Important Regular Polygon Formulas PDF

Formulas
Examples
with Units

List of 28
Important Regular Polygon Formulas

1) Angles of Regular Polygon Formulas

1.1) Exterior Angle of Regular Polygon Formula

Evaluate Formula

Formula

$$\angle_{Exterior} = \frac{2 \cdot \pi}{N_S}$$

Example with Units

$$45° = \frac{2 \cdot 3.1416}{8}$$

1.2) Interior Angle of Regular Polygon Formula

Evaluate Formula

Formula

$$\angle_{Interior} = \frac{\left(N_S - 2\right) \cdot \pi}{N_S}$$

Example with Units

$$135° = \frac{\left(8 - 2\right) \cdot 3.1416}{8}$$

1.3) Interior Angle of Regular Polygon given Sum of Interior Angles Formula

Evaluate Formula

Formula

$$\angle_{Interior} = \frac{Sum\angle_{Interior}}{N_S}$$

Example with Units

$$135° = \frac{1080°}{8}$$

1.4) Sum of Interior Angles of Regular Polygon Formula

Evaluate Formula

Formula

$$Sum\angle_{Interior} = \left(N_S - 2\right) \cdot \pi$$

Example with Units

$$1080° = \left(8 - 2\right) \cdot 3.1416$$

2) Area of Regular Polygon Formulas

2.1) Area of Regular Polygon Formula

Evaluate Formula

Formula

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

Example with Units

$$482.8427\,\text{m}^2 = \frac{10\,\text{m}^{\,2} \cdot 8}{4 \cdot \tan\left(\frac{3.1416}{8}\right)}$$

2.2) Area of Regular Polygon given Circumradius Formula

Evaluate Formula

Formula

$$A = \frac{r_c^2 \cdot N_S \cdot \sin\left(\frac{2 \cdot \pi}{N_S}\right)}{2}$$

Example with Units

$$478.0042\,\text{m}^2 = \frac{13\,\text{m}^2 \cdot 8 \cdot \sin\left(\frac{2 \cdot 3.1416}{8}\right)}{2}$$

2.3) Area of Regular Polygon given Inradius Formula

Evaluate Formula

Formula

$$A = r_i^2 \cdot N_S \cdot \tan\left(\frac{\pi}{N_S}\right)$$

Example with Units

$$477.174\,\text{m}^2 = 12\,\text{m}^2 \cdot 8 \cdot \tan\left(\frac{3.1416}{8}\right)$$

2.4) Area of Regular Polygon given Perimeter and Circumradius Formula

Evaluate Formula

Formula

$$A = \frac{P \cdot \sqrt{r_c^2 - \frac{l_e^2}{4}}}{2}$$

Example with Units

$$480\,\text{m}^2 = \frac{80\,\text{m} \cdot \sqrt{13\,\text{m}^2 - \frac{10\,\text{m}^2}{4}}}{2}$$

2.5) Area of Regular Polygon given Perimeter and Inradius Formula

Evaluate Formula

Formula

$$A = \frac{P \cdot r_i}{2}$$

Example with Units

$$480\,\text{m}^2 = \frac{80\,\text{m} \cdot 12\,\text{m}}{2}$$

3) Edge Length of Regular Polygon Formulas

3.1) Edge Length of Regular Polygon given Area Formula

Evaluate Formula

Formula

$$l_e = \frac{\sqrt{4 \cdot A \cdot \tan\left(\frac{\pi}{N_S}\right)}}{\sqrt{N_S}}$$

Example with Units

$$9.9705\,\text{m} = \frac{\sqrt{4 \cdot 480\,\text{m}^2 \cdot \tan\left(\frac{3.1416}{8}\right)}}{\sqrt{8}}$$

3.2) Edge Length of Regular Polygon given Circumradius Formula

Evaluate Formula

Formula

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

Example with Units

$$9.9498\,\text{m} = 2 \cdot 13\,\text{m} \cdot \sin\left(\frac{3.1416}{8}\right)$$

3.3) Edge Length of Regular Polygon given Inradius Formula

Evaluate Formula

Formula

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

Example with Units

$$9.9411\,\text{m} = 12\,\text{m} \cdot 2 \cdot \tan\left(\frac{3.1416}{8}\right)$$

3.4) Edge Length of Regular Polygon given Perimeter Formula

Evaluate Formula

Formula

$$l_e = \frac{P}{N_S}$$

Example with Units

$$10\,\text{m} = \frac{80\,\text{m}}{8}$$

4) Other Formulas of Regular Polygon Formulas

4.1) Number of Diagonals of Regular Polygon Formula

Evaluate Formula

Formula

$$N_{Diagonals} = \frac{N_S \cdot \left(N_S - 3\right)}{2}$$

Example

$$20 = \frac{8 \cdot \left(8 - 3\right)}{2}$$

4.2) Number of Sides of Regular Polygon given Sum of Interior Angles Formula

Evaluate Formula

Formula

$$N_S = \left(\frac{\text{Sum}\angle_{Interior}}{\pi}\right) + 2$$

Example with Units

$$8 = \left(\frac{1080°}{3.1416}\right) + 2$$

5) Perimeter of Regular Polygon Formulas

5.1) Perimeter of Regular Polygon Formula

Evaluate Formula

Formula

$$P = N_S \cdot l_e$$

Example with Units

$$80\,\text{m} = 8 \cdot 10\,\text{m}$$

5.2) Perimeter of Regular Polygon given Circumradius and Area Formula

Evaluate Formula

Formula

$$P = \frac{2 \cdot A}{\sqrt{r_c^2 - \frac{l_e^2}{4}}}$$

Example with Units

$$80\,\text{m} = \frac{2 \cdot 480\,\text{m}^2}{\sqrt{13\,\text{m}^2 - \frac{10\,\text{m}^2}{4}}}$$

5.3) Perimeter of Regular Polygon given Inradius and Area Formula

Evaluate Formula

Formula

$$P = \frac{2 \cdot A}{r_i}$$

Example with Units

$$80\,\text{m} = \frac{2 \cdot 480\,\text{m}^2}{12\,\text{m}}$$

5.4) Perimeter of Regular Polygon given Number of Sides and Circumradius Formula

Evaluate Formula

Formula

$$P = 2 \cdot r_c \cdot N_S \cdot \sin\left(\frac{\pi}{N_S}\right)$$

Example with Units

$$79.5982\,\text{m} = 2 \cdot 13\,\text{m} \cdot 8 \cdot \sin\left(\frac{3.1416}{8}\right)$$

5.5) Perimeter of Regular Polygon given Number of Sides and Inradius Formula

Evaluate Formula

Formula

$$P = 2 \cdot N_S \cdot r_i \cdot \tan\left(\frac{\pi}{N_S}\right)$$

Example with Units

$$79.529\,\text{m} = 2 \cdot 8 \cdot 12\,\text{m} \cdot \tan\left(\frac{3.1416}{8}\right)$$

6) Radius of Regular Polygon Formulas

6.1) Circumradius of Regular Polygon Formulas

6.1.1) Circumradius of Regular Polygon Formula

Evaluate Formula

Formula

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

Example with Units

$$13.0656\,\text{m} = \frac{10\,\text{m}}{2 \cdot \sin\left(\frac{3.1416}{8}\right)}$$

6.1.2) Circumradius of Regular Polygon given Area Formula

Evaluate Formula

Formula

$$r_c = \sqrt{\frac{2 \cdot A}{N_S \cdot \sin\left(\frac{2 \cdot \pi}{N_S}\right)}}$$

Example with Units

$$13.0271\,\text{m} = \sqrt{\frac{2 \cdot 480\,\text{m}^2}{8 \cdot \sin\left(\frac{2 \cdot 3.1416}{8}\right)}}$$

6.1.3) Circumradius of Regular Polygon given Inradius Formula

Evaluate Formula

Formula

$$r_c = \frac{r_i}{\cos\left(\frac{\pi}{N_S}\right)}$$

Example with Units

$$12.9887\,\text{m} = \frac{12\,\text{m}}{\cos\left(\frac{3.1416}{8}\right)}$$

6.1.4) Circumradius of Regular Polygon given Perimeter Formula

Evaluate Formula

Formula

$$r_c = \frac{P}{2 \cdot N_S \cdot \sin\left(\frac{\pi}{N_S}\right)}$$

Example with Units

$$13.0656\,\text{m} = \frac{80\,\text{m}}{2 \cdot 8 \cdot \sin\left(\frac{3.1416}{8}\right)}$$

6.2) Inradius of Regular Polygon Formulas

6.2.1) Inradius of Regular Polygon Formula

Evaluate Formula

Formula

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

Example with Units

$$12.0711\,\text{m} = \frac{10\,\text{m}}{2 \cdot \tan\left(\frac{3.1416}{8}\right)}$$

6.2.2) Inradius of Regular Polygon given Area Formula

Evaluate Formula

Formula

$$r_i = \sqrt{\frac{A}{N_S \cdot \tan\left(\frac{\pi}{N_S}\right)}}$$

Example with Units

$$12.0355\,\text{m} = \sqrt{\frac{480\,\text{m}^2}{8 \cdot \tan\left(\frac{3.1416}{8}\right)}}$$

6.2.3) Inradius of Regular Polygon given Circumradius Formula

Evaluate Formula

Formula

$$r_i = r_c \cdot \cos\left(\frac{\pi}{N_S}\right)$$

Example with Units

$$12.0104\,\text{m} = 13\,\text{m} \cdot \cos\left(\frac{3.1416}{8}\right)$$

6.2.4) Inradius of Regular Polygon given Perimeter Formula

Evaluate Formula

Formula

$$r_i = \frac{P}{2 \cdot N_S \cdot \tan\left(\frac{\pi}{N_S}\right)}$$

Example with Units

$$12.0711\,\text{m} = \frac{80\,\text{m}}{2 \cdot 8 \cdot \tan\left(\frac{3.1416}{8}\right)}$$

Variables used in list of Regular Polygon Formulas above

- $\angle_{Exterior}$ Exterior Angle of Regular Polygon *(Degree)*
- $\angle_{Interior}$ Interior Angle of Regular Polygon *(Degree)*
- **A** Area of Regular Polygon *(Square Meter)*
- l_e Edge Length of Regular Polygon *(Meter)*
- $N_{Diagonals}$ Number of Diagonals of Regular Polygon
- N_S Number of Sides of Regular Polygon
- **P** Perimeter of Regular Polygon *(Meter)*
- r_c Circumradius of Regular Polygon *(Meter)*
- r_i Inradius of Regular Polygon *(Meter)*
- $Sum\angle_{Interior}$ Sum of Interior Angles of Regular Polygon *(Degree)*

Constants, Functions, Measurements used in list of Regular Polygon Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- 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: **sin**, sin(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(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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