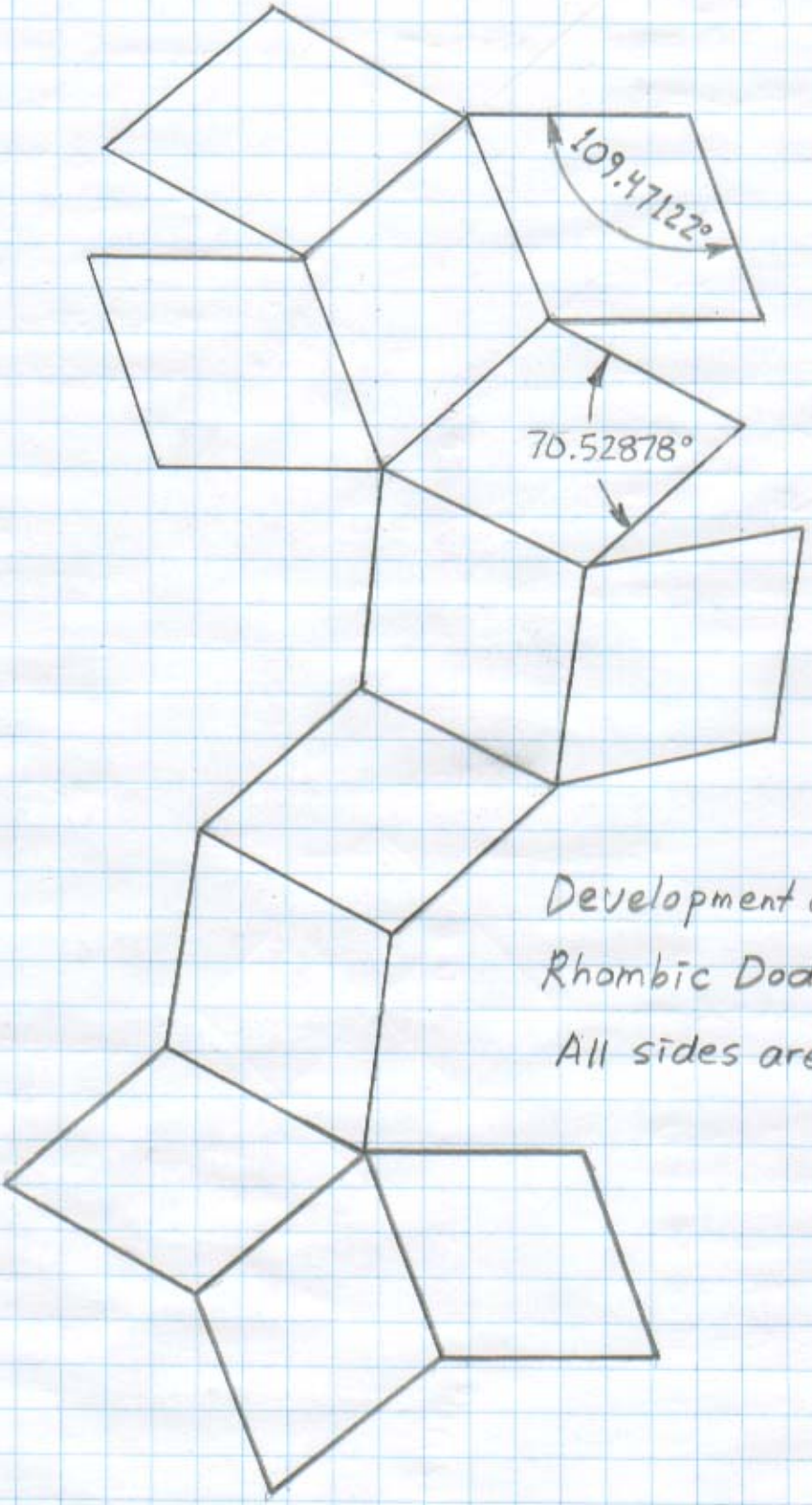
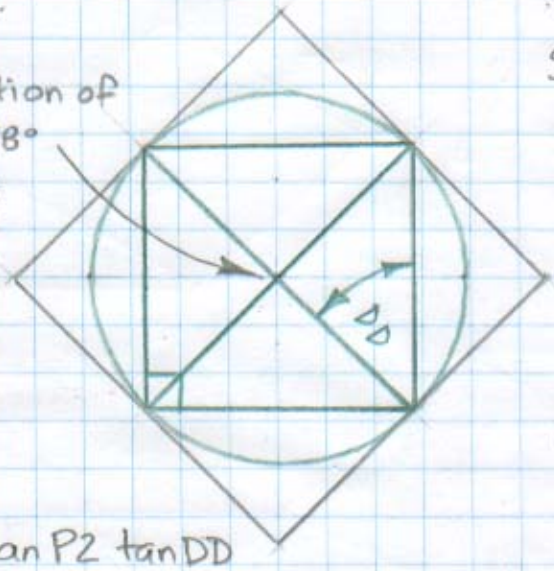


Development of Standard
Rhombic Dodecahedron
All sides are equal

Views from the Vertices

Intersection of
70.52878°
Angles



Symmetrical

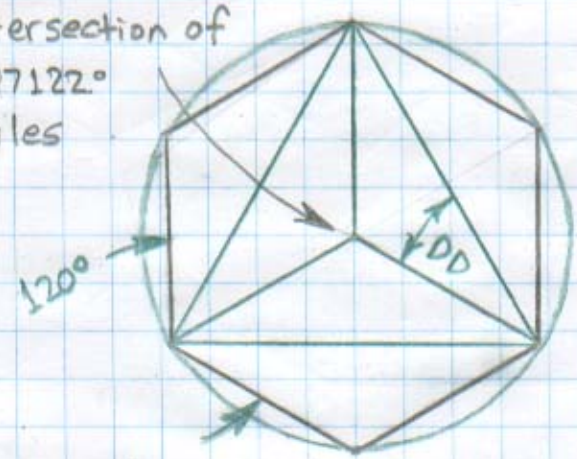
SS = 45°
DD = 45° P2 = 35.26439°
C5 = 30°
R1 = 35.26439°
R4P = 39.23152°
A5P = 24.09484°

$\cos SS = \tan P2 \tan DD$

$SS = \arccos(\tan P2 \tan DD)$

Edges → "Hips"
are equal length

Intersection of
109.47122°
Angles



Symmetrical

SS = 35.26439°
DD = 30° P2 = 54.73561°
C5 = 30°
R1 = 19.47122°
R4P = 58.51785°
A5P = 16.77865°

Plan and roof
surface angles (P2, 90°-P2)
may be developed if desired

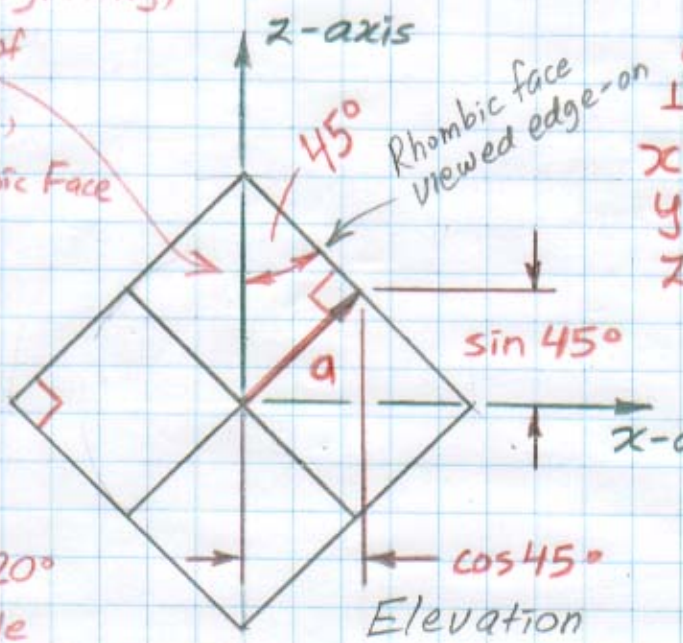
Vector Math Dihedral Angle Check

Invoking symmetry, the components of Unit Vector **b**, ⊥ to this Rhombic Face

$x = 0$

$y = -(\cos 45°)$

$z = \sin 45°$



a: Unit Vector ⊥ to Rhombic Face

$x = \cos 45°$

$y = 0$

$z = \sin 45°$

Elevation

Greater Angle between **a** and **b** = 120° = Dihedral Angle between Rhombic Faces

Trig Check:

$180° - (2 \times 30°) = 120°$

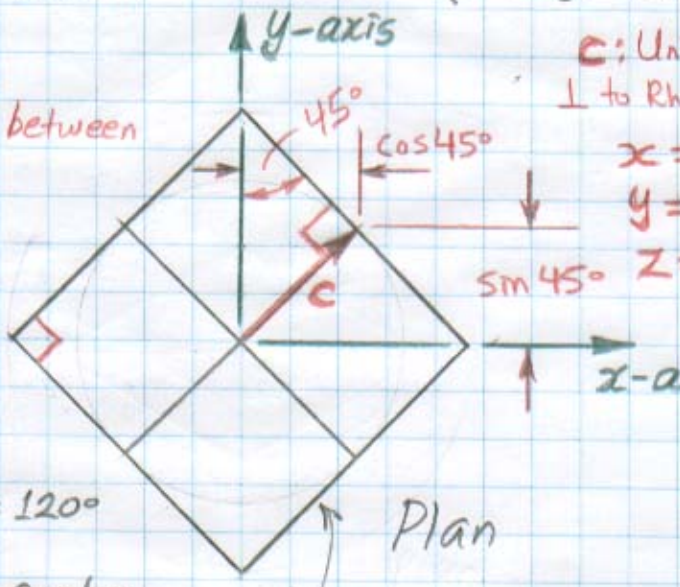
ANGLE BETWEEN VECTORS

$$= \arccos\left(\frac{x_a x_b + y_a y_b + z_a z_b}{\sqrt{x_a^2 + y_a^2 + z_a^2}\sqrt{x_b^2 + y_b^2 + z_b^2}}\right)$$

Greater Angle between **a** and **c** or between **b** and **c** = 120°

Trig Check:

$180° - (2 \times 30°) = 120°$



c: Unit Vector ⊥ to Rhombic Face

$x = \cos 45°$

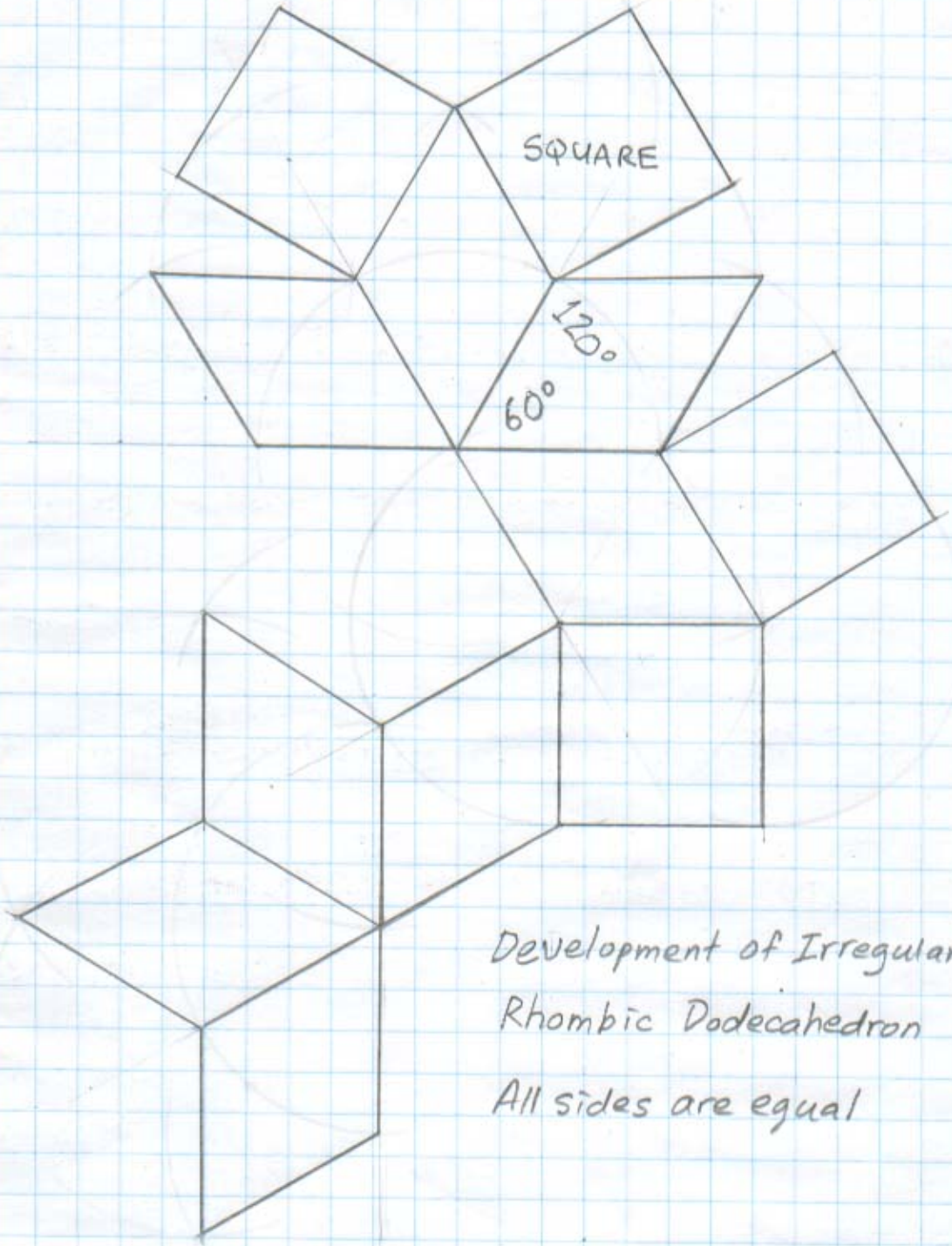
$y = \sin 45°$

$z = 0$

Plan

Rhombic face viewed edge-on

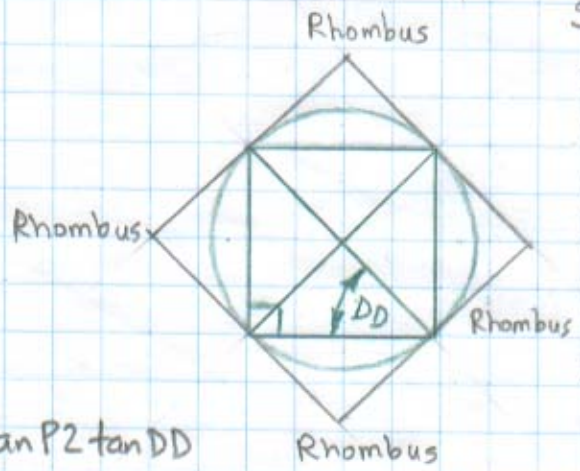
All dihedral angles are 120°



Development of Irregular Rhombic Dodecahedron

All sides are equal

Views from the Vertices



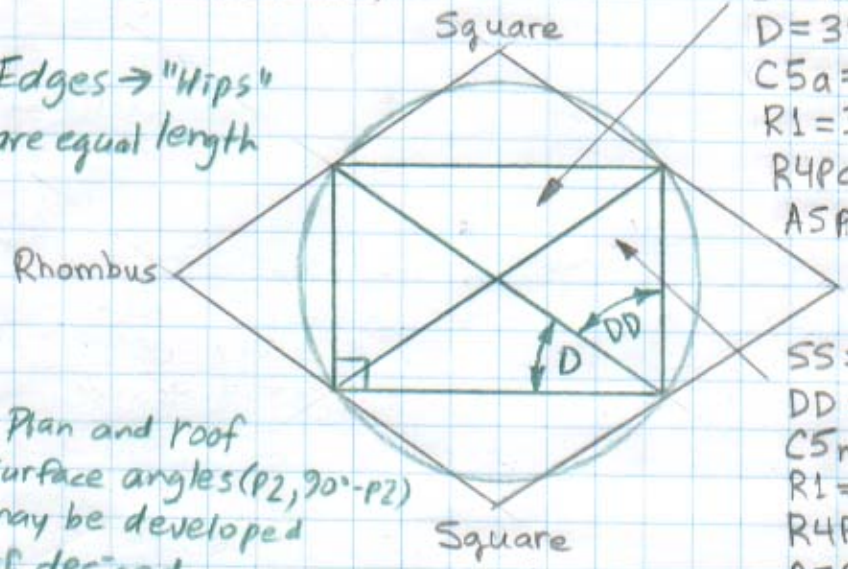
Symmetrical

SS = 54.73561°
DD = 45.00000° P2 = 30°
C5 = 35.26439°
R1 = 45.00000°
R4P = 35.26439°
A5P = 30°

$\cos SS = \tan P2 \tan DD$

$SS = \arccos(\tan P2 \tan DD)$

Edges → "Hips" are equal length



Plan and roof surface angles (P2, 90°-P2) may be developed if desired

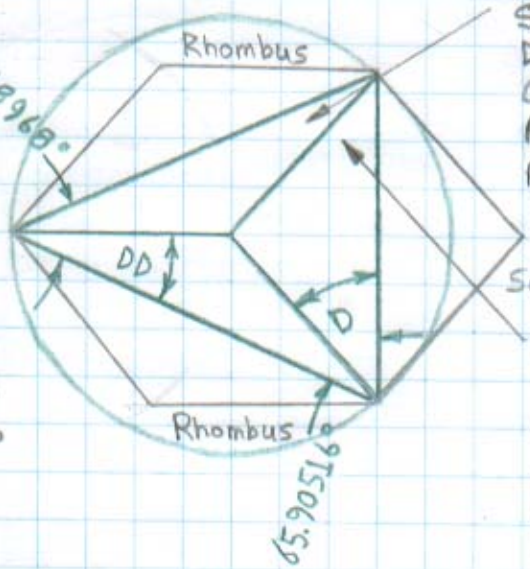
S = 45.00000°
D = 35.26439° P2a = 45°
C5a = 35.26439°
R1 = 30.00000°
R4Pa = 50.76848°
A5Pa = 24.09484°

SS = 35.26439°
DD = 54.73561° P2m = 30°
C5m = 19.47122°
R1 = 30.00000°
R4Pm = 31.48215°
A5Pm = 16.77866°

P2m = 60°

Symmetrical

SS = 39.23152°
DD = 24.09484°
C5m = 35.26439°
R1 = 18.43495°
R4Pm = 64.76060°
A5Pm = 16.77865°



SS = 39.23152°
DD = 24.09484° P2m = 60°
C5m = 35.26439°
R1 = 18.43495°
R4Pm = 64.76060°
A5Pm = 16.77865°

Square

S = 26.56505°
D = 41.81031° P2a = 45°
C5a = 19.47122°
R1 = 18.43495°
R4Pa = 46.68614°
A5Pa = 13.63302°

Vector Math Dihedral Angle Check

a: Unit Vector ⊥ to Rhombic Face

$x = \cos 35.26439°$

$y = 0$

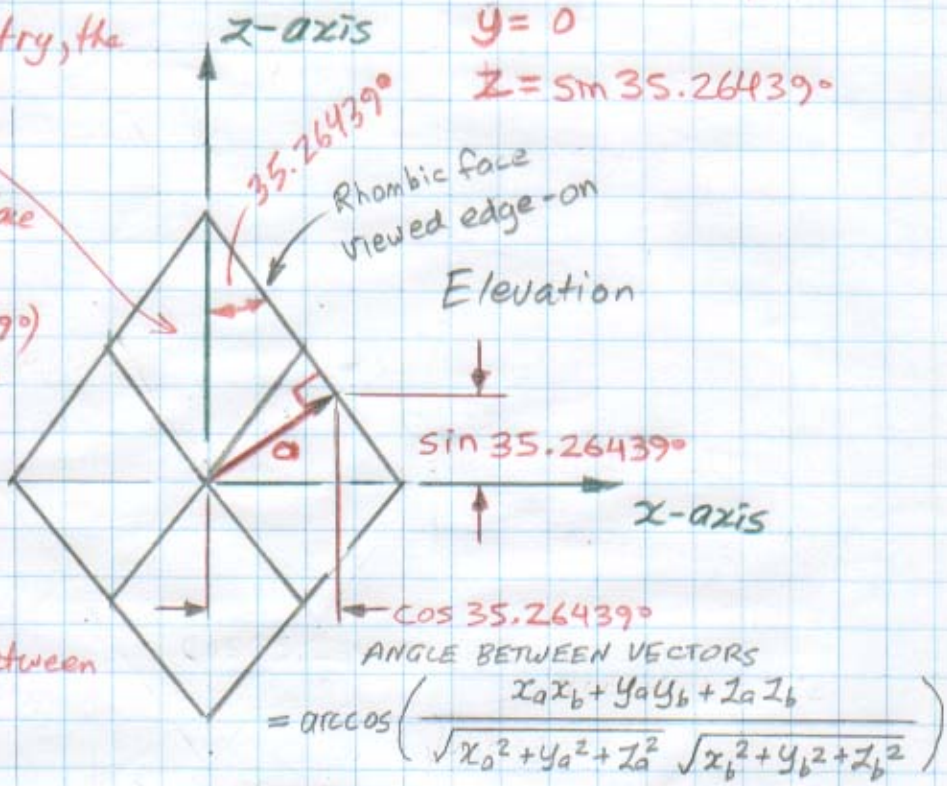
$z = \sin 35.26439°$

Invoking symmetry, the components of Unit Vector **b**, ⊥ to this Rhombic Face

$x = 0$

$y = -(\cos 35.26439°)$

$z = \sin 35.26439°$

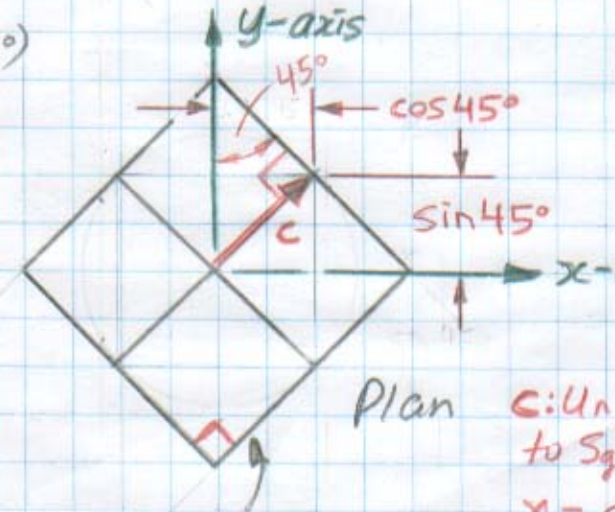


Greater Angle between **a** and **b**
= 109.47122°
= Dihedral Angle between Rhombic Faces

Trig Check =
$180° - (2 \times 35.26439°)$
= 109.47122°

ANGLE BETWEEN VECTORS

$$= \arccos\left(\frac{x_a x_b + y_a y_b + z_a z_b}{\sqrt{x_a^2 + y_a^2 + z_a^2}\ \sqrt{x_b^2 + y_b^2 + z_b^2}}\right)$$



Plan

Greater Angle between **a** and **c**
= 125.26439°

or Angle between **b** and **c**
= 125.26439°

Trig Check:
$180° - (35.26439° + 19.47122°)$
= 125.26439°

Square face viewed edge-on

c: Unit Vector ⊥ to Square Face

$x = \cos 45°$

$y = \sin 45°$

$z = 0$