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Regular Polygon Formulas

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List of 28 Regular Polygon Formulas

Regular Polygon

Angles of Regular Polygon

1) Exterior Angle of Regular Polygon

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

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$\text{ex } 45^\circ = \frac{2 \cdot \pi}{8}$$

2) Interior Angle of Regular Polygon

$$\text{fx } \angle_{\text{Interior}} = \frac{(N_S - 2) \cdot \pi}{N_S}$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$\text{ex } 135^\circ = \frac{(8 - 2) \cdot \pi}{8}$$

3) Interior Angle of Regular Polygon given Sum of Interior Angles

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

[Open Calculator !\[\]\(f1c5da15572e3e09d343161be98f508d_img.jpg\)](#)

$$\text{ex } 135^\circ = \frac{1080^\circ}{8}$$



4) Sum of Interior Angles of Regular Polygon

$$\text{fx } \text{Sum} \angle_{\text{Interior}} = (N_S - 2) \cdot \pi$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 1080^\circ = (8 - 2) \cdot \pi$$

Area of Regular Polygon

5) Area of Regular Polygon

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

[Open Calculator !\[\]\(5361750c22c4e047a52f4eac1ec2d4cc_img.jpg\)](#)

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

6) Area of Regular Polygon given Circumradius

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

[Open Calculator !\[\]\(b792654f2cef9719eabeb6c5be00811e_img.jpg\)](#)

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



7) Area of Regular Polygon given Inradius [Open Calculator !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5_img.jpg\)](#)

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

$$ex \quad 477.174m^2 = (12m)^2 \cdot 8 \cdot \tan\left(\frac{\pi}{8}\right)$$

8) Area of Regular Polygon given Perimeter and Circumradius [Open Calculator !\[\]\(ec9132f1d27c8919987d92907322654d_img.jpg\)](#)

$$fx \quad A = \frac{P \cdot \sqrt{r_c^2 - \frac{l_c^2}{4}}}{2}$$

$$ex \quad 480m^2 = \frac{80m \cdot \sqrt{(13m)^2 - \frac{(10m)^2}{4}}}{2}$$

9) Area of Regular Polygon given Perimeter and Inradius [Open Calculator !\[\]\(758ebdf4629c903da74c2e079717ae32_img.jpg\)](#)

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

$$ex \quad 480m^2 = \frac{80m \cdot 12m}{2}$$



Edge Length of Regular Polygon

10) Edge Length of Regular Polygon given Area

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

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

$$\text{ex } 9.970519\text{m} = \frac{\sqrt{4 \cdot 480\text{m}^2 \cdot \tan\left(\frac{\pi}{8}\right)}}{\sqrt{8}}$$

11) Edge Length of Regular Polygon given Circumradius

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

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

$$\text{ex } 9.949769\text{m} = 2 \cdot 13\text{m} \cdot \sin\left(\frac{\pi}{8}\right)$$

12) Edge Length of Regular Polygon given Inradius

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

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

$$\text{ex } 9.941125\text{m} = 12\text{m} \cdot 2 \cdot \tan\left(\frac{\pi}{8}\right)$$



13) Edge Length of Regular Polygon given Perimeter

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

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

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

Other Formulas of Regular Polygon

14) Number of Diagonals of Regular Polygon

$$\text{fx } N_{\text{Diagonals}} = \frac{N_S \cdot (N_S - 3)}{2}$$

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719_img.jpg\)](#)

$$\text{ex } 20 = \frac{8 \cdot (8 - 3)}{2}$$

15) Number of Sides of Regular Polygon given Sum of Interior Angles

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

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7_img.jpg\)](#)

$$\text{ex } 8 = \left(\frac{1080^\circ}{\pi} \right) + 2$$



Perimeter of Regular Polygon

16) Perimeter of Regular Polygon

$$fx \quad P = N_S \cdot l_e$$

[Open Calculator !\[\]\(83f22ed94ec5517769dd76d702c6bfd8_img.jpg\)](#)

$$ex \quad 80m = 8 \cdot 10m$$

17) Perimeter of Regular Polygon given Circumradius and Area

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

[Open Calculator !\[\]\(3cb60d42b10e53f9522bb0b392c1c4cd_img.jpg\)](#)

$$ex \quad 80m = \frac{2 \cdot 480m^2}{\sqrt{(13m)^2 - \frac{(10m)^2}{4}}}$$

18) Perimeter of Regular Polygon given Inradius and Area

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

[Open Calculator !\[\]\(0d7ca0919e6c47bbd874bfa0189fe22e_img.jpg\)](#)

$$ex \quad 80m = \frac{2 \cdot 480m^2}{12m}$$



19) Perimeter of Regular Polygon given Number of Sides and Circumradius

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

[Open Calculator !\[\]\(6605b201d6f14d9b3bcb8ab5f274d107_img.jpg\)](#)

$$\text{ex } 79.59815\text{m} = 2 \cdot 13\text{m} \cdot 8 \cdot \sin\left(\frac{\pi}{8}\right)$$

20) Perimeter of Regular Polygon given Number of Sides and Inradius

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

[Open Calculator !\[\]\(e8fb589d58dad1692debababa5e928b6_img.jpg\)](#)

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

Radius of Regular Polygon

Circumradius of Regular Polygon


21) Circumradius of Regular Polygon

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

[Open Calculator !\[\]\(e3f255517d37bb309a3a931ec4849e6a_img.jpg\)](#)

$$\text{ex } 13.06563\text{m} = \frac{10\text{m}}{2 \cdot \sin\left(\frac{\pi}{8}\right)}$$



22) Circumradius of Regular Polygon given Area [Open Calculator](#) 

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

$$\text{ex } 13.02711\text{m} = \sqrt{\frac{2 \cdot 480\text{m}^2}{8 \cdot \sin\left(\frac{2 \cdot \pi}{8}\right)}}$$

23) Circumradius of Regular Polygon given Inradius [Open Calculator](#) 

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

$$\text{ex } 12.98871\text{m} = \frac{12\text{m}}{\cos\left(\frac{\pi}{8}\right)}$$

24) Circumradius of Regular Polygon given Perimeter [Open Calculator](#) 

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

$$\text{ex } 13.06563\text{m} = \frac{80\text{m}}{2 \cdot 8 \cdot \sin\left(\frac{\pi}{8}\right)}$$



Inradius of Regular Polygon

25) Inradius of Regular Polygon

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

[Open Calculator !\[\]\(339a16584d5da0f0a3ca4e9ec17bf6a1_img.jpg\)](#)

$$\text{ex } 12.07107\text{m} = \frac{10\text{m}}{2 \cdot \tan\left(\frac{\pi}{8}\right)}$$

26) Inradius of Regular Polygon given Area

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

[Open Calculator !\[\]\(6059a5aa8b4ca7bb793408023d6c6e42_img.jpg\)](#)

$$\text{ex } 12.03548\text{m} = \sqrt{\frac{480\text{m}^2}{8 \cdot \tan\left(\frac{\pi}{8}\right)}}$$

27) Inradius of Regular Polygon given Circumradius

$$\text{fx } r_i = r_c \cdot \cos\left(\frac{\pi}{N_s}\right)$$

[Open Calculator !\[\]\(e3275251d0893157c3584e20c81dc3ba_img.jpg\)](#)

$$\text{ex } 12.01043\text{m} = 13\text{m} \cdot \cos\left(\frac{\pi}{8}\right)$$



28) Inradius of Regular Polygon given Perimeter [Open Calculator](#) 

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

$$\text{ex } 12.07107\text{m} = \frac{80\text{m}}{2 \cdot 8 \cdot \tan\left(\frac{\pi}{8}\right)}$$






Variables Used

- \angle_{Exterior} Exterior Angle of Regular Polygon (Degree)
- \angle_{Interior} Interior Angle of Regular Polygon (Degree)
- **A** Area of Regular Polygon (Square Meter)
- I_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

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **cos**, $\cos(\text{Angle})$
Trigonometric cosine function
- **Function:** **sin**, $\sin(\text{Angle})$
Trigonometric sine function
- **Function:** **sqrt**, $\text{sqrt}(\text{Number})$
Square root function
- **Function:** **tan**, $\tan(\text{Angle})$
Trigonometric tangent function
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Area** in Square Meter (m^2)
Area Unit Conversion 
- **Measurement:** **Angle** in Degree ($^\circ$)
Angle Unit Conversion 



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