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Section Modulus for Various Beams or Shape Sections Formulas

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List of 21 Section Modulus for Various Beams or Shape Sections Formulas

Section Modulus for Various Beams or Shape Sections

Circular Section

1) Diameter of Circular Section given Distance of Outermost Layer from Neutral Layer

$$fx \quad d_c = 2 \cdot Y_{\max}$$

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

$$ex \quad 15000\text{mm} = 2 \cdot 7500\text{mm}$$

2) Diameter of Circular Section given Moment of Inertia about Neutral Axis

$$fx \quad d_c = \left(\frac{64 \cdot I_{\text{circular}}}{\pi} \right)^{\frac{1}{4}}$$

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

$$ex \quad 12.38252\text{mm} = \left(\frac{64 \cdot 1154\text{mm}^4}{\pi} \right)^{\frac{1}{4}}$$



3) Diameter of Circular Section given Section Modulus

$$\text{fx } d_c = \left(\frac{32 \cdot Z}{\pi} \right)^{\frac{1}{3}}$$

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

$$\text{ex } 63.38406\text{mm} = \left(\frac{32 \cdot 25000\text{mm}^3}{\pi} \right)^{\frac{1}{3}}$$

4) Distance of Outermost Layer from Neutral Layer in Circular Sections

$$\text{fx } Y_{\max} = \frac{d_c}{2}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$\text{ex } 180\text{mm} = \frac{360\text{mm}}{2}$$

5) Moment of Inertia about Neutral Axis for Circular Section

$$\text{fx } I_{\text{circular}} = \frac{\pi}{64} \cdot d_c^4$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 8.2\text{E}^8\text{mm}^4 = \frac{\pi}{64} \cdot (360\text{mm})^4$$

6) Section Modulus for Circular Section

$$\text{fx } Z = \frac{\pi}{32} \cdot d_c^3$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$\text{ex } 4.6\text{E}^6\text{mm}^3 = \frac{\pi}{32} \cdot (360\text{mm})^3$$



Hollow Circular Section

7) Distance of Outermost Layer from Neutral Axis in Hollow Circular Section

$$fx \quad Y_{\max} = \frac{d_o}{2}$$

[Open Calculator !\[\]\(23d9fc146e83b5c3013cfa32c784f8d5_img.jpg\)](#)

$$ex \quad 120\text{mm} = \frac{240\text{mm}}{2}$$

8) Inner Diameter of Hollow Circular Section given Section Modulus

$$fx \quad d_i = \left(d_o^4 - \frac{32 \cdot d_o \cdot Z}{\pi} \right)^{\frac{1}{4}}$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a_img.jpg\)](#)

$$ex \quad 238.887\text{mm} = \left((240\text{mm})^4 - \frac{32 \cdot (240\text{mm}) \cdot 25000\text{mm}^3}{\pi} \right)^{\frac{1}{4}}$$

9) Moment of Inertia of Hollow Circular Section

$$fx \quad I_{\text{circular}} = \frac{\pi}{64} \cdot (d_o^4 - d_i^4)$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a_img.jpg\)](#)

$$ex \quad 1.6E^8\text{mm}^4 = \frac{\pi}{64} \cdot \left((240\text{mm})^4 - (15\text{mm})^4 \right)$$

10) Outer Diameter of Hollow Circular Section

$$fx \quad d_o = 2 \cdot Y_{\max}$$

[Open Calculator !\[\]\(c1168d6a8b365d11e842ece304635fa7_img.jpg\)](#)

$$ex \quad 15000\text{mm} = 2 \cdot 7500\text{mm}$$



11) Section Modulus of Hollow Circular Section

$$\text{fx } Z = \frac{\pi}{32 \cdot d_o} \cdot (d_o^4 - d_i^4)$$

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

$$\text{ex } 1.4E^6 \text{mm}^3 = \frac{\pi}{32 \cdot (240\text{mm})} \cdot ((240\text{mm})^4 - (15\text{mm})^4)$$

Hollow Rectangular Section

12) Distance of Outermost Layer from Neutral Axis for Hollow Rectangular Sections

$$\text{fx } Y_{\max} = \frac{L_{\text{outer}}}{2}$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762_img.jpg\)](#)

$$\text{ex } 550\text{mm} = \frac{1100\text{mm}}{2}$$

13) Moment of Inertia for Hollow Rectangular Section

$$\text{fx } I_{\text{circular}} = \frac{B_{\text{outer}} \cdot L_{\text{outer}}^3 - B_{\text{inner}} \cdot L_{\text{inner}}^3}{12}$$

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

$$\text{ex } 4.9E^{10} \text{mm}^4 = \frac{480\text{mm} \cdot (1100\text{mm})^3 - 250\text{mm} \cdot (600\text{mm})^3}{12}$$



14) Outer Breadth of Hollow Rectangular Section given Section Modulus



$$fx \quad B_{outer} = \frac{6 \cdot Z \cdot L_{outer} + B_{inner} \cdot L_{inner}^3}{L_{outer}^3}$$

[Open Calculator](#)

$$ex \quad 40.69497\text{mm} = \frac{6 \cdot 25000\text{mm}^3 \cdot (1100\text{mm}) + 250\text{mm} \cdot (600\text{mm})^3}{(1100\text{mm})^3}$$

15) Outer Length of Hollow Rectangular Section



$$fx \quad L_{outer} = 2 \cdot Y_{max}$$

[Open Calculator](#)

$$ex \quad 15000\text{mm} = 2 \cdot 7500\text{mm}$$

16) Section Modulus for Hollow Rectangular Section



$$fx \quad Z = \frac{B_{outer} \cdot L_{outer}^3 - B_{inner} \cdot L_{inner}^3}{6 \cdot L_{outer}}$$

[Open Calculator](#)

$$ex \quad 8.9E^7\text{mm}^3 = \frac{480\text{mm} \cdot (1100\text{mm})^3 - 250\text{mm} \cdot (600\text{mm})^3}{6 \cdot (1100\text{mm})}$$



Rectangular Section

17) Breadth of Rectangular Section given Section Modulus

$$fx \quad B = \frac{6 \cdot Z}{L^2}$$

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

$$ex \quad 0.066667\text{mm} = \frac{6 \cdot 25000\text{mm}^3}{(1500\text{mm})^2}$$

18) Distance of Outermost Layer from Neutral Layer for Rectangular Section

$$fx \quad Y_{\max} = \frac{L}{2}$$

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

$$ex \quad 750\text{mm} = \frac{1500\text{mm}}{2}$$

19) Length of Rectangular Section given Section Modulus

$$fx \quad L = \sqrt{\frac{6 \cdot Z}{B}}$$

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

$$ex \quad 15.19109\text{mm} = \sqrt{\frac{6 \cdot 25000\text{mm}^3}{650\text{mm}}}$$



20) Length of Rectangular Section using Distance of Outermost Layer from Neutral Layer

$$\text{fx } L = 2 \cdot Y_{\max}$$

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

$$\text{ex } 15000\text{mm} = 2 \cdot 7500\text{mm}$$

21) Section Modulus for Rectangular Section

$$\text{fx } Z = \frac{1}{6} \cdot B \cdot L^2$$

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

$$\text{ex } 2.4\text{E}^8\text{mm}^3 = \frac{1}{6} \cdot 650\text{mm} \cdot (1500\text{mm})^2$$






Variables Used

- **B** Breadth of Rectangular Section (*Millimeter*)
- **B_{inner}** Inner Breadth of Hollow Rectangular Section (*Millimeter*)
- **B_{outer}** Outer Breadth of Hollow Rectangular Section (*Millimeter*)
- **d_c** Diameter of Circular section (*Millimeter*)
- **d_i** Inner Diameter of Hollow Circular Section (*Millimeter*)
- **d_o** Outer Diameter of Hollow Circular Section (*Millimeter*)
- **I_{circular}** MOI of Area of Circular Section (*Millimeter⁴*)
- **L** Length of Rectangular Section (*Millimeter*)
- **L_{inner}** Inner Length of Hollow Rectangle (*Millimeter*)
- **L_{outer}** Outer Length of Hollow Rectangle (*Millimeter*)
- **Y_{max}** Distance b/w Outermost and Neutral Layer (*Millimeter*)
- **Z** Section Modulus (*Cubic Millimeter*)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Volume** in Cubic Millimeter (mm³)
Volume Unit Conversion 
- **Measurement:** **Second Moment of Area** in Millimeter⁴ (mm⁴)
Second Moment of Area Unit Conversion 



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