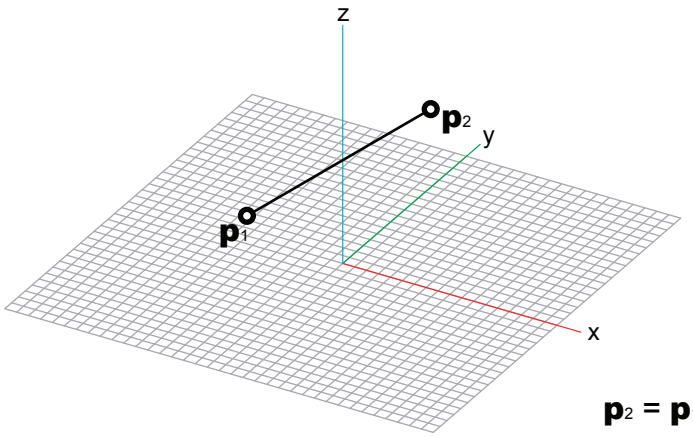
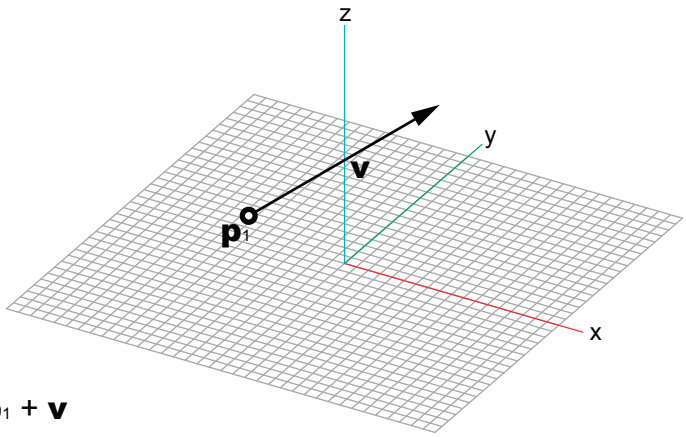
LINE



Line by Two Points

$\mathbf{p}_2 = \mathbf{p}_1 + \mathbf{v}$

$\mathbf{v} = \mathbf{p}_2 - \mathbf{p}_1$



Line by One Point and One Vector

EQUATION

$\mathbf{p}_1 = (p_{1x}, p_{1y}, p_{1z})$

$\mathbf{p}_2 = (p_{2x}, p_{2y}, p_{2z})$

$\mathbf{v} = (v_x, v_y, v_z)$

$= (p_{2x} - p_{1x}, p_{2y} - p_{1y}, p_{2z} - p_{1z})$

by vector

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \mathbf{p} = \mathbf{p}_1 + t\,\mathbf{v} = \begin{pmatrix} p_{1x} + t\,v_x \\ p_{1y} + t\,v_y \\ p_{1z} + t\,v_z \end{pmatrix} \quad 0 < t < 1$$

by number

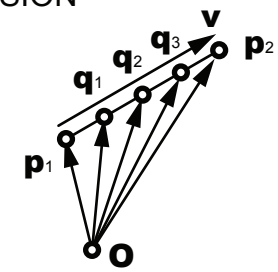
$$\frac{x - p_{1x}}{p_{2x} - p_{1x}} = \frac{y - p_{1y}}{p_{2y} - p_{1y}} = \frac{z - p_{1z}}{p_{2z} - p_{1z}}$$

$p_{1x} < x < p_{2x}$

$p_{1y} < y < p_{2y}$

$p_{1z} < z < p_{2z}$

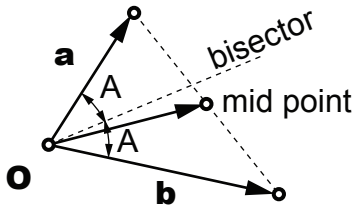
DIVISION



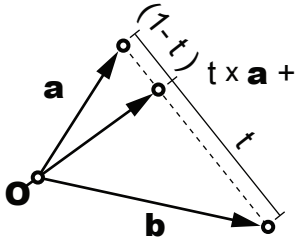
$\mathbf{q}_i = \mathbf{p}_1 + i/N \times \mathbf{v}$

$= (N-i)/N \times \mathbf{p}_1 + i/N \times \mathbf{p}_2$

MID POINT AND BISECTOR

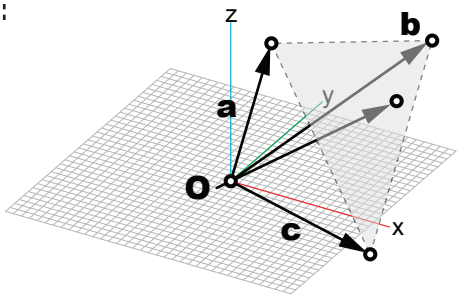


INTERPOLATION OF 2 VECTORS



$t \times \mathbf{a} + (1-t) \times \mathbf{b}$

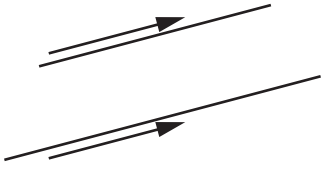
INTERPOLATION OF 3 VECTORS



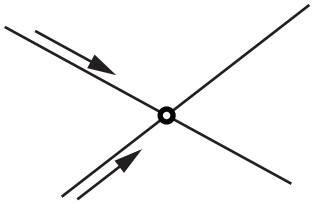
$i \times \mathbf{a} + j \times \mathbf{b} + k \times \mathbf{c}$

$i + j + k = 1$

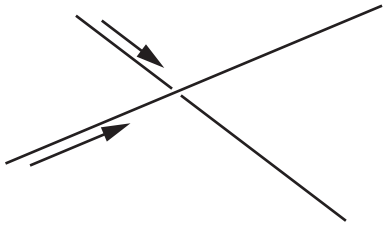
RELATIONSHIP OF LINES



PARALELL



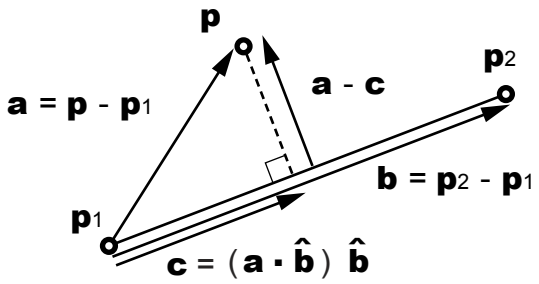
INTERSECTING



SKEW

LINE

DISTANCE OF POINT&LINE (BY VECTOR)



$$d = |\mathbf{a} - \mathbf{c}| = |\mathbf{a} - (\mathbf{a} \cdot \hat{\mathbf{b}})\,\hat{\mathbf{b}}|$$

DISTANCE OF POINT & LINE (BY FORMULA)

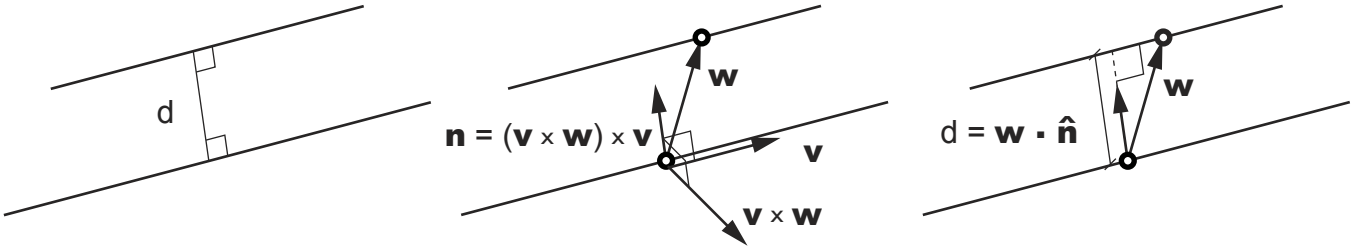
Line : $\dfrac{x - q_x}{a} = \dfrac{y - q_y}{b} = \dfrac{z - q_z}{c}$

Point : $p = (p_x, p_y, p_z)$

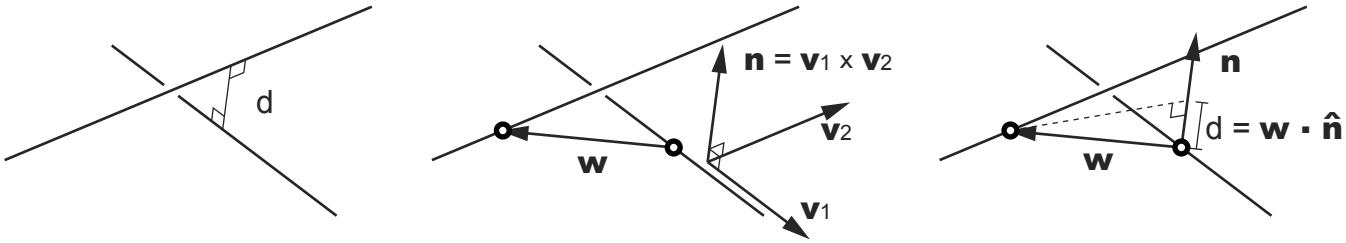
when $x' = p_x - q_x$ $y' = p_y - q_y$ $z' = p_z - q_z$

$$d = \sqrt{\frac{(b^2 + c^2)\,x'^2 + (c^2 + a^2)y'^2 + (a^2 + b^2)z'^2 - 2abx'y' - 2bcy'z' - 2caz'x'}{a^2 + b^2 + c^2}}$$

DISTANCE OF PARALLEL LINES



DISTANCE OF SKEW LINES



BINARY NUMBER (8 BIT EXAMPLE)

Integer

b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0

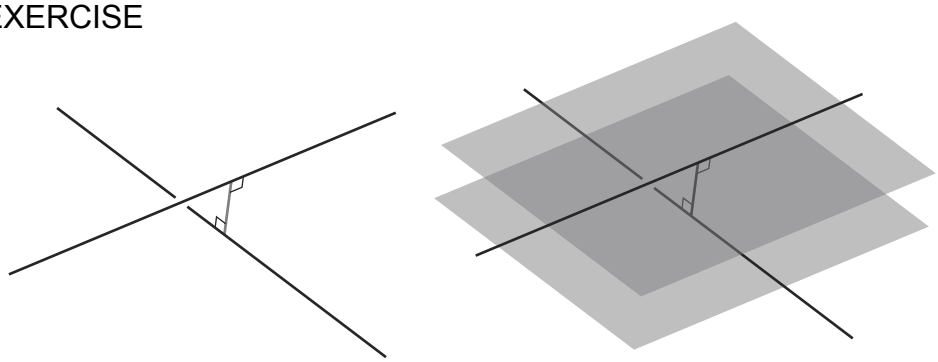
$$b_7 \times 2^7 + b_6 \times 2^6 + b_5 \times 2^5 + b_4 \times 2^4 + b_3 \times 2^3 + b_2 \times 2^2 + b_1 \times 2^1 + b_0 \times 2^0$$

Floating Point Number

s	e_2	e_1	e_0	s_3	s_2	s_1	s_0
sign	exponent			significand			

$$(-1)^s \times (1 + s_3 \times 1/2 + s_2 \times 1/2^2 + s_1 \times 1/2^3 + s_0 \times 1/2^4) \times 2^{(e_2 \times 2^2 + e_1 \times 2 + e_0 - 3)}$$

EXERCISE



1 Draw skew lines and the shortest line between them without using “Minimum Distance Line” tool nor “Line Perpendicular to Two Curve” tool.

2 And make two parallel planes on which each skew line lie.