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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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

fx $$M = \rho \cdot L \cdot H \cdot w$$

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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

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

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Cone

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Cuboid

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Rectangular Plate

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Rod

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Solid Cylinder

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Solid Sphere

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

Mass Moment of Inertia of Triangular Plate

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

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/m³)
  Density Unit Conversion
- Measurement: **Moment of Inertia** in Kilogram Square Meter (kg·m²)
  Moment of Inertia Unit Conversion

Check other formula lists

- **Area Moment of Inertia Formulas**
- **Mass Moment of Inertia Formulas**

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