

## 12.1.39 Editors - Geometry Nodes Editor - Header - Add Menu - Utilities - Math

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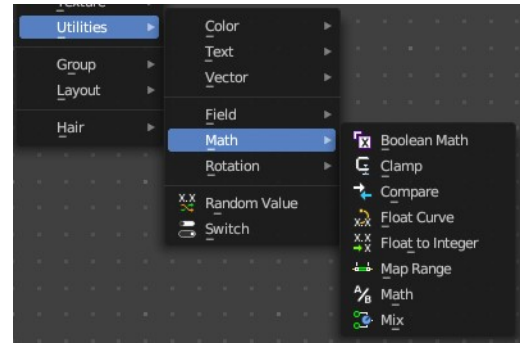
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## Add menu - Utilities - Math

Utility nodes are mainly for mathematical operations.



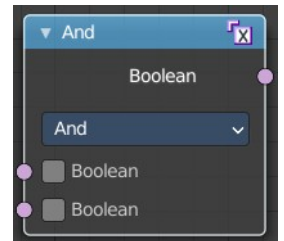
### Boolean Math

The Boolean Math node performs a basic logical operation between its inputs.

#### Inputs

##### *Boolean*

Two standard Boolean inputs.



#### Properties

##### *Operation*

##### **And**

True if both inputs are true.

##### **Or**

True if either or both inputs are true.

##### **Not**

True if both inputs are false.

##### **Not And (NAND)**

True when at least one input is false.

##### **Nor (NOR)**

True when both inputs are false.

##### **Equal (XNOR)**

True when both inputs are equal.



## Not Equal (XOR)

True when both inputs are different.

## Imply (IMPLY)

True unless the first input is true and the second is false.

## Subtract (NIMPLY)

True when the first input is true and the second is false.

## Output

### *Boolean*

Standard Boolean output.

---

## Clamp

Clamps a value between a minimum and a maximum.

## Inputs

### *Value*

The input value to be clamped.

### *Min*

The minimum value.

### *Max*

The maximum value.

## Properties

### *Clamp Type*

#### **Min Max**

Clamp values using Min and Max values.

#### **Range**

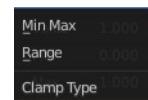
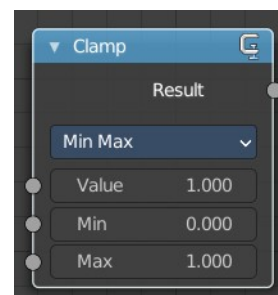
Clamp values between Min and Max range.

## Outputs

### *Result*

The input value after clamping.

---



## Compare

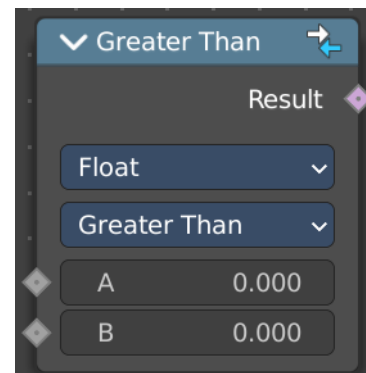
The Compare node takes two inputs and does a math comparison between them.

### Inputs

#### **A, B**

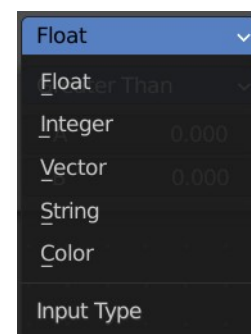
Standard float value input.

### Properties



### *Input Type*

What kind of data to compare.



### *Operation*

#### **A is less than B**

True if A is smaller than B.

#### **A is lesser than or equal B**

True if A is smaller or equal than B.

#### **A is greater than B**

True if A is bigger than B.

#### **A is greater than or equal B**

True if A is bigger or equal than B.

#### **A is equal B**

True if A and B are the same.

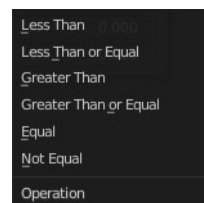
#### **A is not equal B**

True if A and B are different.

### Output

#### **Result**

Standard Boolean output.



## Float Curve

The Float Curve node maps an input float to a curve and outputs a float value. This curve can then be used for profiles for example.

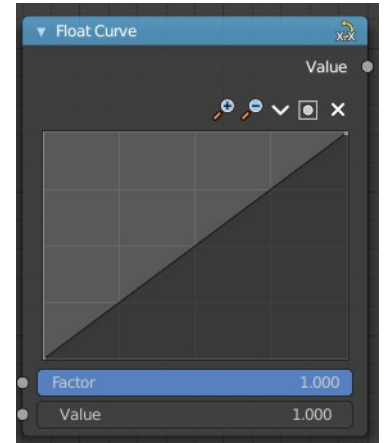
### Inputs

#### **Factor**

How strong the input influences the output value.

#### **Attribute**

The input value.



## Properties

### **Curve Field**

#### **Channel buttons**

Clicking on one of the channels displays the curve for each.

C (Combined RGB), R (Red), G (Green), B (Blue).

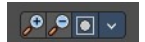


#### **Navigation elements**

They are described from left to right.

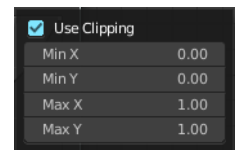
#### **Zoom in and out**

The two buttons with the magnifying glass at it zooms in and out in the curve window.



#### **Use Clipping**

Clipping options. Set up clipping for the stroke.



### **Tools**

Tools is a menu where you can find some curve related tools.

#### **Reset View**

Resets the curve windows zoom.

#### **Extend horizontal**

Extends the curve before the first curve point and behind the last curve point horizontally.

#### **Extend extrapolated**

Extends the curve before the first curve point and behind the last curve point extrapolated.





## Reset Curve

Resets the curve to the initial shape.

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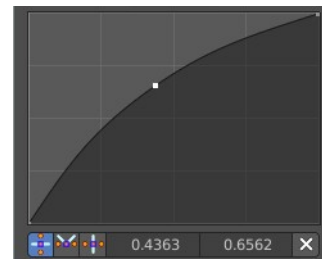
## Curve edit field

Create and tweak a Bezier curve that varies the input levels (X axis) to produce an output level (Y axis).

### Selecting Points

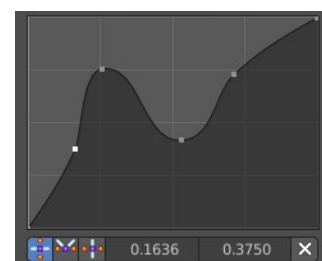
You can select curve points. This reveals two edit boxes for the x and y coordinate of this point.

Selected points can be moved around. Left click at them, hold the mouse button down and move them to a new location.



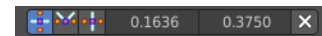
### Adding Points

You can add new curve points by simply left clicking at the curve. Move the mouse to position them where you need it.



### Curve point settings

When you have a point selected then you will reveal further settings at the bottom.



### Vector Handle

Set handle type to Vector.

### Auto Handle

Set handle type to Auto.

### Auto Clamped Handle

Set handle type to Auto Clamped.

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## Output

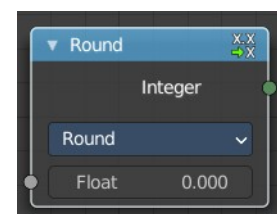
### Value

The output value.

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## Float to Integer

Converts a floating point value into an integer value.



## Inputs

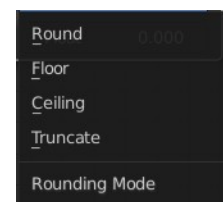
### *Float*

The input float value.

## Properties

### *Rounding Mode*

How the float value should be converted.



## Outputs

### *Integer*

The output integer value.

## Map Range

This node converts (maps) an input value range into a destination range. By default, values outside the specified input range will be proportionally mapped as well. This node is similar to Map Value node but provides a more intuitive way to specify the desired output range.

## Inputs

### *Value*

Standard value input.

### *From Min*

Start of the input value range.

### *From Max*

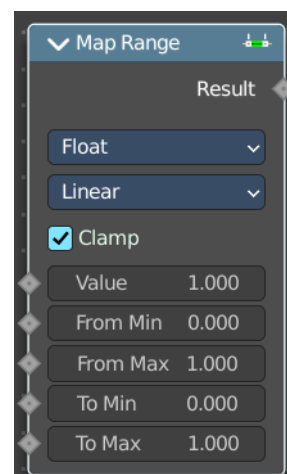
End of the input value range.

### *To Min*

Start of the destination range.

### *To Max*

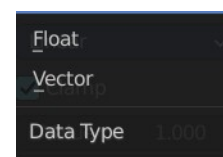
End of the destination range.



## Properties

### **Data Type**

The data type to calculate.

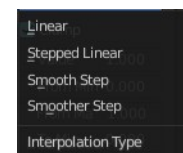


### **Interpolation Type**

how to interpolate the values between min and max.

### **Clamp**

Clamps values to Min/Max of the destination range.



## Outputs

### **Value**

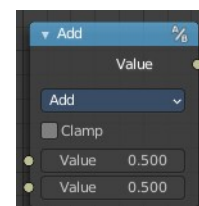
Standard value output.

## Math

The Math Node performs math operations.

### Inputs

The inputs of the node are dynamic. Some inputs are only available with certain operations. For example, the Addend input is only available in the Multiply Add operator.



### **Value**

Input Value. Trigonometric functions read this value as radians.

### **Addend**

Input Addend.

### **Base**

Input Base.

### **Exponent**

Input Exponent.

### **Epsilon**

Input Epsilon.

### **Distance**

Input Distance.

## **Min**

Input Minimum.

## **Max**

Input Maximum.

## **Increment**

Input Increment.

## **Scale**

Input Scale.

## **Degrees**

Input Degrees.

## **Radians**

Input Radians.

## **Properties**

### **Operation**

The mathematical operator to be applied to the input values:

Functions	Comparison	Rounding	Trigonometric	Conversion
Add	Minimum	Round	Sine	To Radians
Subtract	Maximum	Floor	Cosine	To Degrees
Multiply	Less Than	Ceil	Tangent	
Divide	Greater Than	Truncate	Arcsine	
Multiply Add	Sign	Fraction	Arccosine	
Power	Compare	Modulo	Arctangent	
Logarithm	Smooth Minimum	Wrap	Arctan2	
Square Root	Smooth Maximum	Snap	Hyperbolic Sine	
Inverse Square Root		Ping-pong	Hyperbolic Cosine	
Absolute			Hyperbolic Tangent	
Exponent				

## **Functions**

### **Add**

The sum of the two values.

### **Subtract**

The difference between the two values.

### **Multiply**

The product of the two values.

### **Divide**

The division of the first value by the second value.

### **Multiply Add**

The sum of the product of the two values with Addend.

### **Power**

The Base raised to the power of Exponent.

### ***Logarithm***

The log of the value with a Base as its base.

### ***Square Root***

The square root of the value.

### ***Inverse Square Root***

One divided by the square root of the value.

### ***Absolute***

The input value is read with without regard to its sign. This turns negative values into positive values.

### ***Exponent***

Raises Euler's number to the power of the value.

### **Comparison**

#### ***Minimum***

Outputs the smallest of the input values.

#### ***Maximum***

Outputs the largest of two input values.

#### ***Less Than***

Outputs 1.0 if the first value is smaller than the second value. Otherwise the output is 0.0.

#### ***Greater Than***

Outputs 1.0 if the first value is larger than the second value. Otherwise the output is 0.0.

#### ***Sign***

Extracts the sign of the input value. All positive numbers will output 1.0. All negative numbers will output -1.0. And 0.0 will output 0.0.

#### ***Compare***

Outputs 1.0 if the difference between the two input values is less than or equal to Epsilon.

#### ***Smooth Minimum***

Smooth Minimum.

#### ***Smooth Maximum***

Smooth Maximum.

### **Rounding**

#### ***Round***

Round the input value to the nearest integer.

#### ***Floor***

Rounds the input value down to the nearest integer.

### ***Ceil***

Rounds the input value up to the nearest integer.

### ***Truncate***

Outputs the integer part of the value.

### ***Fraction***

Fraction.

### ***Modulo***

Outputs the remainder once the first value is divided by the second value.

### ***Wrap***

Outputs a value between Min and Max based on the absolute difference between the input value and the nearest integer multiple of Max less than the value.

### ***Snap***

Round the input value to down to the nearest integer multiple of Increment.

### ***Ping-pong***

The output value is moved between 0.0 and the Scale based on the input value.

## **Trigonometric**

### ***Sine***

The Sine of the input value.

### ***Cosine***

The Cosine of the input value.

### ***Tangent***

The Tangent of the input value.

### ***Arcsine***

The Arcsine of the input value.

### ***Arccosine***

The Arccosine of the input value.

### ***Arctangent***

The Arctangent of the input value.

### ***Arctan2***

Outputs the Inverse Tangent of the first value divided by the second value measured in radians.

### ***Hyperbolic Sine***

The Hyperbolic Sine of the input value.

### ***Hyperbolic Cosine***

The Hyperbolic Cosine of the input value.

## **Hyperbolic Tangent**

The Hyperbolic Tangent of the input value.

## **Conversion**

### **To Radians**

Converts the input from degrees to radians.

### **To Degrees**

Converts the input from radians to degrees.

### **Clamp**

Limits the output to the range (0.0 to 1.0). See Clamp.

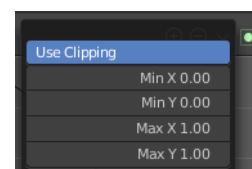
## **Outputs**

### **Value**

Numerical value output.

## **Use Clipping**

Clipping options. Set up clipping for the stroke.



## **Delete Points**

Deletes selected curve point.

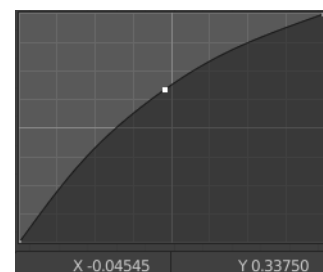
## **Curve window**

Tweak and adjust the falloff curve by clicking at a curve point and dragging it around.

Double click adds a new point.

Holding down ctrl activates temporary snapping.

Holding down shift enables slower movement, which allows more accurate setting.

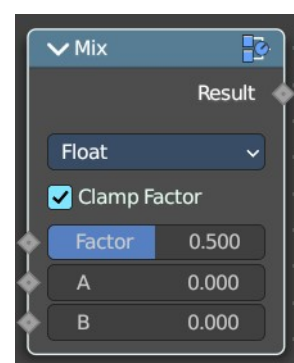


## **X / Y values**

The x and y value of the currently selected point.

## **Mix**

Allows to mix values and vectors in various ways. The node has three different modes. Float, Vector and Color. This node covers the Float mode



## Input

### *Float*

#### **Factor**

The mix factor.

#### **A**

Float value A input.

#### **B**

Float value B input.

## Properties

### *Clamp Factor*

Clamp the factor to 0-1 range.

## Output

### *Result*

The output value or vector.

