

Dimensions of Mass and Force (Weight)

Engineering Fluid Mechanics

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$$\text{FORCE (F)} = M * L / T^2$$

$$F = m \cdot a$$

$$\underline{W} = mg$$

$$= m \cdot \frac{L}{T^2}$$

Dimensions of Mass and Force



SI

$$F = ma$$

$$F = \text{kg} \cdot \frac{\text{m}}{\text{s}^2} = \text{N} \quad \text{IN U.S.}$$

$$1 \text{ N} = 1 \text{ kg} \cdot \frac{\text{m}}{\text{s}^2}$$

$$F = \text{lbm} \cdot \text{ft}/\text{s}^2 = \text{lbf}$$

$$\frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m}/\text{s}^2} = 1$$

$$1 \text{ lbf} = 32.2 \cdot \text{lbm} \cdot \text{ft}/\text{s}^2$$

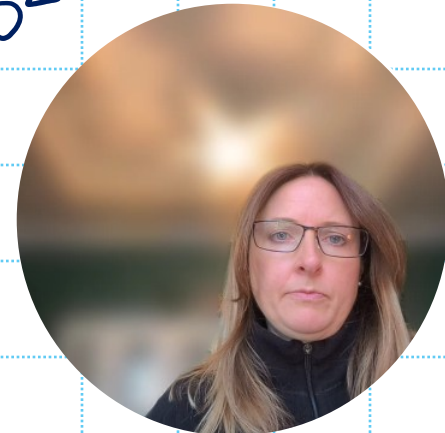
$$\frac{1 \text{ lbf}}{32.2 \text{ lbm} \cdot \text{ft}/\text{s}^2} = 1$$

1:1

$$32.2 \text{ lbm} \cdot \text{ft}/\text{s}^2$$

1:32.2

Units of Mass and Force



$$M = 25 \text{ kg}$$

$$m = 55 \text{ lbm}$$

$$W = mg$$

$$W = 25 \text{ kg} \cdot 9.81 \text{ m/s}^2 = 245.25 \text{ kg} \cdot \frac{\text{m}}{\text{s}^2} \left(\frac{1 \text{ N}}{1 \text{ kg} \cdot \frac{\text{m}}{\text{s}^2}} \right) =$$

$$W = 55 \text{ lbm} \cdot 32.2 \text{ ft/s}^2 = 1771 \text{ lbm} \cdot \frac{\text{ft}}{\text{s}^2} \quad \frac{245.25 \text{ N}}{\cancel{\text{ft/s}^2}}$$

$$1771 \text{ lbm} \cdot \frac{\text{ft}}{\text{s}^2} \left(\frac{1 \text{ lbf}}{32.2 \text{ lbm} \cdot \frac{\text{ft}}{\text{s}^2}} \right) = 55 \text{ lbf}$$

Units of Mass and Force





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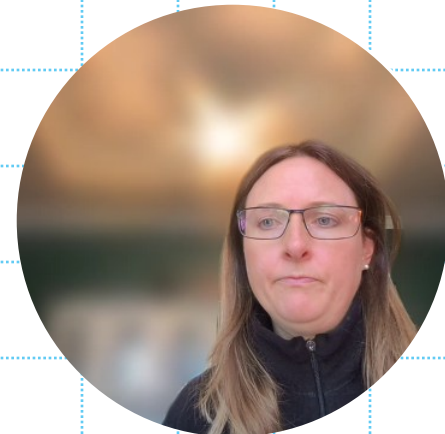


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THE END



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