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Important Formulas of Dodecahedron

Calculators!

Examples!

Conversions!

List of 33 Important Formulas of Dodecahedron

Important Formulas of Dodecahedron

Area of Dodecahedron

1) Face Area of Dodecahedron

Open Calculator

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

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

2) Face Area of Dodecahedron given Midsphere Radius

Open Calculator

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

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

3) Lateral Surface Area of Dodecahedron

Open Calculator

fx $$\mathrm{LSA} = \frac{5}{2} \cdot \sqrt{25 + \left(10 \cdot \sqrt{5}\right)} \cdot \mathrm{l}_{\mathrm{e}}^{2}$$

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

4) Lateral Surface Area of Dodecahedron given Circumsphere Radius

fx

Open Calculator

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

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

5) Lateral Surface Area of Dodecahedron given Total Surface Area

Open Calculator

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

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

6) Total Surface Area of Dodecahedron

Open Calculator

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

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

7) Total Surface Area of Dodecahedron given Face Perimeter

Open Calculator

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

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

8) Total Surface Area of Dodecahedron given Volume

fx Open Calculator

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

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

Diagonal of Dodecahedron

9) Face Diagonal of Dodecahedron

Open Calculator

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

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

10) Face Diagonal of Dodecahedron given Insphere Radius

Open Calculator

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

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

11) Face Diagonal of Dodecahedron given Total Surface Area

Open Calculator

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

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

12) Space Diagonal of Dodecahedron

Open Calculator

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

$$28.02517\mathrm{m} = \sqrt{3} \cdot \left(1+\sqrt{5}\right) \cdot \frac{10\mathrm{m}}{2}$$

13) Space Diagonal of Dodecahedron given Lateral Surface Area

Open Calculator

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

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

14) Space Diagonal of Dodecahedron given Perimeter

Open Calculator

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

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

Edge Length of Dodecahedron

15) Edge Length of Dodecahedron given Circumsphere Radius

Open Calculator

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

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

16) Edge Length of Dodecahedron given Insphere Radius

Open Calculator

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

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

17) Edge Length of Dodecahedron given Total Surface Area

Open Calculator

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

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

18) Edge Length of Dodecahedron given Volume

Open Calculator

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

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

Perimeter of Dodecahedron

19) Face Perimeter of Dodecahedron

Open Calculator

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

ex $$50\text{m} = 5 \cdot 10\text{m}$$

20) Face Perimeter of Dodecahedron given Face Area

Open Calculator

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

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

21) Perimeter of Dodecahedron

Open Calculator

fx $$P = 30 \cdot l_e$$

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

22) Perimeter of Dodecahedron given Circumsphere Radius

Open Calculator

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

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

23) Perimeter of Dodecahedron given Total Surface Area

Open Calculator

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

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

Radius of Dodecahedron

24) Circumsphere Radius of Dodecahedron

Open Calculator

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

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

25) Circumsphere Radius of Dodecahedron given Total Surface Area

Open Calculator

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

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

26) Insphere Radius of Dodecahedron

Open Calculator

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

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

27) Insphere Radius of Dodecahedron given Perimeter

Open Calculator

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

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

28) Midsphere Radius of Dodecahedron

Open Calculator

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

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

29) Midsphere Radius of Dodecahedron given Lateral Surface Area

Open Calculator

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

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

Volume of Dodecahedron

30) Volume of Dodecahedron

Open Calculator

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

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

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

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

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

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

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

Variables Used

- 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

- Function: **sqrt**, sqrt(Number)
  Square root function
- 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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