Important Polygram Formulas PDF

Formulas
Examples
with Units

List of 17
Important Polygram Formulas

1) Area and Perimeter of Polygram Formulas

1.1) Area of Polygram Formula

Evaluate Formula

Formula

$$A = \left(N_{Spikes} \cdot \frac{l_{Base}^{2}}{4 \cdot \tan\left(\frac{\pi}{N_{Spikes}}\right)} \right) + \left(N_{Spikes} \cdot h_{Spike} \cdot \frac{l_{Base}}{2} \right)$$

Example with Units

$$396.9915\,\text{m}^2 = \left(10 \cdot \frac{6\,\text{m}^{2}}{4 \cdot \tan\left(\frac{3.1416}{10}\right)} \right) + \left(10 \cdot 4\,\text{m} \cdot \frac{6\,\text{m}}{2} \right)$$

1.2) Perimeter of Polygram Formula

Evaluate Formula

Formula

$$P = 2 \cdot N_{Spikes} \cdot l_e$$

Example with Units

$$100\,\text{m} = 2 \cdot 10 \cdot 5\,\text{m}$$

2) Inner Angle of Polygram Formulas

2.1) Inner Angle of Polygram given Base Length Formula

Evaluate Formula

Formula

$$\angle_{Inner} = \arccos\left(\frac{\left(2 \cdot l_e^{2}\right) - l_{Base}^{2}}{2 \cdot l_e^{2}} \right)$$

Example with Units

$$73.7398° = \arccos\left(\frac{\left(2 \cdot 5\,\text{m}^{2}\right) - 6\,\text{m}^{2}}{2 \cdot 5\,\text{m}^{2}} \right)$$

2.2) Inner Angle of Polygram given Outer Angle Formula

Evaluate Formula

Formula

$$\angle_{Inner} = \angle_{Outer} - \frac{2 \cdot \pi}{N_{Spikes}}$$

Example with Units

$$74° = 110° - \frac{2 \cdot 3.1416}{10}$$

3) Lengths of Polygram Formulas

3.1) Base Length of Polygram Formulas

3.1.1) Base Length of Polygram given Inner Angle Formula

Evaluate Formula

Formula

$$l_{Base} = l_e \cdot \sqrt{2 \cdot \left(1 - \cos\left(\angle_{Inner}\right)\right)}$$

Example with Units

$$6.0182\,\text{m} = 5\,\text{m} \cdot \sqrt{2 \cdot \left(1 - \cos\left(74°\right)\right)}$$

3.1.2) Base Length of Polygram given Spike Height Formula

Evaluate Formula

Formula

$$l_{Base} = 2 \cdot \sqrt{l_e^2 - h_{Spike}^2}$$

Example with Units

$$6\,\text{m} = 2 \cdot \sqrt{5\,\text{m}^2 - 4\,\text{m}^2}$$

3.2) Chord Length of Polygram Formulas

3.2.1) Chord Length of Polygram Formula

Evaluate Formula

Formula

$$l_c = \sqrt{2 \cdot l_e^2 \cdot \left(1 - \cos\left(\angle_{Outer}\right)\right)}$$

Example with Units

$$8.1915\,\text{m} = \sqrt{2 \cdot 5\,\text{m}^2 \cdot \left(1 - \cos\left(110°\right)\right)}$$

3.3) Edge Length of Polygram Formulas

3.3.1) Edge Length of Polygram given Base Length Formula

Evaluate Formula

Formula

$$l_e = \frac{l_{Base}}{\sqrt{2 \cdot \left(1 - \cos\left(\angle_{Inner}\right)\right)}}$$

Example with Units

$$4.9849\,\text{m} = \frac{6\,\text{m}}{\sqrt{2 \cdot \left(1 - \cos\left(74°\right)\right)}}$$

3.3.2) Edge Length of Polygram given Chord Length Formula

Evaluate Formula

Formula

$$l_e = \frac{l_c}{\sqrt{2 \cdot \left(1 - \cos\left(\angle_{Outer}\right)\right)}}$$

Example with Units

$$4.8831\,\text{m} = \frac{8\,\text{m}}{\sqrt{2 \cdot \left(1 - \cos\left(110°\right)\right)}}$$

3.3.3) Edge Length of Polygram given Perimeter Formula

Evaluate Formula

Formula

$$l_e = \frac{P}{2 \cdot N_{Spikes}}$$

Example with Units

$$5\,\text{m} = \frac{100\,\text{m}}{2 \cdot 10}$$

3.3.4) Edge Length of Polygram given Spike Height Formula

Evaluate Formula

Formula

$$l_e = \sqrt{h_{Spike}^2 + \frac{l_{Base}^2}{4}}$$

Example with Units

$$5\,\text{m} = \sqrt{4\,\text{m}^2 + \frac{6\,\text{m}^2}{4}}$$

4) Number of Points of Polygram Formulas

4.1) Number of Spikes in Polygram given Outer and Inner Angles Formula

Evaluate Formula

Formula

$$N_{Spikes} = \frac{2 \cdot \pi}{\angle_{Outer} - \angle_{Inner}}$$

Example with Units

$$10 = \frac{2 \cdot 3.1416}{110° - 74°}$$

4.2) Number of Spikes in Polygram given Perimeter Formula

Evaluate Formula

Formula

$$N_{Spikes} = \frac{P}{2 \cdot l_e}$$

Example with Units

$$10 = \frac{100\,m}{2 \cdot 5\,m}$$

5) Outer Angle of Polygram Formulas

5.1) Outer Angle of Polygram Formula

Evaluate Formula

Formula

$$\angle_{Outer} = \frac{2 \cdot \pi}{N_{Spikes}} + \angle_{Inner}$$

Example with Units

$$110° = \frac{2 \cdot 3.1416}{10} + 74°$$

5.2) Outer Angle of Polygram given Chord Length Formula

Evaluate Formula

Formula

$$\angle_{Outer} = \arccos\left(\frac{\left(2 \cdot l_e^{\,2}\right) - l_c^{\,2}}{2 \cdot l_e^{\,2}}\right)$$

Example with Units

$$106.2602° = \arccos\left(\frac{\left(2 \cdot 5\,m^{\,2}\right) - 8\,m^{\,2}}{2 \cdot 5\,m^{\,2}}\right)$$

6) Spike Height of Polygram Formulas

6.1) Spike Height of Polygram Formula

Evaluate Formula

Formula

$$h_{Spike} = \sqrt{\frac{\left(4 \cdot l_e^{\,2}\right) - l_{Base}^{\,2}}{4}}$$

Example with Units

$$4\,m = \sqrt{\frac{\left(4 \cdot 5\,m^{\,2}\right) - 6\,m^{\,2}}{4}}$$

6.2) Spike Height of Polygram given Area Formula

Evaluate Formula

Formula

$$h_{Spike} = \left(\frac{2 \cdot A}{N_{Spikes} \cdot l_{Base}} \right) - \left(\frac{l_{Base}}{2 \cdot \tan\left(\frac{\pi}{N_{Spikes}} \right)} \right)$$

Example with Units

$$4.1003\,\text{m} = \left(\frac{2 \cdot 400\,\text{m}^2}{10 \cdot 6\,\text{m}} \right) - \left(\frac{6\,\text{m}}{2 \cdot \tan\left(\frac{3.1416}{10} \right)} \right)$$

Variables used in list of Polygram Formulas above

- $\angle_{Inner}$ Inner Angle of Polygram *(Degree)*
- $\angle_{Outer}$ Outer Angle of Polygram *(Degree)*
- **A** Area of Polygram *(Square Meter)*
- h_{Spike} Spike Height of Polygram *(Meter)*
- l_{Base} Base Length of Polygram *(Meter)*
- l_c Chord Length of Polygram *(Meter)*
- l_e Edge Length of Polygram *(Meter)*
- N_{Spikes} Number of Spikes in Polygram
- **P** Perimeter of Polygram *(Meter)*

Constants, Functions, Measurements used in list of Polygram Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **arccos**, arccos(Number) *Arccosine function, is the inverse function of the cosine function.It is the function that takes a ratio as an input and returns the angle whose cosine is equal to that ratio.*
- Functions: **cos**, cos(Angle) *Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.*
- 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.*
- Functions: **tan**, tan(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 (m²) *Area Unit Conversion*
- Measurement: **Angle** in Degree (°) *Angle Unit Conversion*

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