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Technical Documentation.

Portfolio activity

Programming IIi

AT1.7

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**GitHub Link:**

<https://github.com/CycloneSuzi/Calculator>

# Data Structure

Data Structure

|  |  |  |
| --- | --- | --- |
| **Calculator/GUICalc** | | |
| **Name** | **Type** | **Purpose** |
| a | double | First user input |
| b | double | Second user input |
| Result | double | Result of a and b |
| plusButtonClicked | bool | Determines if plus button has been clicked |
| minusButtonClicked | bool | Determines if the minus button has been clicked |
| divideButtonClicked | bool | Determines if the divide button has been clicked |
| multiplyButtonClicked | bool | Determines if the multiply button has been clicked |
| GUICalc | Form | Form |
| fileToolStripMenuItem | Tool strip menu item | Tool strip menu item |
| quitToolStripMenuItem | Tool strip menu item | Tool strip menu item |
| clearToolStripMenuItem | Tool strip menu item | Tool strip menu item |
| txtDisplay | Text box | Displays text |
| btnOne | Button | Displays/sets text to ‘1’ |
| BtnTwo | Button | Displays/sets text to ‘2’ |
| BtnThree | Button | Displays/sets text to ‘3’ |
| BtnFour | Button | Displays/sets text to ‘4’ |
| BtnFive | Button | Displays/sets text to ‘5’ |
| BtnSix | Button | Displays/sets text to ‘6’ |
| btnSeven | Button | Displays/sets text to ‘7’ |
| btnEight | Button | Displays/sets text to ‘8’ |
| btnNine | Button | Displays/sets text to ‘9’ |
| btnZero | Button | Displays/sets text to ‘0’ |
| BtnDecimal | Button | Displays/sets text to ‘.’ |
| btnInv | Button | Calculates the inverse |
| btnSQRT | Button | Calculates the Square Root |
| btnCube | Button | Calculates the Cube Root |
| btnTan | Button | Calculates the Tan |
| btnCos | Button | Calculates the Cos |
| btnSin | Button | Calculates the Sine |
| btnPlus | Button | Selects addition |
| btnMinus | Button | Selects Subtraction |
| BtnPosNeg | Button | Changes the current number to positive or negative |
| BtnEquals | Button | Calculates chose equation |
| btnDivide | Button | Selects division |
| btnMultiply | Button | Select multiplication |
| num | Double | Becomes user input |
| x | Double | Becomes user input |
| variable | Int | Displays when user calculates the cos of 180 degrees |

|  |  |  |
| --- | --- | --- |
| **Basic Match/Arithmetic** | | |
| a | Double | Holds the first user input |
| b | Double | Holds the second user input |
| **Algebra/Alge** | | |
| x | Double | Becomes the user input |
| **Trigonometry/Trig** | | |
| angle | double | User input |
| Radians | double | Becomes calculated user input |
| Result | double | Becomes user input result |
| degreesToRadians | double | User input |
| sinAngle | double | Becomes user input result |
| Degrees | double | User input |
| cosAngle | Double | Becomes user input result |

# Flow Diagrams

Flow Chart

Basic Maths Add, Sub, Div, Mult.

Flow Chart

Start

Initialisation

Accepts input a, b

Returns   
a(+or-or\*or/)b

Algebra – SquareRoot & Inv

Start

Flow Chart

Initialisation

Accepts input x

Calculates the square root or Inverse of x and assigns the value to x

Returns x

Algebra – CubeRoot

Flow Chart

Start

Initialisation

Accepts input x

Return – CubeRoot(-x)

Yes

If x < 0.0

No

Calculates the Cube root of x and assigns the value to x

Returns x

Trigonometry - Tan

Flow Chart

Start

Initialisation

Accepts input angle

Calculates the radians of angle

Calculates the tan of radians

Returns result

Trigonometry – cos and sine

Flow Chart

Start

Initialisation

Accepts input degrees

Calculates the angle

Calculates the cos or sine

Returns cos/sinAngle

Buttons region

Flow Chart

Start

Initialisation

On button click

Display button text in text box

Arithmetic Region – Plus, Minus, Divide, Multiply

Flow Chart

Start

Initialisation

Focus cursor to textbox

Yes

If Textbox not empty

No

A = textbox text – 1st input and textbox clears

Bool determines which Arithmetic Button was pressed

Arithmetic Region – Equals

Flow Chart

Start

Initialisation

Yes

Focus cursor to textbox

If Textbox not empty

No

b = textbox text -2nd input

Result = Basic Math function ‘Add’

If bool plusButtonClicked true

If bool plusButtonClicked true

Result = Basic Math function ‘Add’

If bool plusButtonClicked true

No

No

No

If bool minusButtonClicked true

Yes

Yes

Yes

Yes

Result = Basic Math function ‘Add’

Result = Basic Math function ‘Add’

Display result in text box

Algebraic Region – SQRT

Flow Chart

Start

Initialisation

Yes

No

If Textbox not empty

Focus cursor to textbox

num = textbox text

No

Text display shows “ Invalid Input”

If num >= 0

Text Display = Algebra Square root function (num)

Algebraic Region – Cuberoot, Inv

Flow Chart

Start

Initialisation

Focus cursor to textbox

Yes

No

If Textbox not empty

x = text display

Text display = Algebra Inv or Cube Root Function (x)

Trigonometry Region - Tan

Start

No

Yes

Text box display = 0

No

If angle = 360 or angle = 180

Text box display = Trigonometry tan function(angle)

Text box display “Undefined”

Yes

No

If angle not equal to 90 & angle not equal to 270

angle = textbox text

Yes

Focus cursor to textbox

Flow Chart

Initialisation

If Textbox not empty

Trigonometry Region – cos

Flow Chart

Yes

Text box display = Trigonometry cos function(degrees)

If degrees not equal to 0, 90, 180 or 360

Degrees = textbox text

No

Focus cursor to textbox

Yes

Start

Initialisation

If Textbox not empty

textbox display = 0

textbox display = -1

Yes

Yes

Yes

Yes

No

No

No

textbox display = 1

textbox display = 0

If degrees = 360

If degrees = 270

If degrees = 180

If degrees = 90

No

Trigonometry Region -Sine

Flow Chart

Yes

Text box display = Trigonometry Sine function(degrees)

If degrees not equal to 0, 90, 180 or 360

Degrees = textbox text

No

Focus cursor to textbox

Yes

Start

Initialisation

If Textbox not empty

textbox display =   
-1

textbox display = 0

Yes

Yes

Yes

Yes

No

No

No

textbox display = 0

textbox display = 1

If degrees = 360

If degrees = 270

If degrees = 180

If degrees = 90

No

# Arithmetic

Arithmetic Test Table

|  |  |  |
| --- | --- | --- |
| Test | Expected | Actual / Comment |
| Addition | | |
| -5 + -5 | -10 | Actual [1] |
| -5 + 0 | -5 | Actual |
| 0 + 5 | 5 | Actual |
| 5 + 5 | 10 | Actual |
| Subtraction | | |
| -5 - -5 | 0 | Actual [2] |
| 5 - 0 | 5 | Actual |
| 0 - 5 | -5 | Actual |
| 10 - 15 | -5 | Actual |
| Multiplication | | |
| 5 \* 5 | 25 | Actual [3] |
| 5 \* 0 | 0 | Actual |
| 0 \* 5 | 0 | Actual |
| 5 \* -5 | -25 | Actual |
| Division | | |
| 10 / 5 | 2 | Actual |
| 10 / 3 | 3.333333333 | Actual |
| 10 / 0 | Infinity | Actual / Cannot divide by zero [4] |
| 0 / 10 | 0 | Actual |
| 10 / -2 | -5 | Actual |

# Trigonometric

Trigonometric Test Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test | Expected | | | Actual / Comment |
| Tan | | | | |
| 0o | | 0 | Actual | |
| 30o | | 0.5777350269189626 | Actual [5] | |
| 45o | | 1 | Actual | |
| 60o | | 1.73205080756888 | Actual [6] | |
| 90o | | Undefined | Actual/ Cannot have Tan of 90**°** | |
| Sin | | | | |
| 0o | | 0 | Actual | |
| 30o | | 0.5 | Actual | |
| 45o | | 0.707106781186547 | Actual | |
| 60o | | 0.866025403784439 | Actual [7] | |
| 90o | | 1 | Actual | |
| Cos | | | | |
| 0o | | 1 | Actual [8] | |
| 30o | | 0.866025403784439 | Actual | |
| 45o | | 0.707106781186548 | Actual | |
| 60o | | 0.5 | Actual | |
| 90o | | 0 | Actual | |

# Algebraic

Algebraic Test Table

|  |  |  |
| --- | --- | --- |
| Test | Expected | Actual / Comment |
| Square Root | | |
| 0 | 0 | Actual |
| 1 | 1 | Actual |
| 2 | 1.4142135623731 | Actual |
| -1 | error | Actual / Cannot square root -1 [9] |
| Cube Root | | |
| 0 | 0 | Actual |
| 1 | 1 | Actual |
| 2 | 1.25992104989487 | Actual |
| -1 | NaN | Actual / Cannot cube root -1[10] |
| Inverse | | |
| 0 | Infinite | Actual / Inverse of 0 is infinite [11] |
| 1 | 1 | Actual |
| 2 | 0.5 | Actual |
| -1 | -1 | Actual |

# Recommendations

Recommendations

This calculator is now the perfect template to add any mathematical function, increasing its capabilities to become a fully equipped scientific calculator. I highly suggest the Third-party library technique be used for any further advancements

# Testing Evidence

Testing Evidence

**Addition:**

A picture containing clock, wall

Description generated with high confidence[1]

**Subtraction:**

A screenshot of a cell phone

Description generated with high confidence[2]

**Multiplication:**

A screenshot of a cell phone

Description generated with high confidence[3]

**Division:**

A screenshot of a cell phone

Description generated with high confidence[4]

**Tan 30°:**

A picture containing clock, wall

Description generated with very high confidence[5]

**Tan 90°:**

A picture containing clock, wall

Description generated with high confidence[6]

**Sin:**

A picture containing clock

Description generated with very high confidence[7]

**Cos:**

A screenshot of a cell phone

Description generated with high confidence[8]

**Square Root:**

A picture containing wall

Description generated with high confidence[9]

**Cube Root:**

A picture containing clock, wall

Description generated with very high confidence[10]

**Inverse:**

A screenshot of a cell phone

Description generated with high confidence[11]