

## 12.1.22 Editors - Geometry Nodes Editor - Header - Add Menu - Utilities

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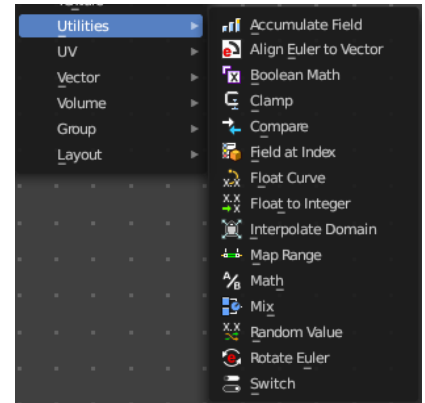
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## Add menu - Utilities

Utility nodes are mainly for mathematical operations.



### Accumulate Field

Creates a running total of a given Vector, Float, or Int field.

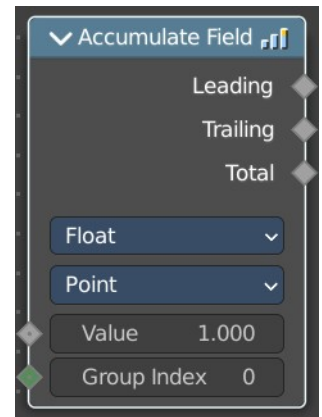
#### Inputs

##### Value

The field to be accumulated.

##### Group Index

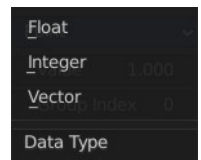
The values of this input are used to aggregate the input into separate 'bins', creating multiple accumulations.



#### Properties

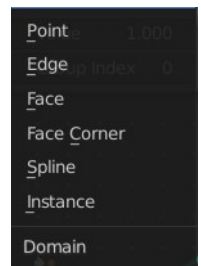
##### Data Type

What data type to work with.



##### Domain

From which domain to use the data.



#### Outputs

##### Leading and Trailing

Returns the running totals starting at either the first value of each accumulations or 0 if there is no data

##### Total

Returns the total accumulation at all positions of the field.

## Align Euler to Vector

Aligns a euler value to a vector.

### Inputs

#### **Rotation**

The input euler rotation vector.

#### **Factor**

The factor to align the euler value to the vector.

#### **Vector**

The vector to align to.

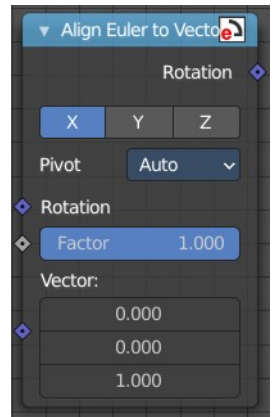
### Properties

#### **Align Axis**

To which axis to align the vector.

#### **Pivot**

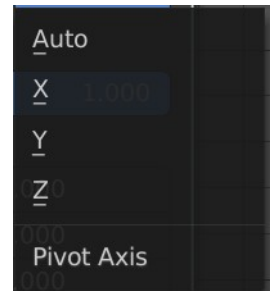
The pivot axis.



### Output

#### **Rotation**

The output rotation euler angle.



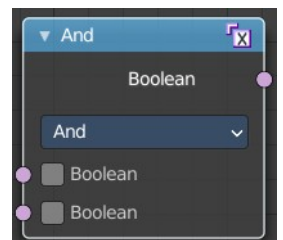
## Boolean Math

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.



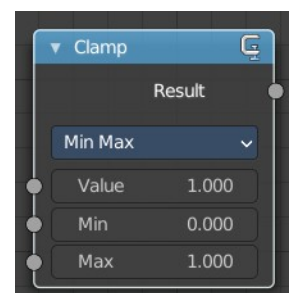
## Clamp

Clamps a value between a minimum and a maximum.

### Inputs

#### Value

The input value to be clamped.



## ***Min***

The minimum value.

## ***Max***

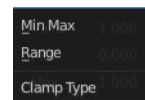
The maximum value.

## **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.

---

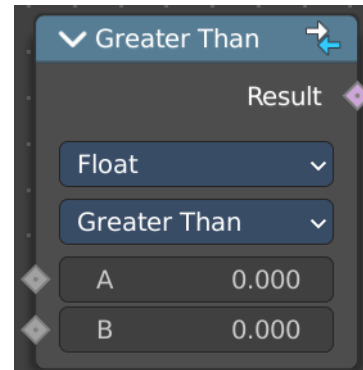
## **Compare**

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

## **Inputs**

### ***A, B***

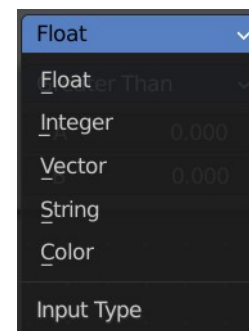
Standard float value input.



## **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

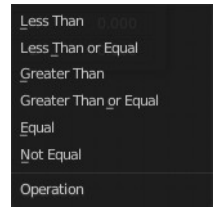
True if A is bigger or equal than B.

### 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.

## Field at Index

This node allows accessing data of other elements in the context geometry.

It is similar to the Transfer Attribute node in Index mode. The main difference is that this node does not require a geometry input, because the context is used.

## Inputs

### Index

Input Index.

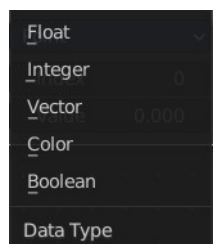
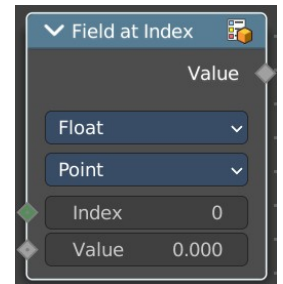
### Value

Input Value.

## Properties

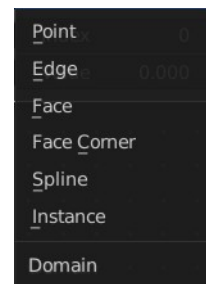
### Data Type

What data type to calculate.



## Domain

What geometry to calculate.



## Output

### Value

The output value.

## 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.

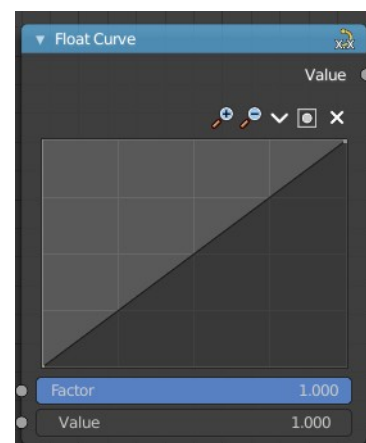
## Inputs

### 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.

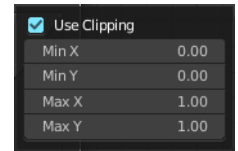


#### Zoom in and out

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.

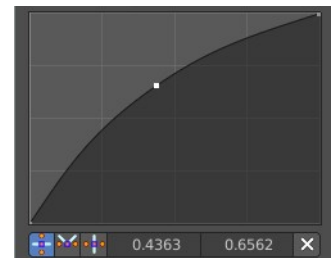
## Curve edit field

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

### Selecting Points

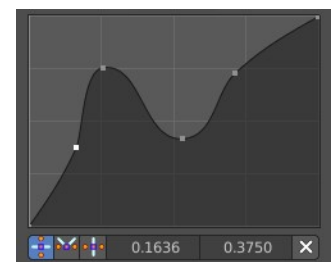
You can select curve points. This reveals two edit boxes for the x and y coordinate of this point.

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



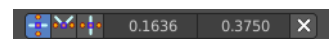
### Adding Points

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.

## Output

### Value

The output value.

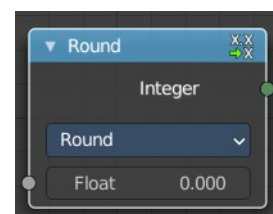
## Float to Integer

Converts a floating point value into an integer value.

## Inputs

### Float

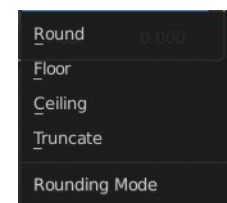
The input float value.



## Properties

### Rounding Mode

How the float value should be converted.



## Outputs

### Integer

The output integer value.

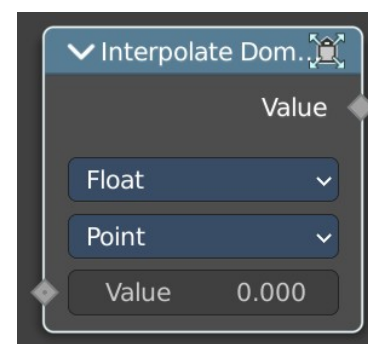
## Interpolate on Domain

This node evaluates an existing field on a separate domain in a larger field context - an alternative to the Capture Attribute node. This node gets the field type of an existing field from the input socket and interpolates the field type as an array in the output socket.

## Inputs

### Value

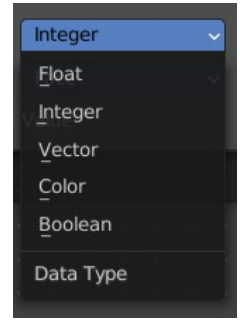
The input value to get the field.



## Properties

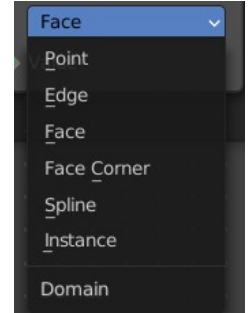
### Data Type

Select the Data Type - which can be float, integer, vector, color and boolean.



### Domain

The domain the Field evaluates. This gets and filters the field type. The domain can be point, edge, face, face corner, spline or instance.



## Outputs

### Value

The output 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

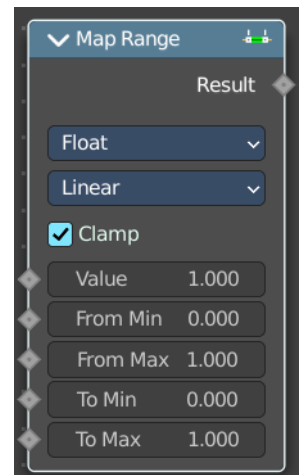
End of the input value range.

#### To Min

Start of the destination range.

#### To Max

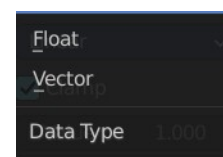
End of the destination range.



## Properties

### **Data Type**

The data type to calculate.

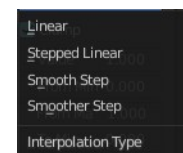


### **Interpolation Type**

how to interpolate the values between min and max.

### **Clamp**

Clamps values to Min/Max of the destination range.



## Outputs

### **Value**

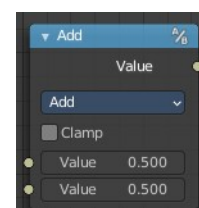
Standard value output.

## 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.

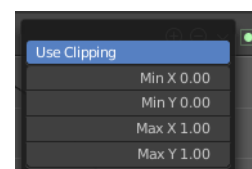
## **Outputs**

### **Value**

Numerical value output.

## **Use Clipping**

Clipping options. Set up clipping for the stroke.



## **Delete Points**

Deletes selected curve point.

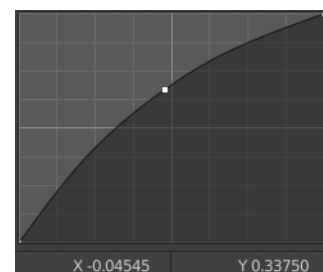
## **Curve window**

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.

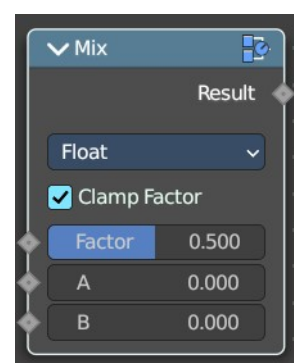


## **X / Y values**

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



## Input

### *Float*

#### **Factor**

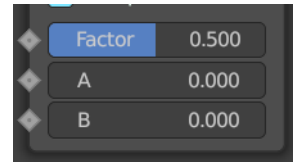
The mix factor.

#### **A**

Float value A input.

#### **B**

Float value B input.



### *Vector*

#### **Factor mode Uniform**

#### **Factor**

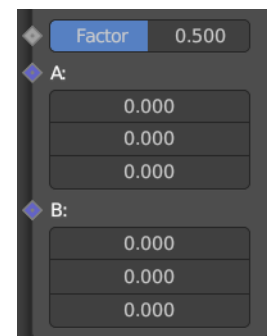
The mix factor.

#### **A**

Vector A input.

#### **B**

Vector B input.



#### **Factor mode Non Uniform**

#### **Factor**

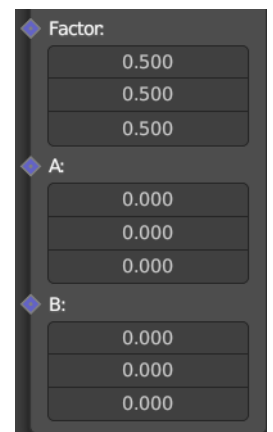
The vector mix factor.

#### **A**

Vector A input.

#### **B**

Vector B input.



### *Color*

#### **Factor**

The mix factor.

#### **A**

Color A input.

#### **B**

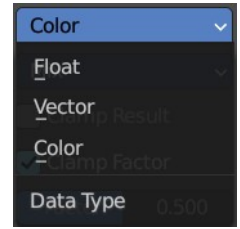
Color B input.



## Properties

### **Data Type**

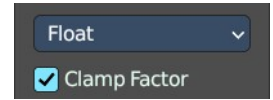
Which mode to use.



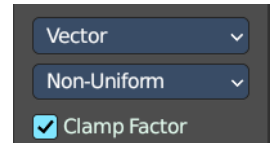
### **Float mode**

#### **Clamp Factor**

Clamp the factor to 0-1 range.

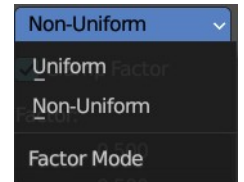


### **Vector mode**



### **Factor mode**

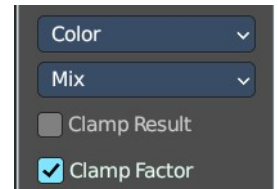
Uniform or non uniform factor.



#### **Clamp Factor**

Clamp the factor to 0-1 range.

### **Color mode**



### **Blending mode**

What blending mode to use for the color.

#### **Clamp Result**

Clamp the result to 0-1 range.

#### **Clamp Factor**

Clamp the input factor to 0-1 range.

## Output

### **Result**

The output value or vector.

## Random Value

Generates a random value.

### Input

#### Min

The minimum value of the range. This input is only available for Float, Integer, and Vector types.

#### Max

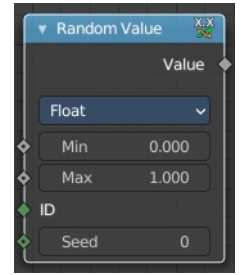
The maximum value of the range. This input is only available for Float, Integer, and Vector types.

#### ID

An ID to drive the random number generator seed. By default, this input uses the same value as if the ID Node, which is the id attribute of the context geometry if it exists, and otherwise the index.

#### Seed

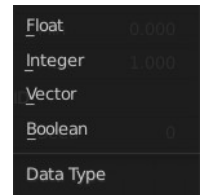
The random seed for the random number generation.



### Properties

#### Data Type

What kind of random value to create. The items should be self explaining.



### Output

#### Value

The output value.

## Rotate Euler

Rotates an euler rotation.

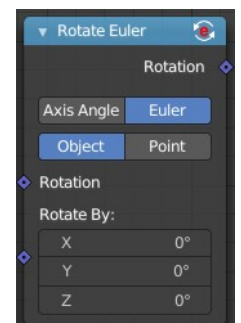
### Inputs

#### Rotation

Use the rotation of an existing geometry.

#### Rotate By

The input rotation.



## Properties

### *Rotate Type*

#### **Axis Angle**

Rotate around an axis by an angle.

#### **Euler**

Rotate around the x, y and z axis.

### *Rotate Space*

#### **Object**

Rotate points in the local space of the object.

#### **Point**

Rotate every point in its local space.

## Outputs

### *Rotation*

The euler angle output.

## Switch

Switch between two inputs values based on a boolean.

## Inputs

### *Switch*

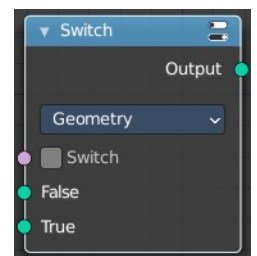
The boolean switch.

#### **A**

The input value A. Used when the switch is off.

#### **B**

The input value B. Used when the switch is on.

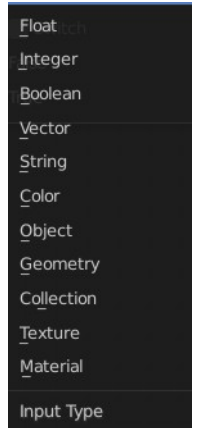




## Properties

### *Input Type*

What input type the values are, which defines what type to output then.



## Outputs

### *Output*

Numerical value output.