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# Circular Hyperboloid Formulas

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# List of 12 Circular Hyperboloid Formulas

## Circular Hyperboloid

### 1) Shape Parameter of Circular Hyperboloid

Open Calculator

fx $$p = \sqrt{\frac{h^2}{4 \cdot \left(\frac{r_{Base}^2}{r_{Skirt}^2} - 1\right)}}$$

ex $$3.464102\text{m} = \sqrt{\frac{(12\text{m})^2}{4 \cdot \left(\frac{(20\text{m})^2}{(10\text{m})^2} - 1\right)}}$$

### 2) Shape Parameter of Circular Hyperboloid given Volume

Open Calculator

fx $$p = \frac{3 \cdot V}{2 \cdot \pi \cdot \sqrt{\frac{r_{Base}^2}{r_{Skirt}^2} - 1} \cdot \left(\left(2 \cdot r_{Skirt}^2\right) + r_{Base}^2\right)}$$

ex $$3.468778\text{m} = \frac{3 \cdot 7550\text{m}^3}{2 \cdot \pi \cdot \sqrt{\frac{(20\text{m})^2}{(10\text{m})^2} - 1} \cdot \left(\left(2 \cdot (10\text{m})^2\right) + (20\text{m})^2\right)}$$

# Height and Volume of Circular Hyperboloid

## 3) Height of Circular Hyperboloid

Open Calculator

fx $$h = 2 \cdot p \cdot \sqrt{\frac{r_{Base}^2}{r_{Skirt}^2} - 1}$$

ex $$12.12436\text{m} = 2 \cdot 3.5\text{m} \cdot \sqrt{\frac{(20\text{m})^2}{(10\text{m})^2} - 1}$$

## 4) Height of Circular Hyperboloid given Volume

Open Calculator

fx $$h = \frac{3 \cdot V}{\pi \cdot \left(\left(2 \cdot r_{Skirt}^2\right) + r_{Base}^2\right)}$$

ex $$12.0162\text{m} = \frac{3 \cdot 7550\text{m}^3}{\pi \cdot \left(\left(2 \cdot (10\text{m})^2\right) + (20\text{m})^2\right)}$$

## 5) Volume of Circular Hyperboloid

Open Calculator

fx $$V = \frac{1}{3} \cdot \pi \cdot h \cdot \left(\left(2 \cdot r_{Skirt}^2\right) + r_{Base}^2\right)$$

ex $$7539.822\text{m}^3 = \frac{1}{3} \cdot \pi \cdot 12\text{m} \cdot \left(\left(2 \cdot (10\text{m})^2\right) + (20\text{m})^2\right)$$

## 6) Volume of Circular Hyperboloid given Base Radius and Skirt Radius

Open Calculator

fx $$V = \frac{2}{3} \cdot \pi \cdot p \cdot \sqrt{\frac{r_{Base}^2}{r_{Skirt}^2} - 1} \cdot \left( \left( 2 \cdot r_{Skirt}^2 \right) + r_{Base}^2 \right)$$

ex $$7617.957\text{m}^3 = \frac{2}{3} \cdot \pi \cdot 3.5\text{m} \cdot \sqrt{\frac{(20\text{m})^2}{(10\text{m})^2} - 1} \cdot \left( \left( 2 \cdot (10\text{m})^2 \right) + (20\text{m})^2 \right)$$

## 7) Volume of Hyperboloid given Base Radius

Open Calculator

fx $$V = \frac{1}{3} \cdot \pi \cdot h \cdot r_{Base}^2 \cdot \left( \frac{2}{1 + \frac{h^2}{4 \cdot p^2}} + 1 \right)$$

ex $$7578.889\text{m}^3 = \frac{1}{3} \cdot \pi \cdot 12\text{m} \cdot (20\text{m})^2 \cdot \left( \frac{2}{1 + \frac{(12\text{m})^2}{4 \cdot (3.5\text{m})^2}} + 1 \right)$$

## 8) Volume of Hyperboloid given Skirt Radius

Open Calculator

fx $$V = \frac{1}{3} \cdot \pi \cdot h \cdot r_{Skirt}^2 \cdot \left( 3 + \frac{h^2}{4 \cdot p^2} \right)$$

ex $$7462.885\text{m}^3 = \frac{1}{3} \cdot \pi \cdot 12\text{m} \cdot (10\text{m})^2 \cdot \left( 3 + \frac{(12\text{m})^2}{4 \cdot (3.5\text{m})^2} \right)$$

# Radius of Hyperboloid

## 9) Base Radius of Circular Hyperboloid

Open Calculator

fx $$r_{Base} = r_{Skirt} \cdot \sqrt{1 + \frac{h^2}{4 \cdot p^2}}$$

ex $$19.84635\text{m} = 10\text{m} \cdot \sqrt{1 + \frac{(12\text{m})^2}{4 \cdot (3.5\text{m})^2}}$$

## 10) Base Radius of Circular Hyperboloid given Volume

Open Calculator

fx $$r_{Base} = \sqrt{\frac{3 \cdot V}{\pi \cdot h} - \left(2 \cdot r_{Skirt}^2\right)}$$

ex $$20.02024\text{m} = \sqrt{\frac{3 \cdot 7550\text{m}^3}{\pi \cdot 12\text{m}} - \left(2 \cdot (10\text{m})^2\right)}$$

## 11) Skirt Radius of Circular Hyperboloid

Open Calculator

fx $$r_{Skirt} = \frac{r_{Base}}{\sqrt{1 + \frac{h^2}{4 \cdot p^2}}}$$

ex $$10.07742\text{m} = \frac{20\text{m}}{\sqrt{1 + \frac{(12\text{m})^2}{4 \cdot (3.5\text{m})^2}}}$$

## 12) Skirt Radius of Circular Hyperboloid given Volume

Open Calculator

fx $$r_{Skirt} = \sqrt{\frac{1}{2} \cdot \left( \frac{3 \cdot V}{\pi \cdot h} - r_{Base}^2 \right)}$$

ex $$10.02023\text{m} = \sqrt{\frac{1}{2} \cdot \left( \frac{3 \cdot 7550\text{m}^3}{\pi \cdot 12\text{m}} - (20\text{m})^2 \right)}$$

# Variables Used

- **h** Height of Circular Hyperboloid *(Meter)*
- **p** Shape Parameter of Circular Hyperboloid *(Meter)*
- $r_{Base}$ Base Radius of Circular Hyperboloid *(Meter)*
- $r_{Skirt}$ Skirt Radius of Circular Hyperboloid *(Meter)*
- **V** Volume of Circular Hyperboloid *(Cubic Meter)*

# Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  *Archimedes' constant*
- Function: **sqrt**, sqrt(Number)
  *Square root function*
- Measurement: **Length** in Meter (m)
  *Length Unit Conversion*
- Measurement: **Volume** in Cubic Meter ($m^3$)
  *Volume Unit Conversion*

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- Capsule Formulas
- Circular Hyperboloid Formulas
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- Cut Cylinder Formulas
- Cut Cylindrical Shell Formulas
- Cylinder Formulas
- Cylindrical Shell Formulas
- Diagonally Halved Cylinder Formulas
- Disphenoid Formulas
- Double Calotte Formulas
- Double Point Formulas
- Ellipsoid Formulas
- Elliptic Cylinder Formulas
- Elongated Dodecahedron Formulas
- Flat End Cylinder Formulas
- Frustum of Cone Formulas
- Great Dodecahedron Formulas
- Great Icosahedron Formulas
- Great Stellated Dodecahedron Formulas
- Half Cylinder Formulas
- Half Tetrahedron Formulas
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- Solid of Revolution Formulas
- Sphere Formulas
- Spherical Cap Formulas
- Spherical Corner Formulas
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- Spherical Segment Formulas
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