

Important Formulas of Pentagon PDF



Formulas
Examples
with Units

List of 21
Important Formulas of Pentagon

1) Area of Pentagon Formulas

1.1) Area of Pentagon Formula

Formula

$$A = \frac{l_e^2}{4} \cdot \sqrt{25 + (10 \cdot \sqrt{5})}$$

Example with Units

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

Evaluate Formula 

1.2) Area of Pentagon given Edge Length and Inradius Formula

Formula

$$A = \frac{5}{2} \cdot l_e \cdot r_i$$

Example with Units

$$175 \text{ m}^2 = \frac{5}{2} \cdot 10 \text{ m} \cdot 7 \text{ m}$$

Evaluate Formula 

1.3) Area of Pentagon given Edge Length using Central Angle Formula

Formula

$$A = \frac{5 \cdot l_e^2}{4 \cdot \tan\left(\frac{\pi}{5}\right)}$$

Example with Units

$$172.0477 \text{ m}^2 = \frac{5 \cdot 10 \text{ m}^2}{4 \cdot \tan\left(\frac{3.1416}{5}\right)}$$

Evaluate Formula 

1.4) Area of Pentagon given Edge Length using Interior Angle Formula

Formula

$$A = \frac{5 \cdot l_e^2 \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot \pi\right)\right)^2}{2 \cdot \sin\left(\frac{3}{5} \cdot \pi\right)}$$

Example with Units

$$172.0477 \text{ m}^2 = \frac{5 \cdot 10 \text{ m}^2 \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot 3.1416\right)\right)^2}{2 \cdot \sin\left(\frac{3}{5} \cdot 3.1416\right)}$$

Evaluate Formula 

2) Height of Pentagon Formulas

2.1) Height of Pentagon Formula

Formula

$$h = \frac{l_e}{2} \cdot \sqrt{5 + (2 \cdot \sqrt{5})}$$

Example with Units

$$15.3884 \text{ m} = \frac{10 \text{ m}}{2} \cdot \sqrt{5 + (2 \cdot \sqrt{5})}$$

Evaluate Formula 



2.2) Height of Pentagon given Circumradius and Inradius Formula

Formula

$$h = r_c + r_i$$

Example with Units

$$16\text{ m} = 9\text{ m} + 7\text{ m}$$

Evaluate Formula 

2.3) Height of Pentagon given Edge Length using Central Angle Formula

Formula

$$h = \frac{l_e}{2} \cdot \frac{1 + \cos\left(\frac{\pi}{5}\right)}{\sin\left(\frac{\pi}{5}\right)}$$

Example with Units

$$15.3884\text{ m} = \frac{10\text{ m}}{2} \cdot \frac{1 + \cos\left(\frac{3.1416}{5}\right)}{\sin\left(\frac{3.1416}{5}\right)}$$

Evaluate Formula 

2.4) Height of Pentagon given Edge Length using Interior Angle Formula

Formula

$$h = l_e \cdot \frac{\left(\frac{3}{2} - \cos\left(\frac{3}{5} \cdot \pi\right)\right) \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot \pi\right)\right)}{\sin\left(\frac{3}{5} \cdot \pi\right)}$$

Example with Units

$$15.3884\text{ m} = 10\text{ m} \cdot \frac{\left(\frac{3}{2} - \cos\left(\frac{3}{5} \cdot 3.1416\right)\right) \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot 3.1416\right)\right)}{\sin\left(\frac{3}{5} \cdot 3.1416\right)}$$

Evaluate Formula 

3) Other Formulas of Pentagon Formulas

3.1) Diagonal of Pentagon Formula

Formula

$$d = (1 + \sqrt{5}) \cdot \frac{l_e}{2}$$

Example with Units

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

Evaluate Formula 

3.2) Edge Length of Pentagon given Area and Inradius Formula

Formula

$$l_e = \frac{2 \cdot A}{5 \cdot r_i}$$

Example with Units

$$9.7143\text{ m} = \frac{2 \cdot 170\text{ m}^2}{5 \cdot 7\text{ m}}$$

Evaluate Formula 

3.3) Perimeter of Pentagon Formula

Formula

$$P = 5 \cdot l_e$$

Example with Units

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

Evaluate Formula 

3.4) Width of Pentagon Formula

Formula

$$w = \frac{1 + \sqrt{5}}{2} \cdot l_e$$

Example with Units

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

Evaluate Formula 



4) Radius of Pentagon Formulas

4.1) Circumradius of Pentagon Formula

Formula

$$r_c = \frac{l_e}{10} \cdot \sqrt{50 + (10 \cdot \sqrt{5})}$$

Example with Units

$$8.5065\text{m} = \frac{10\text{m}}{10} \cdot \sqrt{50 + (10 \cdot \sqrt{5})}$$

Evaluate Formula 

4.2) Circumradius of Pentagon given Edge Length using Central Angle Formula

Formula

$$r_c = \frac{l_e}{2 \cdot \sin\left(\frac{\pi}{5}\right)}$$

Example with Units

$$8.5065\text{m} = \frac{10\text{m}}{2 \cdot \sin\left(\frac{3.1416}{5}\right)}$$

Evaluate Formula 

4.3) Circumradius of Pentagon given Edge Length using Interior Angle Formula

Formula

$$r_c = \frac{l_e \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot \pi\right)\right)}{\sin\left(\frac{3}{5} \cdot \pi\right)}$$

Example with Units

$$8.5065\text{m} = \frac{10\text{m} \cdot \left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot 3.1416\right)\right)}{\sin\left(\frac{3}{5} \cdot 3.1416\right)}$$

Evaluate Formula 

4.4) Circumradius of Pentagon given Height and Inradius Formula

Formula

$$r_c = h - r_i$$

Example with Units

$$8\text{m} = 15\text{m} - 7\text{m}$$

Evaluate Formula 

4.5) Inradius of Pentagon Formula

Formula

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

Example with Units

$$6.8819\text{m} = \frac{10\text{m}}{10} \cdot \sqrt{25 + (10 \cdot \sqrt{5})}$$

Evaluate Formula 

4.6) Inradius of Pentagon given Area and Edge Length Formula

Formula

$$r_i = \frac{2 \cdot A}{5 \cdot l_e}$$

Example with Units

$$6.8\text{m} = \frac{2 \cdot 170\text{m}^2}{5 \cdot 10\text{m}}$$

Evaluate Formula 

4.7) Inradius of Pentagon given Circumradius and Height Formula

Formula

$$r_i = h - r_c$$

Example with Units

$$6\text{m} = 15\text{m} - 9\text{m}$$

Evaluate Formula 



4.8) Inradius of Pentagon given Edge Length using Central Angle Formula

Formula

$$r_i = \frac{l_e}{2 \cdot \tan\left(\frac{\pi}{5}\right)}$$

Example with Units

$$6.8819\text{m} = \frac{10\text{m}}{2 \cdot \tan\left(\frac{3.1416}{5}\right)}$$

Evaluate Formula 

4.9) Inradius of Pentagon given Edge Length using Interior Angle Formula

Formula

$$r_i = \frac{\left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot \pi\right)\right)^2 \cdot l_e}{\sin\left(\frac{3}{5} \cdot \pi\right)}$$

Example with Units

$$6.8819\text{m} = \frac{\left(\frac{1}{2} - \cos\left(\frac{3}{5} \cdot 3.1416\right)\right)^2 \cdot 10\text{m}}{\sin\left(\frac{3}{5} \cdot 3.1416\right)}$$



Evaluate Formula 









Variables used in list of Important Formulas of Pentagon above

- **A** Area of Pentagon (Square Meter)
- **d** Diagonal of Pentagon (Meter)
- **h** Height of Pentagon (Meter)
- **l_e** Edge Length of Pentagon (Meter)
- **P** Perimeter of Pentagon (Meter)
- **r_c** Circumradius of Pentagon (Meter)
- **r_i** Inradius of Pentagon (Meter)
- **w** Width of Pentagon (Meter)

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

- **constant(s): pi**,
3.14159265358979323846264338327950288
Archimedes' constant
- **Functions: cos**, $\cos(\text{Angle})$
Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- **Functions: sin**, $\sin(\text{Angle})$
Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- **Functions: sqrt**, $\sqrt{\text{Number}}$
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.
- **Functions: tan**, $\tan(\text{Angle})$
The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- **Measurement: Length** in Meter (m)
Length Unit Conversion 
- **Measurement: Area** in Square Meter (m^2)
Area Unit Conversion 



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