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# Important Formulas of Icosahedron

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# List of 34 Important Formulas of Icosahedron

## Important Formulas of Icosahedron

### Edge Length of Icosahedron

#### 1) Edge Length of Icosahedron given Circumsphere Radius

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

Open Calculator 

$$ex \quad 9.46316m = \frac{4 \cdot 9m}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

#### 2) Edge Length of Icosahedron given Face Perimeter

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

Open Calculator 

$$ex \quad 10m = \frac{30m}{3}$$



### 3) Edge Length of Icosahedron given Total Surface Area

[Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb\_img.jpg\)](#)

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

$$ex \quad 10.02292m = \sqrt{\frac{870m^2}{5 \cdot \sqrt{3}}}$$

### 4) Edge Length of Icosahedron given Volume

[Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1\_img.jpg\)](#)

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

$$ex \quad 10.02789m = \left( \frac{\frac{12}{5} \cdot 2200m^3}{3 + \sqrt{5}} \right)^{\frac{1}{3}}$$

## Perimeter of Icosahedron

### 5) Face Perimeter of Icosahedron

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

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

$$ex \quad 30m = 3 \cdot 10m$$



6) Face Perimeter of Icosahedron given Circumsphere Radius 

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

Open Calculator 

$$ex \quad 28.38948m = \frac{12 \cdot 9m}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

7) Face Perimeter of Icosahedron given Volume 

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

Open Calculator 

$$ex \quad 30.08367m = 3 \cdot \left( \frac{12 \cdot 2200m^3}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{1}{3}}$$

8) Perimeter of Icosahedron 

$$fx \quad P = 30 \cdot l_e$$

Open Calculator 

$$ex \quad 300m = 30 \cdot 10m$$



9) Perimeter of Icosahedron given Space Diagonal Open Calculator 

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

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

10) Perimeter of Icosahedron given Volume Open Calculator 

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

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



## Radius of Icosahedron

### 11) Circumsphere Radius of Icosahedron

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0\_img.jpg\)](#)

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

$$\text{ex } 9.510565\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot 10\text{m}$$


### 12) Circumsphere Radius of Icosahedron given Volume

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5\_img.jpg\)](#)

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

$$\text{ex } 9.53709\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{4} \cdot \left( \frac{12 \cdot 2200\text{m}^3}{5 \cdot (3 + \sqrt{5})} \right)^{\frac{1}{3}}$$



13) Insphere Radius of Icosahedron [Open Calculator !\[\]\(feabb98897b440bc8695a03336a6e2df\_img.jpg\)](#)


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

$$\text{ex } 7.557613\text{m} = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot 10\text{m}$$

14) Insphere Radius of Icosahedron given Total Surface Area [Open Calculator !\[\]\(642aa997563f9a325b310230bb5078b7\_img.jpg\)](#)

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

$$\text{ex } 7.574936\text{m} = \frac{\sqrt{3} \cdot (3 + \sqrt{5})}{12} \cdot \sqrt{\frac{870\text{m}^2}{5 \cdot \sqrt{3}}}$$

15) Midsphere Radius of Icosahedron [Open Calculator !\[\]\(51514032c8ca341817228f39f1307b05\_img.jpg\)](#)

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

$$\text{ex } 8.09017\text{m} = \frac{1 + \sqrt{5}}{4} \cdot 10\text{m}$$



## 16) Midsphere Radius of Icosahedron given Space Diagonal

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

[Open Calculator !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107\_img.jpg\)](#)

$$\text{ex } 8.081183\text{m} = \frac{1 + \sqrt{5}}{2} \cdot \frac{19\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}}$$

## Space Diagonal of Icosahedron

### 17) Space Diagonal of Icosahedron

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

[Open Calculator !\[\]\(f95dab70c751fda7d824b8b03650f7aa\_img.jpg\)](#)

$$\text{ex } 19.02113\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot 10\text{m}$$





18) Space Diagonal of Icosahedron given Lateral Surface Area Open Calculator 

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

$$\text{ex } 19.02817\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{2 \cdot 780\text{m}^2}{9 \cdot \sqrt{3}}}$$

19) Space Diagonal of Icosahedron given Total Surface Area Open Calculator 

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

$$\text{ex } 19.06473\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \sqrt{\frac{870\text{m}^2}{5 \cdot \sqrt{3}}}$$



## 20) Space Diagonal of Icosahedron given Volume

[Open Calculator !\[\]\(99f58673407353e96a019fbca558fd72\_img.jpg\)](#)

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

$$\text{ex } 19.07418\text{m} = \frac{\sqrt{10 + (2 \cdot \sqrt{5})}}{2} \cdot \left( \frac{\frac{12}{5} \cdot 2200\text{m}^3}{3 + \sqrt{5}} \right)^{\frac{1}{3}}$$

## Surface Area of Icosahedron

### 21) Face Area of Icosahedron

[Open Calculator !\[\]\(3211b5d1d968fc1665909b34f9f16010\_img.jpg\)](#)

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

$$\text{ex } 43.30127\text{m}^2 = \frac{\sqrt{3}}{4} \cdot (10\text{m})^2$$



## 22) Face Area of Icosahedron given Circumsphere Radius

[Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb\_img.jpg\)](#)

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

$$\text{ex } 38.77689\text{m}^2 = \frac{\sqrt{3}}{4} \cdot \left( \frac{4 \cdot 9\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}} \right)^2$$

## 23) Face Area of Icosahedron given Total Surface Area

[Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1\_img.jpg\)](#)

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

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


## 24) Lateral Surface Area of Icosahedron

[Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77\_img.jpg\)](#)

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

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



25) Lateral Surface Area of Icosahedron given Total Surface Area 

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95\_img.jpg\)](#)

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

26) Lateral Surface Area of Icosahedron given Volume 

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2\_img.jpg\)](#)

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

27) Total Surface Area of Icosahedron 

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

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7\_img.jpg\)](#)

$$\text{ex } 866.0254\text{m}^2 = 5 \cdot \sqrt{3} \cdot (10\text{m})^2$$



## 28) Total Surface Area of Icosahedron given Circumsphere Radius

[Open Calculator !\[\]\(bd1a142de767a21e5362c595f844a4ff\_img.jpg\)](#)

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

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

## 29) Total Surface Area of Icosahedron given Lateral Surface Area and Edge Length

[Open Calculator !\[\]\(830769b31eeeaca920791081939ff8ba\_img.jpg\)](#)

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

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



### 30) Total Surface Area of Icosahedron given Volume

[Open Calculator !\[\]\(eafc244b53721dd1ec133f0772f70fc7\_img.jpg\)](#)

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

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

### Volume of Icosahedron

#### 31) Volume of Icosahedron

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5\_img.jpg\)](#)

$$\text{fx } V = \frac{5}{12} \cdot (3 + \sqrt{5}) \cdot l_e^3$$

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



32) Volume of Icosahedron given Circumsphere Radius 


fx

Open Calculator 

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

ex

$$1848.854\text{m}^3 = \frac{5}{12} \cdot (3 + \sqrt{5}) \cdot \left( \frac{4 \cdot 9\text{m}}{\sqrt{10 + (2 \cdot \sqrt{5})}} \right)^3$$

33) Volume of Icosahedron given Insphere Radius 

fx

Open Calculator 

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

ex

$$1733.541\text{m}^3 = \frac{5}{12} \cdot (3 + \sqrt{5}) \cdot \left( \frac{12 \cdot 7\text{m}}{\sqrt{3} \cdot (3 + \sqrt{5})} \right)^3$$



**34) Volume of Icosahedron given Total Surface Area** [Open Calculator](#) 

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

$$\text{ex } 2196.731\text{m}^3 = \frac{3 + \sqrt{5}}{12 \cdot \sqrt{5}} \cdot \left( \frac{870\text{m}^2}{\sqrt{3}} \right)^{\frac{3}{2}}$$








## Variables Used

- **$A_{\text{Face}}$**  Face Area of Icosahedron (Square Meter)
- **$d_{\text{Space}}$**  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)
- **$P_{\text{Face}}$**  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

- **Function:** **sqrt**, sqrt(Number)  
*Square root function*
- **Measurement:** **Length** in Meter (m)  
*Length Unit Conversion* 
- **Measurement:** **Volume** in Cubic Meter (m<sup>3</sup>)  
*Volume Unit Conversion* 
- **Measurement:** **Area** in Square Meter (m<sup>2</sup>)  
*Area Unit Conversion* 



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