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Section modulus, Hydraulic Depth and Practical Channel Sections Formulas

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List of 19 Section modulus, Hydraulic Depth and Practical Channel Sections Formulas

Section modulus, Hydraulic Depth and Practical Channel Sections

Hydraulic Depth

1) Hydraulic Depth

$$\text{fx } D_{\text{Hydraulic}} = \frac{A}{T}$$

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

$$\text{ex } 11.90476\text{m} = \frac{25\text{m}^2}{2.1\text{m}}$$

2) Hydraulic Radius or Hydraulic Mean Depth

$$\text{fx } R_H = \frac{A}{p}$$

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

$$\text{ex } 1.5625\text{m} = \frac{25\text{m}^2}{16\text{m}}$$



3) Top Width given Hydraulic Depth

$$fx \quad T = \frac{A}{D_{\text{Hydraulic}}}$$

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

$$ex \quad 8.333333m = \frac{25m^2}{3m}$$

4) Wetted Area given Hydraulic Depth

$$fx \quad A = D_{\text{Hydraulic}} \cdot T$$

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

$$ex \quad 6.3m^2 = 3m \cdot 2.1m$$

5) Wetted Area given Hydraulic Mean Depth

$$fx \quad A = R_H \cdot p$$

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

$$ex \quad 25.6m^2 = 1.6m \cdot 16m$$

6) Wetted Perimeter given Hydraulic Mean Depth

$$fx \quad p = \frac{A}{R_H}$$

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

$$ex \quad 15.625m = \frac{25m^2}{1.6m}$$



Practical Channel Sections

7) Depth of Flow given Wetted Area of Triangular Channel Section

$$\text{fx } d_f = \sqrt{\frac{A}{\theta + \cot(\theta)}}$$

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

$$\text{ex } 3.329156\text{m} = \sqrt{\frac{25\text{m}^2}{30^\circ + \cot(30^\circ)}}$$

8) Depth of Flow given Wetted Perimeter of Triangular Channel Section

$$\text{fx } d_f = \frac{p}{2 \cdot (\theta + \cot(\theta))}$$

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

$$\text{ex } 3.54665\text{m} = \frac{16\text{m}}{2 \cdot (30^\circ + \cot(30^\circ))}$$

9) Hydraulic Radius of Trapezoidal Channel Section

$$\text{fx } R_H = \frac{d_f \cdot (B + d_f \cdot (\theta + \cot(\theta)))}{B + 2 \cdot d_f \cdot (\theta + \cot(\theta))}$$

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

$$\text{ex } 1.661009\text{m} = \frac{3.3\text{m} \cdot (100\text{mm} + 3.3\text{m} \cdot (30^\circ + \cot(30^\circ)))}{100\text{mm} + 2 \cdot 3.3\text{m} \cdot (30^\circ + \cot(30^\circ))}$$



10) Hydraulic Radius of Triangular Channel Section

$$\text{fx } R_H = \frac{d_f}{2}$$

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

$$\text{ex } 1.65\text{m} = \frac{3.3\text{m}}{2}$$

11) Wetted Area of Trapezoidal Channel Section

$$\text{fx } A = d_f \cdot (B + d_f \cdot (\theta + \cot(\theta)))$$

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

$$\text{ex } 24.89402\text{m}^2 = 3.3\text{m} \cdot (100\text{mm} + 3.3\text{m} \cdot (30^\circ + \cot(30^\circ)))$$

12) Wetted Area of Triangular Channel Section

$$\text{fx } A = (d_f^2) \cdot (\theta + \cot(\theta))$$

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

$$\text{ex } 24.56402\text{m}^2 = ((3.3\text{m})^2) \cdot (30^\circ + \cot(30^\circ))$$

13) Wetted Perimeter of Trapezoidal Channel Section

$$\text{fx } p = (B + 2 \cdot d_f \cdot (\theta + \cot(\theta)))$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$\text{ex } 14.98729\text{m} = (100\text{mm} + 2 \cdot 3.3\text{m} \cdot (30^\circ + \cot(30^\circ)))$$

14) Wetted Perimeter of Triangular Channel Section

$$\text{fx } p = 2 \cdot d_f \cdot (\theta + \cot(\theta))$$

[Open Calculator !\[\]\(4a7b4ce770af8456e11a71f9565c8c2b_img.jpg\)](#)

$$\text{ex } 14.88729\text{m} = 2 \cdot 3.3\text{m} \cdot (30^\circ + \cot(30^\circ))$$



Section modulus

15) Section Modulus of Circular Section

$$\text{fx } z = \frac{\pi \cdot (d_{\text{section}}^3)}{32}$$

[Open Calculator !\[\]\(950a62bbddad88d64435fd35607dfc42_img.jpg\)](#)

$$\text{ex } 12.27185\text{mm}^3 = \frac{\pi \cdot ((5\text{m})^3)}{32}$$

16) Section Modulus of Hollow circular tube of uniform section

$$\text{fx } z = \frac{\pi \cdot ((d_{\text{section}}^4) - (d_i^4))}{32 \cdot d_{\text{section}}}$$

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

$$\text{ex } 12.27185\text{mm}^3 = \frac{\pi \cdot (((5\text{m})^4) - ((2\text{mm})^4))}{32 \cdot 5\text{m}}$$

17) Section Modulus of Hollow Rectangular Section

$$\text{fx } z = \frac{B_H \cdot (D^3) - b \cdot (d^3)}{6 \cdot D}$$

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

$$\text{ex } 3.3\text{E}^{-5}\text{mm}^3 = \frac{20\text{mm} \cdot ((100.1\text{mm})^3) - 10.2\text{mm} \cdot ((10\text{mm})^3)}{6 \cdot 100.1\text{mm}}$$



18) Section Modulus of Rectangular Section

$$\text{fx } z = \frac{B_H \cdot (D^2)}{6}$$

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5_img.jpg\)](#)

$$\text{ex } 3.3\text{E}^{-5}\text{mm}^3 = \frac{20\text{mm} \cdot ((100.1\text{mm})^2)}{6}$$

19) Section Modulus of Triangular Section

$$\text{fx } z = \frac{B_H \cdot (H_s^2)}{24}$$

[Open Calculator !\[\]\(2b376d1a92330ab09dad2665d2f89bf5_img.jpg\)](#)

$$\text{ex } 85.00833\text{mm}^3 = \frac{20\text{mm} \cdot ((10.1\text{mm})^2)}{24}$$







Variables Used

- **A** Wetted Surface Area of Channel (Square Meter)
- **b** Interior Width of Section (Millimeter)
- **B** Width of Trapezoidal Channel Section (Millimeter)
- **B_H** Width of a Section Channel (Millimeter)
- **d** Interior Depth of Section (Millimeter)
- **D** Depth of Section (Millimeter)
- **d_f** Depth of Flow (Meter)
- **D_{Hydraulic}** Hydraulic Depth (Meter)
- **d_i** Interior Diameter of Circular Section (Millimeter)
- **d_{section}** Diameter of Section (Meter)
- **H_s** Height of Section (Millimeter)
- **p** Wetted Perimeter of Channel (Meter)
- **R_H** Hydraulic Radius of Channel (Meter)
- **T** Top Width (Meter)
- **Z** Section Modulus (Cubic Millimeter)
- **θ** Theta (Degree)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **cot**, $\cot(\text{Angle})$
Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.
- **Function:** **sqrt**, $\text{sqrt}(\text{Number})$
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.
- **Measurement:** **Length** in Meter (m), Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Volume** in Cubic Millimeter (mm^3)
Volume Unit Conversion 
- **Measurement:** **Area** in Square Meter (m^2)
Area Unit Conversion 
- **Measurement:** **Angle** in Degree ($^\circ$)
Angle Unit Conversion 



Check other formula lists

- [Geometrical Properties of Circular Channel Section Formulas](#) 
- [Geometrical Properties of Parabolic Channel Section Formulas](#) 
- [Geometrical Properties of Rectangular Channel Section Formulas](#) 
- [Geometrical Properties of Trapezoidal Channel Section Formulas](#) 
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