Important Ellipsoid Formulas PDF

Formulas
Examples
with Units

List of 23
Important Ellipsoid Formulas

1) Axis of Ellipsoid Formulas

1.1) First Semi Axis of Ellipsoid Formula

Evaluate Formula

Formula

$$a = \frac{3 \cdot V}{4 \cdot \pi \cdot b \cdot c}$$

Example with Units

$$10.2314\,\text{m} = \frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 7\,\text{m} \cdot 4\,\text{m}}$$

1.2) First Semi Axis of Ellipsoid given Surface Area Formula

Evaluate Formula

Formula

$$a = \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(b \cdot c \right)^{1.6075}}{b^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$9.9376\,\text{m} = \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{7\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

1.3) Second Semi Axis of Ellipsoid Formula

Evaluate Formula

Formula

$$b = \frac{3 \cdot V}{4 \cdot \pi \cdot a \cdot c}$$

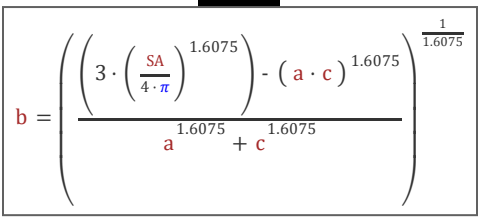
Example with Units

$$7.162\,\text{m} = \frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 4\,\text{m}}$$

1.4) Second Semi Axis of Ellipsoid given Surface Area Formula

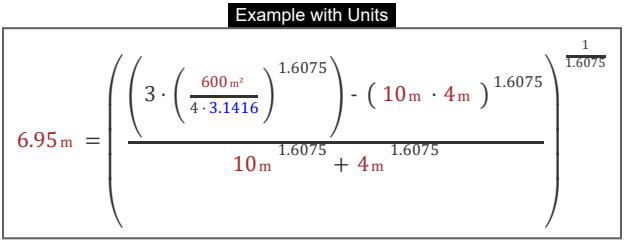
Evaluate Formula

Formula



$$b = \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot c \right)^{1.6075}}{a^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units

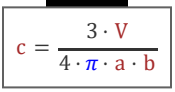


$$6.95\,\text{m} = \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

1.5) Third Semi Axis of Ellipsoid Formula

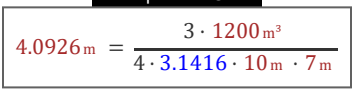
Evaluate Formula

Formula



$$c = \frac{3 \cdot V}{4 \cdot \pi \cdot a \cdot b}$$

Example with Units

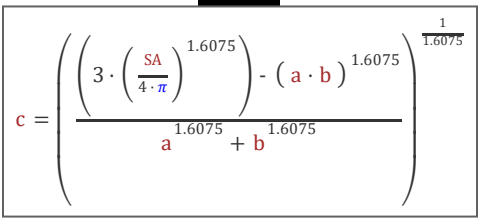


$$4.0926\,\text{m} = \frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 7\,\text{m}}$$

1.6) Third Semi Axis of Ellipsoid given Surface Area Formula

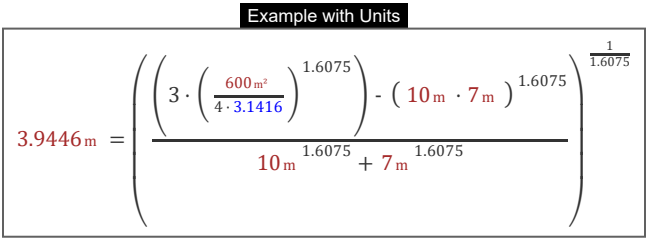
Evaluate Formula

Formula



$$c = \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot b \right)^{1.6075}}{a^{1.6075} + b^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units



$$3.9446\,\text{m} = \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 7\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

2) Surface Area of Ellipsoid Formulas

2.1) Surface Area of Ellipsoid Formula

Evaluate Formula

Formula

$$SA = 4 \cdot \pi \cdot \left(\frac{(a \cdot b)^{1.6075} + (b \cdot c)^{1.6075} + (a \cdot c)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$603.2371\,\text{m}^2 = 4 \cdot 3.1416 \cdot \left(\frac{(10\,\text{m} \cdot 7\,\text{m})^{1.6075} + (7\,\text{m} \cdot 4\,\text{m})^{1.6075} + (10\,\text{m} \cdot 4\,\text{m})^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

2.2) Surface Area of Ellipsoid given Volume, First, and Second Semi Axes Formula

Evaluate Formula

Formula

$$SA = 4 \cdot \pi \cdot \left(\frac{(a \cdot b)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot a}\right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot b}\right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$608.6864\,\text{m}^2 = 4 \cdot 3.1416 \cdot \left(\frac{(10\,\text{m} \cdot 7\,\text{m})^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m}}\right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 7\,\text{m}}\right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

2.3) Surface Area of Ellipsoid given Volume, First, and Third Semi Axes Formula

Evaluate Formula

Formula

$$SA = 4 \cdot \pi \cdot \left(\frac{\left(\frac{3 \cdot V}{4 \cdot \pi \cdot c}\right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot a}\right)^{1.6075} + (a \cdot c)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$613.7431\,\text{m}^2 = 4 \cdot 3.1416 \cdot \left(\frac{\left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 4\,\text{m}}\right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m}}\right)^{1.6075} + (10\,\text{m} \cdot 4\,\text{m})^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

2.4) Surface Area of Ellipsoid given Volume, Second, and Third Semi Axes Formula

Evaluate Formula

Formula

$$SA = 4 \cdot \pi \cdot \left(\frac{\left(\frac{3 \cdot V}{4 \cdot \pi \cdot c} \right)^{1.6075} + \left(b \cdot c \right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot b} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$615.251\,\text{m}^2 = 4 \cdot 3.1416 \cdot \left(\frac{\left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 4\,\text{m}} \right)^{1.6075} + \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 7\,\text{m}} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}$$

3) Surface to Volume Ratio of Ellipsoid Formulas

3.1) Surface to Volume Ratio of Ellipsoid Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{3 \cdot \left(\frac{\left(a \cdot b \right)^{1.6075} + \left(b \cdot c \right)^{1.6075} + \left(a \cdot c \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{a \cdot b \cdot c}$$

Example with Units

$$0.5143\,\text{m}^{-1} = \frac{3 \cdot \left(\frac{\left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075} + \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075} + \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{10\,\text{m} \cdot 7\,\text{m} \cdot 4\,\text{m}}$$

3.2) Surface to Volume Ratio of Ellipsoid given Surface Area Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{SA}{\frac{4}{3} \cdot \pi \cdot a \cdot b \cdot c}$$

Example with Units

$$0.5116\,\text{m}^{-1} = \frac{600\,\text{m}^2}{\frac{4}{3} \cdot 3.1416 \cdot 10\,\text{m} \cdot 7\,\text{m} \cdot 4\,\text{m}}$$

3.3) Surface to Volume Ratio of Ellipsoid given Surface Area, First and Second Semi Axes Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{SA}{\frac{4 \cdot \pi \cdot a \cdot b}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot b \right)^{1.6075}}{a^{1.6075} + b^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

Example with Units

$$0.5187\,\text{m}^{-1} = \frac{600\,\text{m}^2}{\frac{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 7\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 7\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

3.4) Surface to Volume Ratio of Ellipsoid given Surface Area, First and Third Semi Axis Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{SA}{\frac{4 \cdot \pi \cdot a \cdot c}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot c \right)^{1.6075}}{a^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

Example with Units

$$0.5153\,\text{m}^{-1} = \frac{600\,\text{m}^2}{\frac{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 4\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

3.5) Surface to Volume Ratio of Ellipsoid given Surface Area, Second and Third Semi Axes Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{SA}{\frac{4 \cdot \pi \cdot b \cdot c}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(b \cdot c \right)^{1.6075}}{b^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

Example with Units

$$0.5148\,\text{m}^{-1} = \frac{600\,\text{m}^2}{\frac{4 \cdot 3.1416 \cdot 7\,\text{m} \cdot 4\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{7\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}}$$

3.6) Surface to Volume Ratio of Ellipsoid given Volume Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{4 \cdot \pi \cdot \left(\frac{\left(a \cdot b \right)^{1.6075} + \left(b \cdot c \right)^{1.6075} + \left(a \cdot c \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{V}$$

Example with Units

$$0.5027\,\text{m}^{-1} = \frac{4 \cdot 3.1416 \cdot \left(\frac{\left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075} + \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075} + \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{1200\,\text{m}^3}$$

3.7) Surface to Volume Ratio of Ellipsoid given Volume, First and Second Semi Axes Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{4 \cdot \pi \cdot \left(\frac{\left(a \cdot b \right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot a} \right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot b} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{V}$$

Example with Units

$$0.5072\,\text{m}^{-1} = \frac{4 \cdot 3.1416 \cdot \left(\frac{\left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m}} \right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 7\,\text{m}} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{1200\,\text{m}^3}$$

3.8) Surface to Volume Ratio of Ellipsoid given Volume, First and Third Semi Axes Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{4 \cdot \pi \cdot \left(\frac{\left(\frac{3 \cdot V}{4 \cdot \pi \cdot c} \right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot a} \right)^{1.6075} + \left(a \cdot c \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{V}$$

Example with Units

$$0.5115\,\text{m}^{-1} = \frac{4 \cdot 3.1416 \cdot \left(\frac{\left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 4\,\text{m}} \right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 10\,\text{m}} \right)^{1.6075} + \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{1200\,\text{m}^3}$$

3.9) Surface to Volume Ratio of Ellipsoid given Volume, Second and Third Semi Axes Formula

Evaluate Formula

Formula

$$R_{A/V} = \frac{4 \cdot \pi \cdot \left(\frac{\left(\frac{3 \cdot V}{4 \cdot \pi \cdot c} \right)^{1.6075} + \left(b \cdot c \right)^{1.6075} + \left(\frac{3 \cdot V}{4 \cdot \pi \cdot b} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{V}$$

Example with Units

$$0.5127\,\text{m}^{-1} = \frac{4 \cdot 3.1416 \cdot \left(\frac{\left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 4\,\text{m}} \right)^{1.6075} + \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075} + \left(\frac{3 \cdot 1200\,\text{m}^3}{4 \cdot 3.1416 \cdot 7\,\text{m}} \right)^{1.6075}}{3} \right)^{\frac{1}{1.6075}}}{1200\,\text{m}^3}$$

4) Volume of Ellipsoid Formulas

4.1) Volume of Ellipsoid Formula

Evaluate Formula

Formula

$$V = \frac{4}{3} \cdot \pi \cdot a \cdot b \cdot c$$

Example with Units

$$1172.8613\,\text{m}^3 = \frac{4}{3} \cdot 3.1416 \cdot 10\,\text{m} \cdot 7\,\text{m} \cdot 4\,\text{m}$$

4.2) Volume of Ellipsoid given Surface Area, First and Second Semi Axes Formula

Evaluate Formula

Formula

$$V = \frac{4 \cdot \pi \cdot a \cdot b}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot b \right)^{1.6075}}{a^{1.6075} + b^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$1156.6295\,\text{m}^3 = \frac{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 7\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 7\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 7\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

4.3) Volume of Ellipsoid given Surface Area, First and Third Semi Axes Formula

Evaluate Formula

Formula

$$V = \frac{4 \cdot \pi \cdot a \cdot c}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(a \cdot c \right)^{1.6075}}{a^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$1164.4804\,\text{m}^3 = \frac{4 \cdot 3.1416 \cdot 10\,\text{m} \cdot 4\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(10\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{10\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

4.4) Volume of Ellipsoid given Surface Area, Second and Third Semi Axes Formula

Evaluate Formula

Formula

$$V = \frac{4 \cdot \pi \cdot b \cdot c}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{SA}{4 \cdot \pi} \right)^{1.6075} \right) - \left(b \cdot c \right)^{1.6075}}{b^{1.6075} + c^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Example with Units

$$1165.5398\,\text{m}^3 = \frac{4 \cdot 3.1416 \cdot 7\,\text{m} \cdot 4\,\text{m}}{3} \cdot \left(\frac{\left(3 \cdot \left(\frac{600\,\text{m}^2}{4 \cdot 3.1416} \right)^{1.6075} \right) - \left(7\,\text{m} \cdot 4\,\text{m} \right)^{1.6075}}{7\,\text{m}^{1.6075} + 4\,\text{m}^{1.6075}} \right)^{\frac{1}{1.6075}}$$

Variables used in list of Ellipsoid Formulas above

- **a** First Semi Axis of Ellipsoid *(Meter)*
- **b** Second Semi Axis of Ellipsoid *(Meter)*
- **c** Third Semi Axis of Ellipsoid *(Meter)*
- **$R_{A/V}$** Surface to Volume Ratio of Ellipsoid *(1 per Meter)*
- **SA** Surface Area of Ellipsoid *(Square Meter)*
- **V** Volume of Ellipsoid *(Cubic Meter)*

Constants, Functions, Measurements used in list of Ellipsoid Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Reciprocal Length** in 1 per Meter (m^{-1})
  Reciprocal Length Unit Conversion

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- Important Hollow Pyramid Formulas
- Important Hollow Sphere Formulas
- Important Ingot Formulas
- Important Obelisk Formulas
- Important Oblique Cylinder Formulas
- Important Oblique Prism Formulas
- Important Obtuse Edged Cuboid Formulas
- Important Oloid Formulas
- Important Paraboloid Formulas
- Important Parallelepiped Formulas
- Important Ramp Formulas
- Important Regular Bipyramid Formulas
- Important Rhombohedron Formulas
- Important Right Wedge Formulas
- Important Semi Ellipsoid Formulas
- Important Sharp Bent Cylinder Formulas
- Important Skewed Three Edged Prism Formulas

- Important Small Stellated Dodecahedron Formulas
- Important Solid of Revolution Formulas
- Important Sphere Formulas
- Important Spherical Cap Formulas
- Important Spherical Corner Formulas
- Important Spherical Ring Formulas
- Important Spherical Sector Formulas
- Important Spherical Segment Formulas
- Important Spherical Wedge Formulas
- Important Square Pillar Formulas
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