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Mass Moment of Inertia Formulas

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List of 29 Mass Moment of Inertia Formulas

Mass Moment of Inertia

1) Mass of Circular Plate

$$\text{fx } M = \pi \cdot \rho \cdot t \cdot r^2$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 4970.75\text{kg} = \pi \cdot 997\text{kg/m}^3 \cdot 1.2\text{m} \cdot (1.15\text{m})^2$$

2) Mass of Cone

$$\text{fx } M = \frac{1}{3} \cdot \pi \cdot \rho \cdot H_{\text{cone}} \cdot R_{\text{cone}}^2$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 400.9175\text{kg} = \frac{1}{3} \cdot \pi \cdot 997\text{kg/m}^3 \cdot 0.6\text{m} \cdot (0.8\text{m})^2$$

3) Mass of Cuboid

$$\text{fx } M = \rho \cdot L \cdot H \cdot w$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 2198.385\text{kg} = 997\text{kg/m}^3 \cdot 3\text{m} \cdot 1.05\text{m} \cdot 0.7\text{m}$$

4) Mass of Rectangular Plate

$$\text{fx } M = \rho \cdot B \cdot t \cdot L_{\text{rect}}$$

[Open Calculator !\[\]\(83bbbd261710c59db0214aa27b2edc0d_img.jpg\)](#)

$$\text{ex } 1166.49\text{kg} = 997\text{kg/m}^3 \cdot 0.65\text{m} \cdot 1.2\text{m} \cdot 1.5\text{m}$$



5) Mass of Solid Cylinder

$$\text{fx } M = \pi \cdot \rho \cdot H \cdot R_{\text{cyl}}^2$$

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

$$\text{ex } 2.055485\text{kg} = \pi \cdot 997\text{kg/m}^3 \cdot 1.05\text{m} \cdot (0.025\text{m})^2$$

6) Mass of Solid Sphere

$$\text{fx } M = \frac{4}{3} \cdot \pi \cdot \rho \cdot R_{\text{sphere}}^3$$

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

$$\text{ex } 8156.687\text{kg} = \frac{4}{3} \cdot \pi \cdot 997\text{kg/m}^3 \cdot (1.25\text{m})^3$$

7) Mass of Triangular Plate

$$\text{fx } M = \frac{1}{2} \cdot \rho \cdot b_{\text{tri}} \cdot H_{\text{tri}} \cdot t$$

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

$$\text{ex } 291.9216\text{kg} = \frac{1}{2} \cdot 997\text{kg/m}^3 \cdot 0.4\text{m} \cdot 1.22\text{m} \cdot 1.2\text{m}$$

Mass Moment of Inertia of Circular Plate

8) Mass Moment of Inertia of Circular Plate about x-axis Passing through Centroid

$$\text{fx } I_{xx} = \frac{M \cdot r^2}{4}$$

[Open Calculator !\[\]\(84f47badaad7772cd95667a7c387a639_img.jpg\)](#)

$$\text{ex } 11.72066\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (1.15\text{m})^2}{4}$$



9) Mass Moment of Inertia of Circular Plate about y-axis Passing through Centroid

$$\text{fx } I_{yy} = \frac{M \cdot r^2}{4}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$\text{ex } 11.72066\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (1.15\text{m})^2}{4}$$

10) Mass Moment of Inertia of Circular Plate about z-axis through Centroid, Perpendicular to Plate

$$\text{fx } I_{zz} = \frac{M \cdot r^2}{2}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$\text{ex } 23.44131\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (1.15\text{m})^2}{2}$$

Mass Moment of Inertia of Cone

11) Mass Moment of Inertia of Cone about x-axis Passing through Centroid, Perpendicular to Base

$$\text{fx } I_{xx} = \frac{3}{10} \cdot M \cdot R_{\text{cone}}^2$$

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

$$\text{ex } 6.8064\text{kg}\cdot\text{m}^2 = \frac{3}{10} \cdot 35.45\text{kg} \cdot (0.8\text{m})^2$$



12) Mass Moment of Inertia of Cone about y-axis Perpendicular to Height, Passing through Apex Point

$$\text{fx } I_{yy} = \frac{3}{20} \cdot M \cdot (R_{\text{cone}}^2 + 4 \cdot H_{\text{cone}}^2)$$

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

$$\text{ex } 11.0604\text{kg}\cdot\text{m}^2 = \frac{3}{20} \cdot 35.45\text{kg} \cdot ((0.8\text{m})^2 + 4 \cdot (0.6\text{m})^2)$$

Mass Moment of Inertia of Cuboid

13) Mass Moment of Inertia of Cuboid about x-axis Passing through Centroid, Parallel to Length

$$\text{fx } I_{xx} = \frac{M}{12} \cdot (w^2 + H^2)$$

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

$$\text{ex } 4.70451\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot ((0.7\text{m})^2 + (1.05\text{m})^2)$$

14) Mass Moment of Inertia of Cuboid about y-axis Passing through Centroid

$$\text{fx } I_{yy} = \frac{M}{12} \cdot (L^2 + w^2)$$

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

$$\text{ex } 28.03504\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot ((3\text{m})^2 + (0.7\text{m})^2)$$



15) Mass Moment of Inertia of Cuboid about z-axis Passing through Centroid

$$\text{fx } I_{zz} = \frac{M}{12} \cdot (L^2 + H^2)$$

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

$$\text{ex } 29.84447\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot ((3\text{m})^2 + (1.05\text{m})^2)$$

Mass Moment of Inertia of Rectangular Plate

16) Mass Moment of Inertia of Rectangular Plate about x-axis through Centroid, Parallel to Length

$$\text{fx } I_{xx} = \frac{M \cdot B^2}{12}$$

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

$$\text{ex } 1.248135\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (0.65\text{m})^2}{12}$$

17) Mass Moment of Inertia of Rectangular Plate about y-axis through Centroid, Parallel to Breadth

$$\text{fx } I_{yy} = \frac{M \cdot L_{\text{rect}}^2}{12}$$

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

$$\text{ex } 6.646875\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (1.5\text{m})^2}{12}$$



18) Mass Moment of Inertia of Rectangular Plate about z-axis through Centroid, Perpendicular to Plate

$$\text{fx } I_{zz} = \frac{M}{12} \cdot (L_{\text{rect}}^2 + B^2)$$

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

$$\text{ex } 7.89501\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot ((1.5\text{m})^2 + (0.65\text{m})^2)$$

Mass Moment of Inertia of Rod

19) Mass Moment of Inertia of Rod about y-axis Passing through Centroid, Perpendicular to Length of Rod

$$\text{fx } I_{yy} = \frac{M \cdot L_{\text{rod}}^2}{12}$$

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

$$\text{ex } 11.81667\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (2\text{m})^2}{12}$$

20) Mass Moment of Inertia of Rod about z-axis Passing through Centroid, Perpendicular to Length of Rod

$$\text{fx } I_{zz} = \frac{M \cdot L_{\text{rod}}^2}{12}$$

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

$$\text{ex } 11.81667\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (2\text{m})^2}{12}$$



Mass Moment of Inertia of Solid Cylinder

21) Mass Moment of Inertia of Solid Cylinder about x-axis through Centroid, Perpendicular to Length

$$\text{fx } I_{xx} = \frac{M}{12} \cdot (3 \cdot R_{\text{cyl}}^2 + H_{\text{cyl}}^2)$$

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

$$\text{ex } 0.041284\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot (3 \cdot (0.025\text{m})^2 + (0.11\text{m})^2)$$

22) Mass Moment of Inertia of Solid Cylinder about y-axis through Centroid, Parallel to Length

$$\text{fx } I_{yy} = \frac{M \cdot R_{\text{cyl}}^2}{2}$$

[Open Calculator !\[\]\(f95dab70c751fda7d824b8b03650f7aa_img.jpg\)](#)

$$\text{ex } 0.011078\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (0.025\text{m})^2}{2}$$

23) Mass Moment of Inertia of Solid Cylinder about z-axis through Centroid, Perpendicular to Length

$$\text{fx } I_{zz} = \frac{M}{12} \cdot (3 \cdot R_{\text{cyl}}^2 + H_{\text{cyl}}^2)$$

[Open Calculator !\[\]\(e9474ce1d70442456f8fe9c393ea149c_img.jpg\)](#)

$$\text{ex } 0.041284\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{12} \cdot (3 \cdot (0.025\text{m})^2 + (0.11\text{m})^2)$$



Mass Moment of Inertia of Solid Sphere

24) Mass Moment of Inertia of Solid Sphere about x-axis Passing through Centroid

$$\text{fx } I_{xx} = \frac{2}{5} \cdot M \cdot R_{\text{sphere}}^2$$

[Open Calculator !\[\]\(d66ff64371a51729ac8c1cdaa685ba6f_img.jpg\)](#)

$$\text{ex } 22.15625\text{kg}\cdot\text{m}^2 = \frac{2}{5} \cdot 35.45\text{kg} \cdot (1.25\text{m})^2$$

25) Mass Moment of Inertia of Solid Sphere about y-axis Passing through Centroid

$$\text{fx } I_{yy} = \frac{2}{5} \cdot M \cdot R_{\text{sphere}}^2$$

[Open Calculator !\[\]\(faf942dc3e59ce8eb64b4ac481eca7e0_img.jpg\)](#)

$$\text{ex } 22.15625\text{kg}\cdot\text{m}^2 = \frac{2}{5} \cdot 35.45\text{kg} \cdot (1.25\text{m})^2$$

26) Mass Moment of Inertia of Solid Sphere about z-axis Passing through Centroid

$$\text{fx } I_{zz} = \frac{2}{5} \cdot M \cdot R_{\text{sphere}}^2$$

[Open Calculator !\[\]\(95b425611cbd2b8716a140cf67c81822_img.jpg\)](#)

$$\text{ex } 22.15625\text{kg}\cdot\text{m}^2 = \frac{2}{5} \cdot 35.45\text{kg} \cdot (1.25\text{m})^2$$



Mass Moment of Inertia of Triangular Plate

27) Mass Moment of Inertia of Triangular Plate about x-axis Passing through Centroid, Parallel to Base

$$\text{fx } I_{xx} = \frac{M \cdot H_{\text{tri}}^2}{18}$$

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

$$\text{ex } 2.931321\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (1.22\text{m})^2}{18}$$

28) Mass Moment of Inertia of Triangular Plate about y-axis Passing through Centroid, Parallel to Height

$$\text{fx } I_{yy} = \frac{M \cdot b_{\text{tri}}^2}{24}$$

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

$$\text{ex } 0.236333\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg} \cdot (0.4\text{m})^2}{24}$$

29) Mass Moment of Inertia of Triangular Plate about z-axis through Centroid, Perpendicular to Plate

$$\text{fx } I_{zz} = \frac{M}{72} \cdot (3 \cdot b_{\text{tri}}^2 + 4 \cdot H_{\text{tri}}^2)$$

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

$$\text{ex } 3.167654\text{kg}\cdot\text{m}^2 = \frac{35.45\text{kg}}{72} \cdot (3 \cdot (0.4\text{m})^2 + 4 \cdot (1.22\text{m})^2)$$







Variables Used

- **B** Breadth of Rectangular Section (Meter)
- **b_{tri}** Base of Triangle (Meter)
- **H** Height (Meter)
- **H_{cone}** Height of Cone (Meter)
- **H_{cyl}** Cylinder Height (Meter)
- **H_{tri}** Height of Triangle (Meter)
- **I_{xx}** Mass Moment of Inertia about X-axis (Kilogram Square Meter)
- **I_{yy}** Mass Moment of Inertia about Y-axis (Kilogram Square Meter)
- **I_{zz}** Mass Moment of Inertia about Z-axis (Kilogram Square Meter)
- **L** Length (Meter)
- **L_{rect}** Length of Rectangular Section (Meter)
- **L_{rod}** Length of Rod (Meter)
- **M** Mass (Kilogram)
- **r** Radius (Meter)
- **R_{cone}** Radius of Cone (Meter)
- **R_{cyl}** Cylinder Radius (Meter)
- **R_{sphere}** Radius of Sphere (Meter)
- **t** Thickness (Meter)
- **w** Width (Meter)
- **ρ** Density (Kilogram per Cubic Meter)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Weight** in Kilogram (kg)
Weight Unit Conversion 
- **Measurement:** **Density** in Kilogram per Cubic Meter (kg/m^3)
Density Unit Conversion 
- **Measurement:** **Moment of Inertia** in Kilogram Square Meter ($\text{kg}\cdot\text{m}^2$)
Moment of Inertia Unit Conversion 



Check other formula lists

- [Area Moment of Inertia Formulas](#) 

- [Mass Moment of Inertia Formulas](#) 

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