Important Pentagonal Cupola Formulas PDF

Formulas
Examples
with Units

List of 20
Important Pentagonal Cupola Formulas

1) Edge Length of Pentagonal Cupola Formulas

1.1) Edge Length of Pentagonal Cupola given Height Formula

Evaluate Formula

Formula

$$l_e = \frac{h}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{\pi}{5}\right)\right)^2}}$$

Example with Units

$$9.5106\,\text{m} = \frac{5\,\text{m}}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{3.1416}{5}\right)\right)^2}}$$

1.2) Edge Length of Pentagonal Cupola given Surface to Volume Ratio Formula

Evaluate Formula

Formula

$$l_e = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3}\right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5}\right)\right)}\right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5}\right)\right) \cdot R_{A/V}}$$

Example with Units

$$10.1914\,\text{m} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3}\right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5}\right)\right)}\right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5}\right)\right) \cdot 0.7\,\text{m}^{-1}}$$

1.3) Edge Length of Pentagonal Cupola given Total Surface Area Formula

Evaluate Formula

Formula

$$l_e = \sqrt{\frac{TSA}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3}\right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5}\right)\right)}\right)}}$$

Example with Units

$$10.0061\,\text{m} = \sqrt{\frac{1660\,\text{m}^2}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3}\right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5}\right)\right)}\right)}}$$

1.4) Edge Length of Pentagonal Cupola given Volume Formula

Formula

$$l_e = \left(\frac{V}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}}$$

Example with Units

$$9.9654\,\text{m} = \left(\frac{2300\,\text{m}^3}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}}$$

2.1) Height of Pentagonal Cupola Formula

Formula

$$h = l_e \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{\pi}{5} \right) \right)^2}$$

Example with Units

$$5.2573\,\text{m} = 10\,\text{m} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{3.1416}{5} \right) \right)^2}$$

2.2) Height of Pentagonal Cupola given Surface to Volume Ratio Formula

Formula

$$h = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot R_{A/V}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{\pi}{5} \right) \right)^2}$$

Example with Units

$$5.358\,\text{m} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot 0.7\,\text{m}^{-1}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{3.1416}{5} \right) \right)^2}$$

2.3) Height of Pentagonal Cupola given Total Surface Area Formula

Formula

$$h = \sqrt{\frac{TSA}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{\pi}{5} \right) \right)^2}$$

Example with Units

$$5.2605\,\text{m} = \sqrt{\frac{1660\,\text{m}^2}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{3.1416}{5} \right) \right)^2}$$

Evaluate Formula

2.4) Height of Pentagonal Cupola given Volume Formula ⟳

Formula

$$h = \left(\frac{V}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{\pi}{5} \right)^2 \right)}$$

Example with Units

$$5.2391 \, \text{m} = \left(\frac{2300 \, \text{m}^3}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}} \cdot \sqrt{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{3.1416}{5} \right)^2 \right)}$$

3) Surface Area of Pentagonal Cupola Formulas ⟳

3.1) Total Surface Area of Pentagonal Cupola Formulas ⟳

3.1.1) Total Surface Area of Pentagonal Cupola Formula ⟳

Formula

$$TSA = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot l_e^2$$

Example with Units

$$1657.975 \, \text{m}^2 = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot 10 \, \text{m}^2$$

3.1.2) Total Surface Area of Pentagonal Cupola given Height Formula ⟳

Formula

$$TSA = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{h^2}{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{\pi}{5} \right)^2 \right)} \right)$$

Example with Units

$$1499.6525 \, \text{m}^2 = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{5 \, \text{m}^2}{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{3.1416}{5} \right)^2 \right)} \right)$$

3.1.3) Total Surface Area of Pentagonal Cupola given Surface to Volume Ratio Formula ➡

Formula

$$\text{TSA} = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot R_{A/V}} \right)^2$$

Example with Units

$$1722.0615 \, \text{m}^2 = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot 0.7 \, \text{m}^{-1}} \right)^2$$

3.1.4) Total Surface Area of Pentagonal Cupola given Volume Formula ➡

Formula

$$\text{TSA} = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{V}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{2}{3}}$$

Example with Units

$$1646.5192 \, \text{m}^2 = \frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right) \cdot \left(\frac{2300 \, \text{m}^3}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{2}{3}}$$

4) Surface to Volume Ratio of Pentagonal Cupola Formulas ➡

4.1) Surface to Volume Ratio of Pentagonal Cupola Formula ➡

Formula

$$R_{A/V} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot l_e}$$

Example with Units

$$0.7134 \, \text{m}^{-1} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot 10 \, \text{m}}$$

4.2) Surface to Volume Ratio of Pentagonal Cupola given Height Formula ➤

Formula

$$R_{A/V} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{h}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{\pi}{5} \right) \right)^2}} \right)}$$

Example with Units

$$0.7501 \, \text{m}^{-1} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{5 \, \text{m}}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec\left(\frac{3.1416}{5} \right) \right)^2}} \right)}$$

4.3) Surface to Volume Ratio of Pentagonal Cupola given Total Surface Area Formula ➤

Formula

$$R_{A/V} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \sqrt{\frac{TSA}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}}}$$

Example with Units

$$0.713 \, \text{m}^{-1} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \sqrt{\frac{1660 \, \text{m}^2}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}}}$$

4.4) Surface to Volume Ratio of Pentagonal Cupola given Volume Formula 📱

Formula

$$R_{A/V} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{V}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}}}$$

Example with Units

$$0.7159 \, \text{m}^{-1} = \frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{2300 \, \text{m}^3}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right)} \right)^{\frac{1}{3}}}$$

5) Volume of Pentagonal Cupola Formulas 📱

5.1) Volume of Pentagonal Cupola Formula 📱

Formula

$$V = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot l_e^{\,3}$$

Example with Units

$$2324.0453 \, \text{m}^3 = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot 10 \, \text{m}^3$$

5.2) Volume of Pentagonal Cupola given Height Formula 📱

Formula

$$V = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{h}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{\pi}{5} \right) \right)^2}} \right)^3$$

Example with Units

$$1999.2337 \, \text{m}^3 = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{5 \, \text{m}}{\sqrt{1 - \left(\frac{1}{4} \cdot cosec \left(\frac{3.1416}{5} \right) \right)^2}} \right)^3$$

5.3) Volume of Pentagonal Cupola given Surface to Volume Ratio Formula

Formula

$$V = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot R_{A/V}} \right)^3$$

Example with Units

$$2460.0878\,\text{m}^3 = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)}{\frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot 0.7\,\text{m}^{-1}} \right)^3$$

5.4) Volume of Pentagonal Cupola given Total Surface Area Formula

Formula

$$V = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{TSA}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)} \right)^{\frac{3}{2}}$$

Example with Units

$$2328.3044\,\text{m}^3 = \frac{1}{6} \cdot \left(5 + \left(4 \cdot \sqrt{5} \right) \right) \cdot \left(\frac{1660\,\text{m}^2}{\frac{1}{4} \cdot \left(20 + \left(5 \cdot \sqrt{3} \right) + \sqrt{5 \cdot \left(145 + \left(62 \cdot \sqrt{5} \right) \right)} \right)} \right)^{\frac{3}{2}}$$

Variables used in list of Pentagonal Cupola Formulas above

- **h** Height of Pentagonal Cupola *(Meter)*
- **l$_e$** Edge Length of Pentagonal Cupola *(Meter)*
- **R$_{A/V}$** Surface to Volume Ratio of Pentagonal Cupola *(1 per Meter)*
- **TSA** Total Surface Area of Pentagonal Cupola *(Square Meter)*
- **V** Volume of Pentagonal Cupola *(Cubic Meter)*

Constants, Functions, Measurements used in list of Pentagonal Cupola Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **cosec**, cosec(Angle) *The cosecant function is a trigonometric function that is the reciprocal of the sine function.*
- Functions: **sec**, sec(Angle) *Secant is a trigonometric function that is defined ratio of the hypotenuse to the shorter side adjacent to an acute angle (in a right-angled triangle); the reciprocal of a cosine.*
- Functions: **sqrt**, sqrt(Number) *A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion* 📤
- Measurement: **Volume** in Cubic Meter (m³) *Volume Unit Conversion* 📤
- Measurement: **Area** in Square Meter (m²) *Area Unit Conversion* 📤
- Measurement: **Reciprocal Length** in 1 per Meter (m⁻¹) *Reciprocal Length Unit Conversion* 📤

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