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# Important Formulas of Dodecahedron

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# List of 33 Important Formulas of Dodecahedron

## Important Formulas of Dodecahedron

### Area of Dodecahedron

#### 1) Face Area of Dodecahedron

$$\text{fx } A_{\text{Face}} = \frac{1}{4} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot l_e^2$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2\_img.jpg\)](#)

$$\text{ex } 172.0477\text{m}^2 = \frac{1}{4} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot (10\text{m})^2$$

#### 2) Face Area of Dodecahedron given Midsphere Radius

**fx**

$$A_{\text{Face}} = \frac{1}{4} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot r_m}{3 + \sqrt{5}} \right)^2$$

[Open Calculator !\[\]\(9c2e8d1b5bd77cb5c9f83b7a9cff79fd\_img.jpg\)](#)

$$\text{ex } 169.6856\text{m}^2 = \frac{1}{4} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot 13\text{m}}{3 + \sqrt{5}} \right)^2$$



### 3) Lateral Surface Area of Dodecahedron

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

$$\text{fx } \text{LSA} = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot l_e^2$$

$$\text{ex } 1720.477\text{m}^2 = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot (10\text{m})^2$$

### 4) Lateral Surface Area of Dodecahedron given Circumsphere Radius

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

$$\text{fx } \text{LSA} = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot r_c}{\sqrt{3} \cdot (1 + \sqrt{5})} \right)^2$$

$$\text{ex } 1717.388\text{m}^2 = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot 14\text{m}}{\sqrt{3} \cdot (1 + \sqrt{5})} \right)^2$$

### 5) Lateral Surface Area of Dodecahedron given Total Surface Area

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

$$\text{fx } \text{LSA} = \frac{5}{6} \cdot \text{TSA}$$

$$\text{ex } 1750\text{m}^2 = \frac{5}{6} \cdot 2100\text{m}^2$$



6) Total Surface Area of Dodecahedron Open Calculator 


$$fx \quad TSA = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot l_e^2$$

$$ex \quad 2064.573m^2 = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot (10m)^2$$

7) Total Surface Area of Dodecahedron given Face Perimeter Open Calculator 

$$fx \quad TSA = \frac{3}{25} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot P_{Face}^2$$

$$ex \quad 2064.573m^2 = \frac{3}{25} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot (50m)^2$$

8) Total Surface Area of Dodecahedron given Volume Open Calculator 

$$fx \quad TSA = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot V}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{2}{3}}$$

$$ex \quad 2071.192m^2 = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left( \frac{4 \cdot 7700m^3}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{2}{3}}$$



## Diagonal of Dodecahedron

### 9) Face Diagonal of Dodecahedron

$$\text{fx } d_{\text{Face}} = \left( \frac{1 + \sqrt{5}}{2} \right) \cdot l_e$$

[Open Calculator !\[\]\(74d4806277d7e73349d8e8c0897931e9\_img.jpg\)](#)

$$\text{ex } 16.18034\text{m} = \left( \frac{1 + \sqrt{5}}{2} \right) \cdot 10\text{m}$$

### 10) Face Diagonal of Dodecahedron given Insphere Radius

$$\text{fx } d_{\text{Face}} = (1 + \sqrt{5}) \cdot \frac{r_i}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762\_img.jpg\)](#)


$$\text{ex } 15.98394\text{m} = (1 + \sqrt{5}) \cdot \frac{11\text{m}}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$



11) Face Diagonal of Dodecahedron given Total Surface Area Open Calculator 

$$fx \quad d_{\text{Face}} = \frac{1 + \sqrt{5}}{2} \cdot \sqrt{\frac{\text{TSA}}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

$$ex \quad 16.31857m = \frac{1 + \sqrt{5}}{2} \cdot \sqrt{\frac{2100m^2}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

12) Space Diagonal of Dodecahedron Open Calculator 

$$fx \quad d_{\text{Space}} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{l_e}{2}$$


$$ex \quad 28.02517m = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{10m}{2}$$

13) Space Diagonal of Dodecahedron given Lateral Surface Area Open Calculator 

$$fx \quad d_{\text{Space}} = \frac{\sqrt{3} \cdot (1 + \sqrt{5})}{2} \cdot \sqrt{\frac{2 \cdot \text{LSA}}{5 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

$$ex \quad 28.2646m = \frac{\sqrt{3} \cdot (1 + \sqrt{5})}{2} \cdot \sqrt{\frac{2 \cdot 1750m^2}{5 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$



14) Space Diagonal of Dodecahedron given Perimeter 

$$\text{fx } d_{\text{Space}} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{P}{60}$$

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5\_img.jpg\)](#)

$$\text{ex } 28.02517\text{m} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{300\text{m}}{60}$$

Edge Length of Dodecahedron 15) Edge Length of Dodecahedron given Circumsphere Radius 

$$\text{fx } l_e = \frac{4 \cdot r_c}{\sqrt{3} \cdot (1 + \sqrt{5})}$$

[Open Calculator !\[\]\(3cb60d42b10e53f9522bb0b392c1c4cd\_img.jpg\)](#)

$$\text{ex } 9.991019\text{m} = \frac{4 \cdot 14\text{m}}{\sqrt{3} \cdot (1 + \sqrt{5})}$$

16) Edge Length of Dodecahedron given Insphere Radius 

$$\text{fx } l_e = \frac{2 \cdot r_i}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$

[Open Calculator !\[\]\(0d7ca0919e6c47bbd874bfa0189fe22e\_img.jpg\)](#)


$$\text{ex } 9.878615\text{m} = \frac{2 \cdot 11\text{m}}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$



17) Edge Length of Dodecahedron given Total Surface Area Open Calculator 


$$fx \quad l_e = \sqrt{\frac{TSA}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

$$ex \quad 10.08543m = \sqrt{\frac{2100m^2}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

18) Edge Length of Dodecahedron given Volume Open Calculator 

$$fx \quad l_e = \left( \frac{4 \cdot V}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{1}{3}}$$

$$ex \quad 10.01602m = \left( \frac{4 \cdot 7700m^3}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{1}{3}}$$


Perimeter of Dodecahedron 19) Face Perimeter of Dodecahedron Open Calculator 

$$fx \quad P_{Face} = 5 \cdot l_e$$

$$ex \quad 50m = 5 \cdot 10m$$





20) Face Perimeter of Dodecahedron given Face Area Open Calculator 


$$\text{fx } P_{\text{Face}} = 5 \cdot \sqrt{\frac{4 \cdot A_{\text{Face}}}{\sqrt{25 + (10 \cdot \sqrt{5})}}}$$

$$\text{ex } 50.42716\text{m} = 5 \cdot \sqrt{\frac{4 \cdot 175\text{m}^2}{\sqrt{25 + (10 \cdot \sqrt{5})}}}$$

21) Perimeter of Dodecahedron Open Calculator 

$$\text{fx } P = 30 \cdot l_e$$

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

22) Perimeter of Dodecahedron given Circumsphere Radius Open Calculator 

$$\text{fx } P = \frac{120 \cdot r_c}{\sqrt{3} \cdot (1 + \sqrt{5})}$$


$$\text{ex } 299.7306\text{m} = \frac{120 \cdot 14\text{m}}{\sqrt{3} \cdot (1 + \sqrt{5})}$$



23) Perimeter of Dodecahedron given Total Surface Area [Open Calculator !\[\]\(99f58673407353e96a019fbca558fd72\_img.jpg\)](#)

$$\text{fx } P = 30 \cdot \sqrt{\frac{\text{TSA}}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$


$$\text{ex } 302.563\text{m} = 30 \cdot \sqrt{\frac{2100\text{m}^2}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

Radius of Dodecahedron 24) Circumsphere Radius of Dodecahedron [Open Calculator !\[\]\(3211b5d1d968fc1665909b34f9f16010\_img.jpg\)](#)

$$\text{fx } r_c = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{l_e}{4}$$


$$\text{ex } 14.01259\text{m} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{10\text{m}}{4}$$



25) Circumsphere Radius of Dodecahedron given Total Surface Area [Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb\_img.jpg\)](#)

$$\text{fx } r_c = \sqrt{3} \cdot \frac{1 + \sqrt{5}}{4} \cdot \sqrt{\frac{\text{TSA}}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

$$\text{ex } 14.1323\text{m} = \sqrt{3} \cdot \frac{1 + \sqrt{5}}{4} \cdot \sqrt{\frac{2100\text{m}^2}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

26) Insphere Radius of Dodecahedron [Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1\_img.jpg\)](#)

$$\text{fx } r_i = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{l_e}{2}$$


$$\text{ex } 11.13516\text{m} = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{10\text{m}}{2}$$

27) Insphere Radius of Dodecahedron given Perimeter [Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77\_img.jpg\)](#)

$$\text{fx } r_i = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{P}{60}$$

$$\text{ex } 11.13516\text{m} = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{300\text{m}}{60}$$




28) Midsphere Radius of Dodecahedron 

$$fx \quad r_m = \frac{3 + \sqrt{5}}{4} \cdot l_e$$

Open Calculator 

$$ex \quad 13.09017m = \frac{3 + \sqrt{5}}{4} \cdot 10m$$

29) Midsphere Radius of Dodecahedron given Lateral Surface Area 

$$fx \quad r_m = \frac{3 + \sqrt{5}}{4} \cdot \sqrt{\frac{2 \cdot LSA}{5 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

Open Calculator 

$$ex \quad 13.202m = \frac{3 + \sqrt{5}}{4} \cdot \sqrt{\frac{2 \cdot 1750m^2}{5 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$


Volume of Dodecahedron 30) Volume of Dodecahedron 

$$fx \quad V = \frac{(15 + (7 \cdot \sqrt{5})) \cdot l_e^3}{4}$$

Open Calculator 

$$ex \quad 7663.119m^3 = \frac{(15 + (7 \cdot \sqrt{5})) \cdot (10m)^3}{4}$$



31) Volume of Dodecahedron given Circumsphere Radius 


fx

Open Calculator 

$$V = \frac{1}{4} \cdot \left(15 + \left(7 \cdot \sqrt{5}\right)\right) \cdot \left(\frac{4 \cdot r_c}{\sqrt{3} \cdot \left(1 + \sqrt{5}\right)}\right)^3$$

ex

$$7642.49\text{m}^3 = \frac{1}{4} \cdot \left(15 + \left(7 \cdot \sqrt{5}\right)\right) \cdot \left(\frac{4 \cdot 14\text{m}}{\sqrt{3} \cdot \left(1 + \sqrt{5}\right)}\right)^3$$

32) Volume of Dodecahedron given Lateral Surface Area 

fx


Open Calculator 

$$V = \frac{1}{4} \cdot \left(15 + \left(7 \cdot \sqrt{5}\right)\right) \cdot \left(\frac{2 \cdot \text{LSA}}{5 \cdot \sqrt{25 + \left(10 \cdot \sqrt{5}\right)}}\right)^{\frac{3}{2}}$$

ex

$$7861.206\text{m}^3 = \frac{1}{4} \cdot \left(15 + \left(7 \cdot \sqrt{5}\right)\right) \cdot \left(\frac{2 \cdot 1750\text{m}^2}{5 \cdot \sqrt{25 + \left(10 \cdot \sqrt{5}\right)}}\right)^{\frac{3}{2}}$$



**33) Volume of Dodecahedron given Perimeter** **Open Calculator** 

$$\text{fx } V = \frac{1}{4} \cdot (15 + (7 \cdot \sqrt{5})) \cdot \left(\frac{P}{30}\right)^3$$

$$\text{ex } 7663.119\text{m}^3 = \frac{1}{4} \cdot (15 + (7 \cdot \sqrt{5})) \cdot \left(\frac{300\text{m}}{30}\right)^3$$






## Variables Used

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