++
Test Case Specifications**

Version 1.2

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

Revision History

Date	Version	Description	Author
11/24/2023	1.0	Test Case Document Created	Benjamin Kozlowski, MJ McGee, Jacob Leehy, Nicholas Hausler, Steve Gan
11/28/2023	1.1	Began Adding Test Cases in earnest, got complex cases from each member	Benjamin Kozlowski, MJ McGee, Jacob Leehy, Nicholas Hausler, Steve Gan
12/1/2023	1.2	Added the final test cases, tested the final page of cases.	Benjamin Kozlowski, MJ McGee, Jacob Leehy, Nicholas Hausler, Steve Gan

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

Table of Contents

1. Purpose	4
2. Test Cases	4

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

Test Case Document

1. Purpose

The Test Case Specification Document contains a table of test cases which will be used with the Arithmetic Expression Evaluator in C++ to try and find any errors in the program. In the case that a test case results in a failure of the program, the error will be found, a solution will be devised, and changes will be made so that such an error does not appear again when the program is in use.

2. Test Cases

Test ID	Test Description	Test Data	Expected Result	Actual Result	Pass/Fail
B001	Nested Parenthesis, constant multiplication	$((e * \pi) * \pi)$	26.8284	26.8284	Pass
B002	Order of Operations, Parenthesis	$6 * 4 - 8 / 2 + (9 / 3 ^ 2)$	21	21	Pass
B003	Parenthetical Negation, Exponentiation	$-(3 ^ 4)$	-81	-81	Pass
B004	Unsupported Characters Handling	$4 + t$	Invalid Combination Error	Invalid Combination Error	Pass
B005	Parenthetical Negation with Numeric Constants	$-e + -(\pi)$	-5.85987	-5.85987	Pass
B006	Parenthesis, Single term expression	(1)	1	1	Pass
B007	Nested Parenthesis, Single term expression	((1))	1	1	Pass
B008	Order of Operations, Expression Multiplication	$(1 + 1) * (5 + 3)$	16	16	Pass
B009	Unmatched Grouping Symbols	1(Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B010	Unmatched Grouping Symbols	(5	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B011	Unmatched Grouping Symbols, Nested Parenthesis	((7)	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

B012	Unmatched Grouping Symbols	8)	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B013	Unmatched Grouping Symbols	$(1 * 5) + (1 / 2)$	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B014	Order of Operations	$1 + 2 * 3$	7	7	Pass
B015	Order of Operations	$(1 + 2) * 3$	9	9	Pass
B016	Order of Operations	$1 + 2 ^ 2$	5	5	Pass
B017	Expression Exponentiation	$(1 + 2) ^ 3$	27	27	Pass
B018	Expression Exponentiation, Expression as Exponent	$(3 + 2) ^ (1 + 2)$	125	125	Pass
B019	Operands Without Operators	1 1	Invalid Combination Error	Invalid Combination Error	Pass
B020	Operands Without Operators	1 -1	Invalid Combination Error	Invalid Combination Error	Pass
B021	Incorrect Operator/Operand Ordering	1 1 +	Operators without Operand	Operators without Operand	Pass
B022	Exponentiation with Numeric Constants	$\pi ^ e$	22.4592	22.4592	Pass
B023	Exponentiation with Negative Numbers	$5 ^ -2$	0.04	0.04	Pass
B024	Usage of the Modulo Operator	$15 \% 4$	3	3	Pass
B025	Improper Usage of Modulo Operator	$10 \% e$	Modulo Operators must be Integers	Modulo Operators must be Integers	Pass
B026	Addition	$3 + 4$	7	7	Pass
B027	Subtraction with Parentheses	$8 - (5 - 2)$	5	5	Pass
B028	Multiplication and Division	$10 * 2 / 5$	4	4	Pass
B029	Exponentiation	$2 ^ 3$	8	8	Pass
B030	Mixed Operators	$4 * (3 + 2) \% 7 - 1$	5	5	Pass

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

B031	Complex Addition with Extraneous Parentheses	$((2 + 3)) + ((1 + 2))$	8	8	Pass
B032	Mixed Operators with Extraneous Parentheses	$((5 * 2) - ((3 / 1) + ((4 \% 3))))$	6	6	Pass
B033	Nested Parentheses with Exponents	$((2 ^ (1 + 1)) + ((3 - 1) ^ 2)) / ((4 / 2) \% 3)$	4	4	Pass
B034	Combination of Extraneous and Necessary Parentheses	$(((((5 - 3))) * ((2 + 1))) + ((2 * 3)))$	12	12	Pass
B035	Extraneous Parentheses with Division	$((9 + 6)) / ((3 * 1) / (((2 + 2))) - 1)$	-60	-60	Pass
B036	Combining Unary Operators with Arithmetic Operations	$+(-2) * (-3) - ((-4) / (+5))$	6.8	6.8	Pass
B037	Unary Negation and Addition in Parentheses	$- (+1) + (+2)$	1	1	Pass
B038	Negation and Addition with Negated Parentheses	$-(-(-3)) + (-4) + (+5)$	-2	-2	Pass
B039	Unary Negation and Exponentiation	$+2 ^ (-3)$.125	.125	Pass
B040	Combining Unary Operators with Parentheses	$- (+2) * (+3) - (-4) / (-5)$	-6.8	-6.8	Pass
B041	Unmatched Parentheses	$2 * (4 + 3 - 1$	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B042	Operators Without Operands	$* 5 + 2$	Invalid Combination Error	Invalid Combination Error	Pass
B043	Incorrect Operator Usage	$4 / 0$	Division by Zero Error	Division by Zero Error	Pass
B044	Missing Operator	$5 (2 + 3)$	Invalid Combination Error	Invalid Combination Error	Pass
B045	Invalid Characters	$7 \& 3$	Invalid Combination Error	Invalid Combination Error	Pass
B046	Mismatched Parentheses	$((3 + 4) - 2) + (1)$	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

B047	Invalid Operator Usage	$((5 + 2) / (3 * 0))$	Division by Zero	Division by Zero	Pass
B048	Invalid Operator Sequence	$((2 -) 1 + 3)$	Operators must have spaces	Operators must have spaces	Pass
B049	Missing Operand	$((4 * 2) + (-))$	Invalid Combination Error	Invalid Combination Error	Pass
B050	Invalid Characters	$((7 * 3) @ 2)$	Invalid Combination Error	Invalid Combination Error	Pass
B051	Missing Operand	$-() + 5$	Invalid Combination Error	Invalid Combination Error	Pass
B052	Parenthesis without Internals	$() + 5 + 2$	Empty Parenthesis	Empty Parenthesis	Pass
B053	Unary Operator Negation	$-(14 / 2) + (15 \% 3)$	-7	-7	Pass
B054	Invalid Characters	$[1] + 4(5)$	Invalid Combination Error	Invalid Combination Error	Pass
B055	Invalid Characters	$e * -e + E$	Invalid Combination Error	Invalid Combination Error	Pass
B056	Invalid Characters	$2 + p i$	Invalid Combination Error	Invalid Combination Error	Pass
B057	Order of Operations (multiplication vs exponentiation)	$2 * 4 ^ 2$	32	32	Pass
B058	Invalid Characters (Decimals)	$15 * 1.5$	Invalid Combination Error	Invalid Combination Error	Pass
B059	Multiple Nested Parenthesis with Negative Numbers	$(((-1 + (7 * (2)) - 5)) / -12) / 2$	-0.33	-0.33	Pass
B060	Incorrect numeric constant	pie	Invalid Combination Error	Invalid Combination Error	Pass
B061	Invalid Operator Sequence	$1 (+) 1$	Invalid Combination Error	Invalid Combination Error	Pass
B062	Two different errors throw correct first found	$(((* 1)))$	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B063	Large Digit Numbers	$1000 ^ 100$	1e300	1e300	Pass

Arithmetic Expression Evaluator in C++	Version: 1.2
User Manual	Date: 12/01/2023
5	

B064	Modulo Output Divided	$(24 \% 4) / 2$	0	0	Pass
B065	Two Equations	$2 * 5 = 20 / 2$	Invalid Combination Error	Invalid Combination Error	Pass
B066	Order of Operation: All	$(2 + 2) * 4 ^ 2 + 6$	70	70	Pass
B067	Verify negation and floating +	$+(-6) - +6$	-12	-12	Pass
B068	Square Root	Sqrt(100)	Invalid Combination Errors	Invalid Combination Error	Pass
B069	Modulo Operator	$((24 \% 5) \% 5) \% 2$	0	0	Pass
B070	Invalid Characters	$pl ^ e$	Invalid Character Error	Invalid Character Error	Pass
B071	Test the grouping symbols check	$((4) + ((3)))$	Invalid Grouping Symbols	Invalid Grouping Symbols	Pass
B072	Incorrect Spacing	$5 + - 5$	Invalid Combination Error	Invalid Combination Error	Pass
B073	Invalid placement of operator	$3 * 7$	Invalid Combination Error	Invalid Combination Error	Pass
B074	Incorrect Spacing	$5 - 5$	Invalid Combination Error	Invalid Combination Error	Pass
B075	Taking the power of a negative (even exponent)	$-3 ^ 2$	9	9	Pass
B076	Taking the power of a positive	$+5 ^ 2$	25	25	Pass
B077	Taking the power of a negative (odd exponent)	$-3 ^ 3$	-27	-27	Pass
B078	Negative Exponents with Parenthesis	$2 ^ -(2 + 1)$	0.125	0.125	Pass
B079	Long Equations	$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 * 10$	126	126	Pass
B080	Exponentiation of Numerical Constants	$2 ^ pi ^ e$	372.148	372.148	Pass