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X Shape Formulas

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List of 24 X Shape Formulas

X Shape

Angles of X Shape

Bottom and Top Angle of X Shape

1) Bottom and Top Angle of X Shape given Crossing Length

$$\text{fx } \angle_{\text{Bottom/Top}} = \pi - \left(2 \cdot a \cos \left(\frac{t_{\text{Bar}}}{2 \cdot l_{\text{Crossing}}} \right) \right)$$

[Open Calculator !\[\]\(3211b5d1d968fc1665909b34f9f16010_img.jpg\)](#)

$$\text{ex } 38.94244^\circ = \pi - \left(2 \cdot a \cos \left(\frac{2\text{m}}{2 \cdot 3\text{m}} \right) \right)$$

2) Bottom and Top Angle of X Shape given Left or Right Angle

$$\text{fx } \angle_{\text{Bottom/Top}} = \pi - \angle_{\text{Left/Right}}$$

[Open Calculator !\[\]\(9c2e8d1b5bd77cb5c9f83b7a9cff79fd_img.jpg\)](#)

$$\text{ex } 45^\circ = \pi - 135^\circ$$

Left and Right Angle of X Shape

3) Left and Right Angle of X Shape given Bottom or Top Angle

$$\text{fx } \angle_{\text{Left/Right}} = \pi - \angle_{\text{Bottom/Top}}$$

[Open Calculator !\[\]\(eabd9f9ababee93effadc3b380fe65fd_img.jpg\)](#)

$$\text{ex } 135^\circ = \pi - 45^\circ$$



Area of X Shape

4) Area of X Shape given Bottom or Top Angle

fx

Open Calculator 

$$A = (2 \cdot l_{\text{Bar}} \cdot t_{\text{Bar}} \cdot \sin(\angle_{\text{Bottom/Top}})) - \left(\frac{t_{\text{Bar}}^2}{2} \cdot \cot\left(\frac{\angle_{\text{Bottom/Top}}}{2}\right) \right)$$

ex

$$51.74012\text{m}^2 = (2 \cdot 20\text{m} \cdot 2\text{m} \cdot \sin(45^\circ)) - \left(\frac{(2\text{m})^2}{2} \cdot \cot\left(\frac{45^\circ}{2}\right) \right)$$

5) Area of X Shape given Left or Right Angle

fx

Open Calculator 

$$A = (2 \cdot l_{\text{Bar}} \cdot t_{\text{Bar}} \cdot \sin(\angle_{\text{Left/Right}})) - \frac{\left(t_{\text{Bar}} \cdot \sin\left(\frac{\angle_{\text{Left/Right}}}{2}\right) \right)^2}{\sin(\angle_{\text{Left/Right}})}$$

ex

$$51.74012\text{m}^2 = (2 \cdot 20\text{m} \cdot 2\text{m} \cdot \sin(135^\circ)) - \frac{(2\text{m} \cdot \sin(\frac{135^\circ}{2}))^2}{\sin(135^\circ)}$$

Bar Thickness of X Shape

6) Bar Thickness of X Shape given Crossing Length and Bottom or Top Angle

fx

Open Calculator 

$$t_{\text{Bar}} = 2 \cdot l_{\text{Crossing}} \cdot \sin\left(\frac{\angle_{\text{Bottom/Top}}}{2}\right)$$

ex

$$2.296101\text{m} = 2 \cdot 3\text{m} \cdot \sin\left(\frac{45^\circ}{2}\right)$$



7) Bar Thickness of X Shape given Perimeter and Arm Lengths 

$$fx \quad t_{\text{Bar}} = \frac{P}{4} - l_{\text{Inner Arm}} - l_{\text{Outer Arm}}$$

Open Calculator 

$$ex \quad 1.75\text{m} = \frac{75\text{m}}{4} - 7\text{m} - 10\text{m}$$

Height of X Shape 8) Height of X Shape given Bottom or Top Angle 

$$fx \quad h = l_{\text{Bar}} \cdot \cos\left(\frac{\angle_{\text{Bottom/Top}}}{2}\right)$$

Open Calculator 

$$ex \quad 18.47759\text{m} = 20\text{m} \cdot \cos\left(\frac{45^\circ}{2}\right)$$

9) Height of X Shape given Outer Arm Length and Left or Right Angle 

$$fx \quad h = 2 \cdot l_{\text{Outer Arm}} \cdot \sin\left(\frac{\angle_{\text{Left/Right}}}{2}\right)$$

Open Calculator 

$$ex \quad 18.47759\text{m} = 2 \cdot 10\text{m} \cdot \sin\left(\frac{135^\circ}{2}\right)$$

Lengths of X Shape Bar Length of X Shape 10) Bar Length of X Shape given Outer Arm Length 

$$fx \quad l_{\text{Bar}} = 2 \cdot l_{\text{Outer Arm}}$$

Open Calculator 

$$ex \quad 20\text{m} = 2 \cdot 10\text{m}$$



Crossing Length of X Shape

11) Crossing Length of X Shape given Bottom or Top Angle

$$\text{fx } l_{\text{Crossing}} = \frac{t_{\text{Bar}}}{2} \cdot \cos ec \left(\frac{\angle_{\text{Bottom/Top}}}{2} \right)$$

[Open Calculator !\[\]\(74d4806277d7e73349d8e8c0897931e9_img.jpg\)](#)

$$\text{ex } 2.613126\text{m} = \frac{2\text{m}}{2} \cdot \cos ec \left(\frac{45^\circ}{2} \right)$$

12) Crossing Length of X Shape given Inner and Outer Arm Lengths

$$\text{fx } l_{\text{Crossing}} = l_{\text{Outer Arm}} - l_{\text{Inner Arm}}$$

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

$$\text{ex } 3\text{m} = 10\text{m} - 7\text{m}$$

13) Crossing Length of X Shape given Left or Right Angle

$$\text{fx } l_{\text{Crossing}} = t_{\text{Bar}} \cdot \frac{\sin \left(\frac{\angle_{\text{Left/Right}}}{2} \right)}{\sin(\angle_{\text{Left/Right}})}$$

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

$$\text{ex } 2.613126\text{m} = 2\text{m} \cdot \frac{\sin \left(\frac{135^\circ}{2} \right)}{\sin(135^\circ)}$$

14) Crossing Length of X Shape given Perimeter

$$\text{fx } l_{\text{Crossing}} = t_{\text{Bar}} + l_{\text{Bar}} - \frac{P}{4}$$

[Open Calculator !\[\]\(e50091943b385fe16d3277389202856f_img.jpg\)](#)

$$\text{ex } 3.25\text{m} = 2\text{m} + 20\text{m} - \frac{75\text{m}}{4}$$



Inner Arm Length of X Shape

15) Inner Arm Length of X Shape given Bottom or Top Angle

$$\text{fx } l_{\text{Inner Arm}} = \frac{l_{\text{Bar}}}{2} - \frac{t_{\text{Bar}}}{2 \cdot \cos\left(\frac{\pi}{2} - \frac{\angle_{\text{Bottom/Top}}}{2}\right)}$$

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

$$\text{ex } 7.386874\text{m} = \frac{20\text{m}}{2} - \frac{2\text{m}}{2 \cdot \cos\left(\frac{\pi}{2} - \frac{45^\circ}{2}\right)}$$

16) Inner Arm Length of X Shape given Crossing Length

$$\text{fx } l_{\text{Inner Arm}} = \frac{l_{\text{Bar}}}{2} - l_{\text{Crossing}}$$

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

$$\text{ex } 7\text{m} = \frac{20\text{m}}{2} - 3\text{m}$$

17) Inner Arm Length of X Shape given Outer Arm Length and Crossing Length

$$\text{fx } l_{\text{Inner Arm}} = l_{\text{Outer Arm}} - l_{\text{Crossing}}$$

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

$$\text{ex } 7\text{m} = 10\text{m} - 3\text{m}$$

18) Inner Arm Length of X Shape given Perimeter

$$\text{fx } l_{\text{Inner Arm}} = \frac{P}{4} - t_{\text{Bar}} - \frac{l_{\text{Bar}}}{2}$$

[Open Calculator !\[\]\(21226b58c700e5231ab98d27101bac58_img.jpg\)](#)

$$\text{ex } 6.75\text{m} = \frac{75\text{m}}{4} - 2\text{m} - \frac{20\text{m}}{2}$$



Outer Arm Length of X Shape

19) Outer Arm Length of X Shape

$$fx \quad l_{\text{Outer Arm}} = \frac{l_{\text{Bar}}}{2}$$

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

$$ex \quad 10m = \frac{20m}{2}$$

20) Outer Arm Length of X Shape given Crossing and Inner Arm Length

$$fx \quad l_{\text{Outer Arm}} = l_{\text{Inner Arm}} + l_{\text{Crossing}}$$

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

$$ex \quad 10m = 7m + 3m$$

21) Outer Arm Length of X Shape given Perimeter and Inner Arm Length

$$fx \quad l_{\text{Outer Arm}} = \frac{P}{4} - t_{\text{Bar}} - l_{\text{Inner Arm}}$$

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

$$ex \quad 9.75m = \frac{75m}{4} - 2m - 7m$$

Perimeter of X Shape

22) Perimeter of X Shape given Arm Lengths

$$fx \quad P = 4 \cdot (t_{\text{Bar}} + l_{\text{Outer Arm}} + l_{\text{Inner Arm}})$$

[Open Calculator !\[\]\(df47d6bec273bbb8b349135fff3a20f7_img.jpg\)](#)

$$ex \quad 76m = 4 \cdot (2m + 10m + 7m)$$

23) Perimeter of X Shape given Crossing Length

$$fx \quad P = 4 \cdot (t_{\text{Bar}} + l_{\text{Bar}} - l_{\text{Crossing}})$$

[Open Calculator !\[\]\(b58c23cb5aab1cd63092eda333892cb9_img.jpg\)](#)

$$ex \quad 76m = 4 \cdot (2m + 20m - 3m)$$



Width of X Shape

24) Width of X Shape given Inner Arm Length and Bottom or Top Angle

$$\text{fx } w = \left(2 \cdot l_{\text{Inner Arm}} \cdot \sin\left(\frac{\angle_{\text{Bottom/Top}}}{2}\right) \right) + (2 \cdot t_{\text{Bar}})$$

[Open Calculator !\[\]\(96cc62f861fdd6e50510c0224a756dff_img.jpg\)](#)

$$\text{ex } 9.357568\text{m} = \left(2 \cdot 7\text{m} \cdot \sin\left(\frac{45^\circ}{2}\right) \right) + (2 \cdot 2\text{m})$$



Variables Used

- $\angle_{\text{Bottom/Top}}$ Bottom and Top Angle of X Shape (Degree)
- $\angle_{\text{Left/Right}}$ Left and Right Angle of X Shape (Degree)
- **A** Area of X Shape (Square Meter)
- **h** Height of X shape (Meter)
- **l_{Bar}** Bar Length of X Shape (Meter)
- **l_{Crossing}** Crossing Length of X Shape (Meter)
- **l_{Inner Arm}** Inner Arm Length of X Shape (Meter)
- **l_{Outer Arm}** Outer Arm Length of X Shape (Meter)
- **P** Perimeter of X Shape (Meter)
- **t_{Bar}** Bar Thickness of X Shape (Meter)
- **w** Width of X Shape (Meter)



Constants, Functions, Measurements used

- **Constant:** π , 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **acos**, $\text{acos}(\text{Number})$
The inverse cosine 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.
- **Function:** **cos**, $\text{cos}(\text{Angle})$
Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- **Function:** **cosec**, $\text{cosec}(\text{Angle})$
The cosecant function is a trigonometric function that is the reciprocal of the sine function.
- **Function:** **cot**, $\text{cot}(\text{Angle})$
Cotangent is a trigonometric function that is defined as the ratio of the adjacent side to the opposite side in a right triangle.
- **Function:** **sec**, $\text{sec}(\text{Angle})$
Secant is a trigonometric function that is defined ratio of the hypotenuse to the shorter side adjacent to an acute angle (in a right-angled triangle); the reciprocal of a cosine.
- **Function:** **sin**, $\text{sin}(\text{Angle})$
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.
- **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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