Important Formulas of Icosahedron PDF

Formulas
Examples
with Units

List of 34
Important Formulas of Icosahedron

1) Edge Length of Icosahedron Formulas

1.1) Edge Length of Icosahedron given Circumsphere Radius Formula

Evaluate Formula

Formula

$$l_e = \frac{4 \cdot r_c}{\sqrt{10 + \left(2 \cdot \sqrt{5}\right)}}$$

Example with Units

$$9.4632\,\text{m} = \frac{4 \cdot 9\,\text{m}}{\sqrt{10 + \left(2 \cdot \sqrt{5}\right)}}$$

1.2) Edge Length of Icosahedron given Face Perimeter Formula

Evaluate Formula

Formula

$$l_e = \frac{P_{Face}}{3}$$

Example with Units

$$10\,\text{m} = \frac{30\,\text{m}}{3}$$

1.3) Edge Length of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$l_e = \sqrt{\frac{TSA}{5 \cdot \sqrt{3}}}$$

Example with Units

$$10.0229\,\text{m} = \sqrt{\frac{870\,\text{m}^2}{5 \cdot \sqrt{3}}}$$

1.4) Edge Length of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$l_e = \left(\frac{\frac{12}{5} \cdot V}{3 + \sqrt{5}}\right)^{\frac{1}{3}}$$

Example with Units

$$10.0279\,\text{m} = \left(\frac{\frac{12}{5} \cdot 2200\,\text{m}^3}{3 + \sqrt{5}}\right)^{\frac{1}{3}}$$

2) Perimeter of Icosahedron Formulas

2.1) Face Perimeter of Icosahedron Formula

Evaluate Formula

Formula

$$P_{Face} = 3 \cdot l_e$$

Example with Units

$$30\,\text{m} = 3 \cdot 10\,\text{m}$$

2.2) Face Perimeter of Icosahedron given Circumsphere Radius Formula

Evaluate Formula

Formula

$$P_{Face} = \frac{12 \cdot r_c}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

Example with Units

$$28.3895\,\text{m} = \frac{12 \cdot 9\,\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

2.3) Face Perimeter of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$P_{Face} = 3 \cdot \left(\frac{12 \cdot V}{5 \cdot (3 + \sqrt{5})}\right)^{\frac{1}{3}}$$

Example with Units

$$30.0837\,\text{m} = 3 \cdot \left(\frac{12 \cdot 2200\,\text{m}^3}{5 \cdot (3 + \sqrt{5})}\right)^{\frac{1}{3}}$$

2.4) Perimeter of Icosahedron Formula

Evaluate Formula

Formula

$$P = 30 \cdot l_e$$

Example with Units

$$300\,\text{m} = 30 \cdot 10\,\text{m}$$

2.5) Perimeter of Icosahedron given Space Diagonal Formula

Evaluate Formula

Formula

$$P = \frac{60 \cdot d_{Space}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

Example with Units

$$299.6667\,\text{m} = \frac{60 \cdot 19\,\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

2.6) Perimeter of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$P_{Face} = 30 \cdot \left(\frac{12 \cdot V}{5 \cdot (3 + \sqrt{5})}\right)^{\frac{1}{3}}$$

Example with Units

$$300.8367\,\text{m} = 30 \cdot \left(\frac{12 \cdot 2200\,\text{m}^3}{5 \cdot (3 + \sqrt{5})}\right)^{\frac{1}{3}}$$

3) Radius of Icosahedron Formulas

3.1) Circumsphere Radius of Icosahedron Formula

Evaluate Formula

Formula

$$r_c = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot l_e$$

Example with Units

$$9.5106\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot 10\,\text{m}$$

3.2) Circumsphere Radius of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$r_c = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot \left(\frac{12 \cdot V}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{1}{3}}$$

Example with Units

$$9.5371\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot \left(\frac{12 \cdot 2200\,\text{m}^3}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{1}{3}}$$

3.3) Insphere Radius of Icosahedron Formula

Evaluate Formula

Formula

$$r_i = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot l_e$$

Example with Units

$$7.5576\,\text{m} = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot 10\,\text{m}$$

3.4) Insphere Radius of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$r_i = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot \sqrt{\frac{TSA}{5 \cdot \sqrt{3}}}$$

Example with Units

$$7.5749\,\text{m} = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot \sqrt{\frac{870\,\text{m}^2}{5 \cdot \sqrt{3}}}$$

3.5) Midsphere Radius of Icosahedron Formula

Evaluate Formula

Formula

$$r_m = \frac{1 + \sqrt{5}}{4} \cdot l_e$$

Example with Units

$$8.0902\,\text{m} = \frac{1 + \sqrt{5}}{4} \cdot 10\,\text{m}$$

3.6) Midsphere Radius of Icosahedron given Space Diagonal Formula

Evaluate Formula

Formula

$$r_m = \frac{1 + \sqrt{5}}{2} \cdot \frac{d_{Space}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

Example with Units

$$8.0812\,\text{m} = \frac{1 + \sqrt{5}}{2} \cdot \frac{19\,\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

4) Space Diagonal of Icosahedron Formulas

4.1) Space Diagonal of Icosahedron Formula

Evaluate Formula

Formula

$$d_{Space} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot l_e$$

Example with Units

$$19.0211\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot 10\,\text{m}$$

4.2) Space Diagonal of Icosahedron given Lateral Surface Area Formula

Evaluate Formula

Formula

$$d_{Space} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{2 \cdot LSA}{9 \cdot \sqrt{3}}}$$

Example with Units

$$19.0282\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{2 \cdot 780\,\text{m}^2}{9 \cdot \sqrt{3}}}$$

4.3) Space Diagonal of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$d_{Space} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{TSA}{5 \cdot \sqrt{3}}}$$

Example with Units

$$19.0647\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{870\,\text{m}^2}{5 \cdot \sqrt{3}}}$$

4.4) Space Diagonal of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$d_{Space} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \left(\frac{\frac{12}{5} \cdot V}{3 + \sqrt{5}}\right)^{\frac{1}{3}}$$

Example with Units

$$19.0742\,\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \left(\frac{\frac{12}{5} \cdot 2200\,\text{m}^3}{3 + \sqrt{5}}\right)^{\frac{1}{3}}$$

5) Surface Area of Icosahedron Formulas

5.1) Face Area of Icosahedron Formula

Evaluate Formula

Formula

$$A_{Face} = \frac{\sqrt{3}}{4} \cdot l_e^2$$

Example with Units

$$43.3013\,\text{m}^2 = \frac{\sqrt{3}}{4} \cdot 10\,\text{m}^2$$

5.2) Face Area of Icosahedron given Circumsphere Radius Formula

Evaluate Formula

Formula

$$A_{Face} = \frac{\sqrt{3}}{4} \cdot \left(\frac{4 \cdot r_c}{\sqrt{10 + (2 \cdot \sqrt{5})}}\right)^2$$

Example with Units

$$38.7769\,\text{m}^2 = \frac{\sqrt{3}}{4} \cdot \left(\frac{4 \cdot 9\,\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}}\right)^2$$

5.3) Face Area of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$A_{Face} = \frac{TSA}{20}$$

Example with Units

$$43.5\,\text{m}^2 = \frac{870\,\text{m}^2}{20}$$

5.4) Lateral Surface Area of Icosahedron Formula

Evaluate Formula

Formula

$$LSA = 9 \cdot \frac{\sqrt{3}}{2} \cdot l_e^2$$

Example with Units

$$779.4229\,\text{m}^2 = 9 \cdot \frac{\sqrt{3}}{2} \cdot 10\,\text{m}^2$$

5.5) Lateral Surface Area of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$LSA = \frac{9}{10} \cdot TSA$$

Example with Units

$$783\,\text{m}^2 = \frac{9}{10} \cdot 870\,\text{m}^2$$

5.6) Lateral Surface Area of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$LSA = 9 \cdot \frac{\sqrt{3}}{2} \cdot \left(\frac{\frac{12}{5} \cdot V}{3 + \sqrt{5}} \right)^{\frac{2}{3}}$$

Example with Units

$$783.7765\,\text{m}^2 = 9 \cdot \frac{\sqrt{3}}{2} \cdot \left(\frac{\frac{12}{5} \cdot 2200\,\text{m}^3}{3 + \sqrt{5}} \right)^{\frac{2}{3}}$$

5.7) Total Surface Area of Icosahedron Formula

Evaluate Formula

Formula

$$TSA = 5 \cdot \sqrt{3} \cdot l_e^2$$

Example with Units

$$866.0254\,\text{m}^2 = 5 \cdot \sqrt{3} \cdot 10\,\text{m}^2$$

5.8) Total Surface Area of Icosahedron given Circumsphere Radius Formula

Evaluate Formula

Formula

$$TSA = 5 \cdot \sqrt{3} \cdot \left(\frac{4 \cdot r_c}{\sqrt{10 + (2 \cdot \sqrt{5})}} \right)^2$$

Example with Units

$$775.5379\,\text{m}^2 = 5 \cdot \sqrt{3} \cdot \left(\frac{4 \cdot 9\,\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}} \right)^2$$

5.9) Total Surface Area of Icosahedron given Lateral Surface Area and Edge Length Formula

Evaluate Formula

Formula

$$TSA = LSA + \frac{\sqrt{3}}{2} \cdot l_e^2$$

Example with Units

$$866.6025\,\text{m}^2 = 780\,\text{m}^2 + \frac{\sqrt{3}}{2} \cdot 10\,\text{m}^2$$

5.10) Total Surface Area of Icosahedron given Volume Formula

Evaluate Formula

Formula

$$TSA = 5 \cdot \sqrt{3} \cdot \left(\frac{12 \cdot V}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{2}{3}}$$

Example with Units

$$870.8628\,\text{m}^2 = 5 \cdot \sqrt{3} \cdot \left(\frac{12 \cdot 2200\,\text{m}^3}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{2}{3}}$$

6) Volume of Icosahedron Formulas

6.1) Volume of Icosahedron Formula

Evaluate Formula

Formula

$$V = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot l_e^{\,3}$$

Example with Units

$$2181.695\,\text{m}^3 = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot 10\,\text{m}^{\,3}$$

6.2) Volume of Icosahedron given Circumsphere Radius Formula

Evaluate Formula

Formula

$$V = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot \left(\frac{4 \cdot r_c}{\sqrt{10 + \left(2 \cdot \sqrt{5}\right)}}\right)^3$$

Example with Units

$$1848.8539\,\text{m}^3 = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot \left(\frac{4 \cdot 9\,\text{m}}{\sqrt{10 + \left(2 \cdot \sqrt{5}\right)}}\right)^3$$

6.3) Volume of Icosahedron given Insphere Radius Formula

Evaluate Formula

Formula

$$V = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot \left(\frac{12 \cdot r_i}{\sqrt{3} \cdot \left(3 + \sqrt{5}\right)}\right)^3$$

Example with Units

$$1733.5413\,\text{m}^3 = \frac{5}{12} \cdot \left(3 + \sqrt{5}\right) \cdot \left(\frac{12 \cdot 7\,\text{m}}{\sqrt{3} \cdot \left(3 + \sqrt{5}\right)}\right)^3$$

6.4) Volume of Icosahedron given Total Surface Area Formula

Evaluate Formula

Formula

$$V = \frac{3 + \sqrt{5}}{12 \cdot \sqrt{5}} \cdot \left(\frac{TSA}{\sqrt{3}}\right)^{\frac{3}{2}}$$

Example with Units

$$2196.7314\,\text{m}^3 = \frac{3 + \sqrt{5}}{12 \cdot \sqrt{5}} \cdot \left(\frac{870\,\text{m}^2}{\sqrt{3}}\right)^{\frac{3}{2}}$$

Variables used in list of Important Formulas of Icosahedron above

- A_{Face} Face Area of Icosahedron *(Square Meter)*
- d_{Space} Space Diagonal of Icosahedron *(Meter)*
- l_e Edge Length of Icosahedron *(Meter)*
- **LSA** Lateral Surface Area of Icosahedron *(Square Meter)*
- **P** Perimeter of Icosahedron *(Meter)*
- P_{Face} Face Perimeter of Icosahedron *(Meter)*
- r_c Circumsphere Radius of Icosahedron *(Meter)*
- r_i Insphere Radius of Icosahedron *(Meter)*
- r_m Midsphere Radius of Icosahedron *(Meter)*
- **TSA** Total Surface Area of Icosahedron *(Square Meter)*
- **V** Volume of Icosahedron *(Cubic Meter)*

Constants, Functions, Measurements used in list of Important Formulas of Icosahedron above

- 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 (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion

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