Centre of Gravity of a Composite Body

Total mass and centre of gravity (x, y, z) of an assembly of up to five parts from each part's mass and centre-of-gravity coordinates.

Method: Moment of mass about axes (statics definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Mass 1	1,200.0	kg
x of 1	0.50000	m
y of 1	0.80000	m
z of 1	0	m
Mass 2	800.00	kg
x of 2	2.0000	m
y of 2	0.50000	m
z of 2	0	m
Mass 3	400.00	kg
x of 3	3.2000	m
y of 3	1.5000	m
z of 3	0.20000	m
Mass 4	0	kg
x of 4	0	m
y of 4	0	m
z of 4	0	m
Mass 5	0	kg
x of 5	0	m
y of 5	0	m
z of 5	0	m

Calculated results

Parameter	Value	Unit
Total mass	2,400.0	kg
Centre of gravity x	1.4500	m
Centre of gravity y	0.81667	m
Centre of gravity z	0.033333	m

Notes for this case

- Choose one origin for all parts. For lifting, the hook must be directly above this point or the load will tilt.

Formula and method

$$\bar{x} = \frac{\sum m_i x_i}{\sum m_i}, \quad \bar{y} = \frac{\sum m_i y_i}{\sum m_i}, \quad \bar{z} = \frac{\sum m_i z_i}{\sum m_i}$$

Variables

m_1	Mass 1	kg
x_1	x of 1	m
y_1	y of 1	m
z_1	z of 1	m
m_2	Mass 2	kg
x_2	x of 2	m
y_2	y of 2	m
z_2	z of 2	m
m_3	Mass 3	kg
x_3	x of 3	m
y_3	y of 3	m
z_3	z of 3	m
m_4	Mass 4	kg
x_4	x of 4	m
y_4	y of 4	m
z_4	z of 4	m
m_5	Mass 5	kg
x_5	x of 5	m
y_5	y of 5	m
z_5	z of 5	m
M	Total mass	kg
$\bar{x}$	Centre of gravity x	m
$\bar{y}$	Centre of gravity y	m
$\bar{z}$	Centre of gravity z	m

Method and standards

First moments of mass.

Assumptions and limits

- Point masses at part CGs.

References

- Moment of mass about axes (statics definitions)

Report details

Report reference	FCC-0EKX-JEAE (the same inputs always give the same reference)
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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/mechanical/statics-dynamics/centre-of-gravity-composite

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.