
FooBar Inc

C++ Arithmetic Evaluator

Test Case

Version 0.1

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Revision History

Date	Version	Description	Author
03/Dec/2023	0.1	Compilation of test results from GitHub CI/CD for v1.0.0 release	Cody Duong

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1. Purpose

The Test Case Specification document for the C++ Arithmetic Evaluator defines test cases for items that should be tested. This document is a compilation of the GitHub workflow results from the GitHub repository for the project as well as a collection of some manual tests.

These test cases were compiled from source code tagged v1.0.0. (<https://github.com/codyduong/EECS-348-Project/releases/tag/1.0.0>)

2. Test Cases

2.1 Manual Test Cases

Manual test cases are run manually. The inputs and results are compiled below. They are run through the command line in `-c` mode.

ID	Description	Test Data	Expected	Received	Pass/Fail
Manual-1	Expression or number	"1++1"	"Error: Expected an expression or number, received: +"	"Error: Expected an expression or number, received: +"	Pass
Manual-2	Mismatched open parenthesis	"(1 + 1"	"Error: Expected closing parenthesis, received: \\0 (end of expression)"	"Error: Expected closing parenthesis, received: \\0 (end of expression)"	Pass
Manual-3	Mismatched close parenthesis	"1 + 1)"	"Error: Missing opening parenthesis"	"Error: Missing opening parenthesis"	Pass
Manual-4	Complex expression 1	"3 + 2 - 1 / 2 * 4 ^ 2 + 1"	"-2"	"-2"	Pass
Manual-5	Complex expression 2	"3 *(1 + 2) - ((4 + 4) * 3) / 2"	"-3"	"-3"	Pass
Manual-6	Implicit multiplication	"1(2)"	"Error: Expected an operator, received: ("	"Error: Expected an operator, received: ("	Pass
Manual-7	Modulo Remainder +	"-7%-3"	"2"	"2"	Pass

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2.1.1 Other Manual Tests

These tests contain the whole command line string, with expected input and output string.
Separate input strings indicate multiple commands, with each string data corresponding to each expected and received.

ID	Description	Test Data	Expected	Received	Pass/Fail
Cli-1	Argument expression	"expression_parser 1+1"	"2"	"2"	Pass
Cli-2	-c Flag	"expression_parser -c", "1+1", "\04" (CTRL+D)	"Enter an algebraic expression (type 'quit', 'exit', or press CTRL+D to exit loop):", "2", Exits program	"Enter an algebraic expression (type 'quit', 'exit', or press CTRL+D to exit loop):", "2", Exits program (0)	Pass
Cli-3	--configuration Flag	"expression_parser -c", "1+1", "\04" (CTRL+D)	"Enter an algebraic expression (type 'quit', 'exit', or press CTRL+D to exit loop):", "2", Exits program (0)	"Enter an algebraic expression (type 'quit', 'exit', or press CTRL+D to exit loop):", "2", Exits program (0)	Pass
Cli-4	Argument and -c Flag	"expression_parser --configuration"	"-c/--configuration flag is mutually exclusive with an arithmetic input. Please specify one or the other.", Exits program (1)	"-c/--configuration flag is mutually exclusive with an arithmetic input. Please specify one or the other.", Exits program (1)	Pass
Cli-5	-v Flag	"expression_parser 1+1 -c -v"	"Version 1.0.0", Exits program (0)	"Version 1.0.0", Exits program (0)	Pass

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2.2 Automatic Test Cases

These test cases are a compilation of the automatically run tests described in the folder in the source repository `\tests**\`, and were run using [GoogleTest](https://github.com/google/googletest) in a GitHub Actions pipeline (defined here: <https://github.com/codyduong/EECS-348-Project/blob/main/.github/workflows/test.yaml>) which runs on every pull request or merge to master. For the most recent automatic tests (held for 90 days) view at <https://github.com/codyduong/EECS-348-Project/actions?query=branch%3Amain>.

The ID is a simplified test_suite_name concatenated with iterated integer. The test case description is simply the test_name.

For std::runtime_error results, the test implementation can be checked in the tests source folder to ensure that the correct error string was thrown.

2.2.1 Test_ASTNode.cpp

Test Case Id	Description	Left	OP	Right	Expected	Received	Pass/Fail
NumberNodeEvaluate-1	NumberNode Evaluate	42.0			42.0	42.0	Pass
NumberNodeToString-1	NumberNode ToString	42.0			"42.000000"	"42.000000"	Pass
Addition-1	Addition Evaluate	20.0	+	22.0	42.0	42.0	Pass
Addition-2	Addition Evaluate Decimal	5.5	+	7.33	12.83	12.83	Pass
Addition-3	Addition Negative 1	20.0	+	-22.0	-2.0	-2.0	Pass
Addition-4	Addition Negative 2	-20.0	+	22.0	2.0	2.0	Pass
Addition-5	Addition Negative 3	-20.0	+	-22.0	-42.0	-42.0	Pass
Addition-6	Addition ToString	20.0	+	22.0	"(20.000000 + 22.000000)"	"(20.000000 + 22.000000)"	Pass
Subtraction-1	Subtraction Evaluate	20.0	-	22.0	-2.0	-2.0	Pass
Subtraction-2	Subtraction Evaluate Decimal	5.5	-	7.33	-1.83	-1.83	Pass

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Subtraction-3	Subtraction Negative 1	20.0	-	-22.0	42.0	42.0	Pass
Subtraction-4	Subtraction Negative 2	-20.0	-	22.0	-42.0	-42.0	Pass
Subtraction-5	Subtraction Negative 3	-20.0	-	-22.0	2.0	2.0	Pass
Subtraction-6	Subtraction ToString	20.0	-	22.0	"(20.000000 - 22.000000)"	"(20.000000 - 22.000000)"	Pass
Multiplication-1	Multiplication Evaluate	6.0	*	7.0	42.0	42.0	Pass
Multiplication-2	Multiplication Evaluate Decimal	0.1	*	0.2	0.02	0.02	Pass
Multiplication-3	Multiplication Negative 1	6.0	*	-7.0	-42.0	-42.0	Pass
Multiplication-4	Multiplication Negative 2	-6.0	*	7.0	-42.0	-42.0	Pass
Multiplication-5	Multiplication Negative 3	-6.0	*	-7.0	42.0	42.0	Pass
Multiplication-6	Multiplication ToString	6.0	*	7.0	"(6.000000 * 7.000000)"	"(6.000000 * 7.000000)"	Pass
Exponentiation-1	Exponentiation Evaluate	2.0	^	3.0	8.0	8.0	Pass
Exponentiation-2	Exponentiation Evaluate Decimal	2.5	^	2.0	6.25	6.25	Pass
Exponentiation-3	Exponentiation Zero Exponent	5.0	^	0.0	1.0	1.0	Pass
Exponentiation-4	Exponentiation Negative Base	-2.0	^	2.0	4.0	4.0	Pass
Exponentiation-5	Exponentiation Negative Exponent	3.0	^	-2.0	1.0 / 9.0	1.0 / 9.0	Pass
Exponentiation-6	Exponentiation Decimal Base	1.5	^	2.0	2.25	2.25	Pass
Exponentiation-7	Exponentiation	2.0	^	0.5	sqrt(2.0)	sqrt(2.0)	Pass

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	Decimal Exponent						
Exponentiation-8	Exponentiation Zero Base	0.0	^	3.0	0.0	0.0	Pass
Exponentiation-9	Exponentiation Zero Base Zero Exponent	0.0	^	0.0	1.0	1.0	Pass
Exponentiation-10	Exponentiation ToString	2.0	^	3.0	"(2.000000 ^ 3.000000)"	"(2.000000 ^ 3.000000)"	Pass
Modulo-1	Modulo Evaluate	10.0	%	3.0	1.0	1.0	Pass
Modulo-2	Modulo Evaluate Decimal	5.5	%	2.0	1.5	1.5	Pass
Modulo-3	Modulo Negative 1	10.0	%	-3.0	1.0	1.0	Pass
Modulo-4	Modulo Negative 2	-7.0	%	3.0	2.0	2.0	Pass
Modulo-5	Modulo Negative 3	-10.0	%	-3.0	2.0	2.0	Pass
Modulo-6	Modulo ToString	10.0	%	3.0	"(10.000000 % 3.000000)"	"(10.000000 % 3.000000)"	Pass
Modulo-7	Modulo Division By Zero	10.0	%	0.0	-	-	Pass
Modulo-2	Modulo Evaluate Decimal	5.5	%	0	std::runtime_error	std::runtime_error	Pass

2.2.2 Test_ExpressionParser.cpp

ID	Description	Test Data	Expected	Received	Pass/Fail
Special-1	UnaryNegative	"-1"	-1	-1	Pass
Addition-1	NoWhitespace	"1+1"	2	2	Pass
Addition-2	OperatorLeadingWhitespace	"1 +1"	2	2	Pass
Addition-3	OperatorTrailingWhitespace	"1+ 1"	2	2	Pass
Addition-4	OperatorLeadingAndTrailingWhitespace	"1 + 1"	2	2	Pass

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Addition-5	LeadingWhitespace	" 1+1 "	2	2	Pass
Addition-6	TrailingWhitespace	"1+1 "	2	2	Pass
Addition-7	OperatorLeadingAndTrailingWhitespaceAndExpressionLeadingAndTrailingWhitespace	" 1 + 1 "	2	2	Pass
Addition-8	NegativeAddNegative	"-1+-1"	-2	-2	Pass
Addition-9	NegativeAddPositive	"-1+5"	4	4	Pass
Addition-10	PositiveAddNegative	"1+-4"	-3	-3	Pass
Addition-11	DuplicateAddOperator	"1++1"	std::runtime_error	std::runtime_error	Pass
Subtraction-1	NoWhitespace	"1-1"	0	0	Pass
Subtraction-2	OperatorLeadingWhitespace	"1 -1"	0	0	Pass
Subtraction-3	OperatorTrailingWhitespace	"1- 1"	0	0	Pass
Subtraction-4	OperatorLeadingAndTrailingWhitespace	"1 - 1"	0	0	Pass
Subtraction-5	LeadingWhitespace	" 1-1"	0	0	Pass
Subtraction-6	TrailingWhitespace	"1-1 "	0	0	Pass
Subtraction-7	OperatorLeadingAndTrailingWhitespaceAndExpressionLeadingAndTrailingWhitespace	" 1 - 1 "	0	0	Pass
Subtraction-8	NegativeSubtractNegative	"-1--1"	0	0	Pass
Subtraction-9	NegativeSubtractPositive	"-1-5"	-6	-6	Pass
Subtraction-10	PositiveSubtractNegative	"1--4"	5	5	Pass
Multiplication-1	NoWhitespace	"2*2"	4	4	Pass
Multiplication-2	OperatorLeadingWhitespace	"2 *2"	4	4	Pass
Multiplication-3	OperatorTrailingWhitespace	"2* 2"	4	4	Pass
Multiplication-4	OperatorLeadingAndTrailingWhitespace	"2 * 2"	4	4	Pass
Multiplication-5	LeadingWhitespace	" 2*2"	4	4	Pass
Multiplication-6	TrailingWhitespace	"2*2 "	4	4	Pass

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Multiplication-7	OperatorLeadingAndTrailingWhit espaceAndExpressionLeadingAnd TrailingWhitespace	" 2 * 2 "	4	4	Pass
Multiplication-8	NegativeMultiplyNegative	"-2*-2"	4	4	Pass
Multiplication-9	NegativeMultiplyPositive	"-2*4"	-8	-8	Pass
Multiplication-10	PositiveMultiplyNegative	"3*-2"	-6	-6	Pass
Multiplication-11	DuplicateMultiplyOperator	"2**2"	std::runti me_error	std::runti me_error	Pass
Exponentiation-1	PositiveExponentPositive	"2^3"	8	8	Pass
Exponentiation-2	NegativeBasePositiveExponent	"-2^2"	4	4	Pass
Exponentiation-3	PositiveBaseNegativeExponent	"3^(-2)"	1/9	1/9	Pass
Exponentiation-4	BaseWithWhitespaceExponent	"2 ^ 4"	16	16	Pass
Exponentiation-5	ExponentiationWithMultipleOper ators	"2 + 3^2"	11	11	Pass
Exponentiation-6	ExponentiationWithParentheses	"(2 + 3)^2"	25	25	Pass
Exponentiation-7	ExponentiationWithNegativeBase AndExponent	"(-2)^(-3)"	-0.125	-0.125	Pass
Exponentiation-8	ExponentiationWithNegativeBase	"(-2)^3"	-8	-8	Pass
Exponentiation-9	ExponentiationWithZeroBase	"0^2"	0	0	Pass
Exponentiation-10	ExponentiationWithZeroExponent	"3^0"	1	1	Pass
Exponentiation-11	DuplicateExponentOperator	"2^^2"	std::runti me_error	std::runti me_error	Pass
Modulus-1	NoWhitespace	"7%3"	1	1	Pass
Modulus-2	OperatorLeadingWhitespace	"7 %3"	1	1	Pass
Modulus-3	OperatorTrailingWhitespace	"7% 3"	1	1	Pass

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Modulus-4	OperatorLeadingAndTrailingWhit espace	"7 % 3"	1	1	Pass
Modulus-5	LeadingWhitespace	" 7%3"	1	1	Pass
Modulus-6	TrailingWhitespace	"7%3 "	1	1	Pass
Modulus-7	OperatorLeadingAndTrailingWhit espaceAndExpressionLeadingAnd TrailingWhitespace	" 7 % 3 "	1	1	Pass
Modulus-8	NegativeModulusPositive	"-7%3"	2	2	Pass
Modulus-9	PositiveModulusNegative	"7%-3"	1	1	Pass
Modulus-10	NegativeModulusNegative	"-7%-3"	2	2	Pass
Modulus-11	DivisionByZero	"10%0"	std::runti me_error	std::runti me_error	Pass
FullExpression- 1	MultiplicationPrecedence	"2 + 3 * 4 - 1"	13	13	Pass
FullExpression- 2	TwoParenthesisPrecedence	"(2 + 3) * (4 - 1)"	15	15	Pass
FullExpression- 3	OneParenthesisPrecedence	"(2 + 3) * 4 - 1"	19	19	Pass
FullExpression- 4	ExponentialPrecedence	"2 + 2 ^ 2"	6	6	Pass
FullExpression- 5	ExponentialParenthesis	"(2 + 2) ^ 2"	16	16	Pass
FullExpression- 6	ParenthesisExponentialPrecedence	"1 + 2 * (2 + 3)^2"	51	51	Pass
FullExpression- 7	ExponentialPrecedenceOverAdd	"(2 + 3) ^ 2 + 1"	26	26	Pass
FullExpression- 8	ParenthesisPrecedenceOverExpon ential	"(2 + 3) ^ (2 + 1)"	125	125	Pass
FullExpression- 9	LargeExpression	"3 + 2 - 1 / 2 * 4 ^ 2 + 1"	-2	-2	Pass
FullExpression- 10	LargeExpressionParenthesis	"3 * (1 + 2) - ((4 + 4) * 3) / 2"	-3	-3	Pass
FullExpression- 11	NegativeExponent	"2^ -2"	0.25	0.25	Pass

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FullExpression-12	ModPrecedence	"1 + 3 % 2"	2	2	Pass
FullExpression-13	ModPrecedenceParenthesis	"(1 + 3) % 2"	0	0	Pass
FullExpression-14	EnclosedEmptyParenthesisAfter	"(1 + 1 ())"	std::runtime_error	std::runtime_error	Pass
FullExpression-15	EmptyParenthesisAfter	"1 + 1 ()"	std::runtime_error	std::runtime_error	Pass
FullExpression-16	EnclosedEmptyParenthesisBefore	"(() 2 - 1)"	std::runtime_error	std::runtime_error	Pass
FullExpression-17	EmptyParenthesisBefore	"() 2 - 1"	std::runtime_error	std::runtime_error	Pass
FullExpression-18	MismatchedParenthesisBefore	"(1 + 1"	std::runtime_error	std::runtime_error	Pass
FullExpression-19	MismatchedParenthesisBeforeSpaced	"(1 + 1"	std::runtime_error	std::runtime_error	Pass
FullExpression-20	MismatchedParenthesisAfter	"1 + 1)"	std::runtime_error	std::runtime_error	Pass
FullExpression-21	MismatchedParenthesisAfterSpaced	"1 + 1)"	std::runtime_error	std::runtime_error	Pass