

Important Formulas of Dodecahedron PDF



Formulas Examples with Units

List of 33 Important Formulas of Dodecahedron

1) Area of Dodecahedron Formulas

1.1) Face Area of Dodecahedron Formula

Formula

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

Example with Units

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

Evaluate Formula 

1.2) Face Area of Dodecahedron given Midsphere Radius Formula

Formula

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

Example with Units

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

Evaluate Formula 

1.3) Lateral Surface Area of Dodecahedron Formula

Formula

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

Example with Units

$$1720.4774 \text{ m}^2 = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot 10 \text{ m}^2$$

Evaluate Formula 

1.4) Lateral Surface Area of Dodecahedron given Circumsphere Radius Formula

Formula

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

Example with Units

$$1717.3883 \text{ m}^2 = \frac{5}{2} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left(\frac{4 \cdot 14 \text{ m}}{\sqrt{3} \cdot (1 + \sqrt{5})} \right)^2$$

Evaluate Formula 



1.5) Lateral Surface Area of Dodecahedron given Total Surface Area Formula ↺

Formula

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

Example with Units

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

Evaluate Formula ↺

1.6) Total Surface Area of Dodecahedron Formula ↺

Formula

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

Example with Units

$$2064.5729 \text{ m}^2 = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot 10 \text{ m}^2$$

Evaluate Formula ↺

1.7) Total Surface Area of Dodecahedron given Face Perimeter Formula ↺

Formula

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

Example with Units

$$2064.5729 \text{ m}^2 = \frac{3}{25} \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot 50 \text{ m}^2$$

Evaluate Formula ↺

1.8) Total Surface Area of Dodecahedron given Volume Formula ↺

Formula

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

Evaluate Formula ↺

Example with Units

$$2071.1918 \text{ m}^2 = 3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})} \cdot \left(\frac{4 \cdot 7700 \text{ m}^3}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{2}{3}}$$

2) Diagonal of Dodecahedron Formulas ↺

2.1) Face Diagonal of Dodecahedron Formula ↺

Formula

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

Example with Units

$$16.1803 \text{ m} = \left(\frac{1 + \sqrt{5}}{2} \right) \cdot 10 \text{ m}$$

Evaluate Formula ↺

2.2) Face Diagonal of Dodecahedron given Insphere Radius Formula ↺

Formula

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

Example with Units

$$15.9839 \text{ m} = (1 + \sqrt{5}) \cdot \frac{11 \text{ m}}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$

Evaluate Formula ↺



2.3) Face Diagonal of Dodecahedron given Total Surface Area Formula

Formula

Evaluate Formula 

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

Example with Units

$$16.3186 \text{ m} = \frac{1 + \sqrt{5}}{2} \cdot \sqrt{\frac{2100 \text{ m}^2}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

2.4) Space Diagonal of Dodecahedron Formula

Formula

Example with Units

Evaluate Formula 

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

$$28.0252 \text{ m} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{10 \text{ m}}{2}$$

2.5) Space Diagonal of Dodecahedron given Lateral Surface Area Formula

Formula

Evaluate Formula 

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

Example with Units

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

2.6) Space Diagonal of Dodecahedron given Perimeter Formula

Formula

Example with Units

Evaluate Formula 

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

$$28.0252 \text{ m} = \sqrt{3} \cdot (1 + \sqrt{5}) \cdot \frac{300 \text{ m}}{60}$$

3) Edge Length of Dodecahedron Formulas

3.1) Edge Length of Dodecahedron given Circumsphere Radius Formula

Formula

Example with Units

Evaluate Formula 

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

$$9.991 \text{ m} = \frac{4 \cdot 14 \text{ m}}{\sqrt{3} \cdot (1 + \sqrt{5})}$$



3.2) Edge Length of Dodecahedron given Insphere Radius Formula

Formula

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

Example with Units

$$9.8786_m = \frac{2 \cdot 11_m}{\sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}}}$$

Evaluate Formula 

3.3) Edge Length of Dodecahedron given Total Surface Area Formula

Formula

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

Example with Units

$$10.0854_m = \sqrt{\frac{2100_{m^2}}{3 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}}}$$

Evaluate Formula 

3.4) Edge Length of Dodecahedron given Volume Formula

Formula

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

Example with Units

$$10.016_m = \left(\frac{4 \cdot 7700_{m^3}}{15 + (7 \cdot \sqrt{5})} \right)^{\frac{1}{3}}$$

Evaluate Formula 

4) Perimeter of Dodecahedron Formulas

4.1) Face Perimeter of Dodecahedron Formula

Formula

$$P_{\text{Face}} = 5 \cdot l_e$$

Example with Units

$$50_m = 5 \cdot 10_m$$

Evaluate Formula 

4.2) Face Perimeter of Dodecahedron given Face Area Formula

Formula

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

Example with Units

$$50.4272_m = 5 \cdot \sqrt{\frac{4 \cdot 175_{m^2}}{25 + (10 \cdot \sqrt{5})}}$$

Evaluate Formula 

4.3) Perimeter of Dodecahedron Formula

Formula

$$P = 30 \cdot l_e$$

Example with Units

$$300_m = 30 \cdot 10_m$$

Evaluate Formula 

4.4) Perimeter of Dodecahedron given Circumsphere Radius Formula

Formula

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

Example with Units

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

Evaluate Formula 



4.5) Perimeter of Dodecahedron given Total Surface Area Formula

Formula

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

Example with Units

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

Evaluate Formula 

5) Radius of Dodecahedron Formulas

5.1) Circumsphere Radius of Dodecahedron Formula

Formula

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

Example with Units

$$14.0126 \text{ m} = \sqrt{3} \cdot \left(1 + \sqrt{5}\right) \cdot \frac{10 \text{ m}}{4}$$

Evaluate Formula 

5.2) Circumsphere Radius of Dodecahedron given Total Surface Area Formula

Formula

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

Example with Units

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

Evaluate Formula 

5.3) Insphere Radius of Dodecahedron Formula

Formula

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

Example with Units

$$11.1352 \text{ m} = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{10 \text{ m}}{2}$$

Evaluate Formula 

5.4) Insphere Radius of Dodecahedron given Perimeter Formula

Formula

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

Example with Units

$$11.1352 \text{ m} = \sqrt{\frac{25 + (11 \cdot \sqrt{5})}{10}} \cdot \frac{300 \text{ m}}{60}$$

Evaluate Formula 

5.5) Midsphere Radius of Dodecahedron Formula

Formula

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

Example with Units

$$13.0902 \text{ m} = \frac{3 + \sqrt{5}}{4} \cdot 10 \text{ m}$$

Evaluate Formula 



5.6) Midsphere Radius of Dodecahedron given Lateral Surface Area Formula

Formula

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

Example with Units

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

Evaluate Formula 

6) Volume of Dodecahedron Formulas

6.1) Volume of Dodecahedron Formula

Formula

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

Example with Units

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

Evaluate Formula 

6.2) Volume of Dodecahedron given Circumsphere Radius Formula

Formula

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

Example with Units

$$7642.4896_{m^3} = \frac{1}{4} \cdot (15 + (7 \cdot \sqrt{5})) \cdot \left(\frac{4 \cdot 14_m}{\sqrt{3} \cdot (1 + \sqrt{5})} \right)^3$$

Evaluate Formula 

6.3) Volume of Dodecahedron given Lateral Surface Area Formula

Formula

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

Example with Units

$$7861.2061_{m^3} = \frac{1}{4} \cdot (15 + (7 \cdot \sqrt{5})) \cdot \left(\frac{2 \cdot 1750_{m^2}}{5 \cdot \sqrt{25 + (10 \cdot \sqrt{5})}} \right)^{\frac{3}{2}}$$

Evaluate Formula 



6.4) Volume of Dodecahedron given Perimeter Formula

Formula

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

Evaluate Formula 

Example with Units

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



Variables used in list of Important Formulas of Dodecahedron above

- **A_{Face}** Face Area of Dodecahedron (Square Meter)
- **d_{Face}** Face Diagonal of Dodecahedron (Meter)
- **d_{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_{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 in list of Important Formulas of Dodecahedron 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 (m³)
Volume Unit Conversion 
- **Measurement:** **Area** in Square Meter (m²)
Area Unit Conversion 



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