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# Vector Math Node

The *Vector Math* node performs the selected math operation on the input vectors.

## Inputs

The inputs of the node are dynamic. Some inputs are only available in certain operations. For instance, the *Scale* input is only available in the *Scale* operator.

**Vector**
Input vector $A = \begin{pmatrix} A_x \\ A_y \\ A_z \end{pmatrix}$.

**Vector**
Input vector $B = \begin{pmatrix} B_x \\ B_y \\ B_z \end{pmatrix}$.

**Scale**
Input Scale $s$.

## Properties

**Operation**
The vector math operator to be applied on the input vectors.

**Add:**
The sum of A and B. $\begin{pmatrix} A_x + B_x \\ A_y + B_y \\ A_z + B_z \end{pmatrix}$

**Subtract:**
The difference between A and B. $\begin{pmatrix} A_x - B_x \\ A_y - B_y \\ A_z - B_z \end{pmatrix}$

**Multiply:**
The entrywise product of A and B. $\begin{pmatrix} A_x \cdot B_x \\ A_y \cdot B_y \\ A_z \cdot B_z \end{pmatrix}$

**Divide:**
The entrywise division of A by B. Division by zero results in zero. $\begin{pmatrix} A_x / B_x \\ A_y / B_y \\ A_z / B_z \end{pmatrix}$

**Multiply Add:**
The entrywise combination of the multiply and addition operations. $A \times B + C$

**Cross Product:**
The cross product of A and B. $\begin{pmatrix} A_y \cdot B_z - A_z \cdot B_y \\ A_z \cdot B_x - A_x \cdot B_z \\ A_x \cdot B_y - A_
\cdot B_x \end{pmatrix}$

**Project:**
The projection of A onto B.

**Reflect:**
The reflection of A around the normal B. B need not be normalized.

**Refract:**
For a given incident vector A, surface normal B and ratio of indices of refraction (IOR), refract outputs the refraction vector R.

**Faceforward:**
Orients a vector A to point away from a surface B as defined by its normal C. Computes $(dot(B, C) < 0) ? A : -A$.

**Dot Product:**
The dot product of A and B. $A_x \cdot B_x + A_y \cdot B_y + A_z \cdot B_z$

**Distance:**
The distance between A and B.

**Length:**
The length of A. $\sqrt{A_x^2 + A_y^2 + A_z^2}$

**Scale:**
The result of multiplying A by the scalar input *Scale*. $\begin{pmatrix} s \cdot A_x \\ s \cdot A_y \\ s \cdot A_z \end{pmatrix}$

**Normalize:**
The result of normalizing A. The result vector points to the same direction as A and has a length of 1. If A is (0, 0, 0), the result is (0, 0, 0)
well.

**Wrap:**

The entrywise output of 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:**

The result of rounding A to the largest integer multiple of B less than or equal A.

**Floor:**

Rounds the input value entrywise down to the nearest integer.

**Ceil:**

Rounds the input value entrywise up to the nearest integer.

**Modulo:**

The entrywise modulo of A by B.

**Fraction:**

Returns the fractional part of the *value* entrywise.

**Absolute:**

The entrywise absolute value of A.

**Minimum:**

The entrywise minimum value from A and B.

**Maximum:**

The entrywise maximum value from A and B.

**Sine:**

The entrywise Sine of A.

**Cosine:**

The entrywise Cosine of A.

**Tangent:**

The entrywise Tangent of A.

## Outputs

The output of the node is dynamic. It is either a vector or a scalar depending on the operator. For instance, the *Length* operator has a scalar output whil the *Add* operator has a vector output.

**Vector**

Output vector.

**Value**

Output value.

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