

Moments Questions

① (a) Clockwise moment:

$$\text{Weight of right block: } 9.8 \times 2 = 19.6 \text{ N}$$

$$\text{Moment} = 19.6 \text{ N} \times 5 \text{ m} = 98 \text{ Nm}$$

To balance anticlockwise moment must be the same

$$\text{Moment} = 98 \text{ Nm} = \text{Weight of left block} \times 4 \text{ m}$$

$$\hookrightarrow \text{Weight of left block} = \frac{98 \text{ Nm}}{4 \text{ m}} = 24.5 \text{ N}$$

$$\text{Mass of left block} = \frac{24.5 \text{ N}}{9.8} = 2.5 \text{ kg}$$

(b) clockwise moment:

$$\text{Weight of right block} = 10 \times 9.8 = 98 \text{ N}$$

$$\text{Moment} = 98 \text{ N} \times 9 \text{ m} = 882 \text{ Nm}$$

$$\text{Anticlockwise moment} = 882 \text{ Nm} = \text{Weight of left block} \times 1 \text{ m}$$

$$\text{Weight of left block} = \frac{882 \text{ Nm}}{1 \text{ m}} = 882 \text{ N}$$

$$\text{Mass} = \frac{882 \text{ N}}{9.8} = 90 \text{ kg}$$

② (a) Moment caused by statue

$$\text{Weight of statue} = 20 \text{ kg} \times 9.8 = 196 \text{ N}$$

$$\text{Moment} = 1\text{m} \times 196 \text{ N} = 196 \text{ Nm} \quad \text{anticlockwise.}$$

Moment of me lifting

$$\text{Max force I can apply} = 10 \text{ kg} \times 9.8 = 98 \text{ N}$$

$$\text{Moment} = (1\text{m} + \text{length of handle}) \times 98 \text{ N} \quad \text{must equal to balance} \quad 196 \text{ Nm}$$

Rearranging,

$$(1\text{m} + \text{length of handle}) = \frac{196 \text{ Nm}}{98 \text{ N}} = 2\text{m}$$

$$\text{length of handle} = 2\text{m} - 1\text{m} = \underline{\underline{1\text{m}}}$$

(b) Moment of statue is the same = 196 Nm

$$\text{New max force} = 15 \times 9.8 = 147 \text{ N}$$

$$\text{Moment} = (1\text{m} + \text{length of handle}) \times 147 \text{ N} = 196 \text{ Nm}$$

$$1\text{m} + \text{length of handle} = \frac{196 \text{ Nm}}{147 \text{ N}} = 1.34\text{m}$$

$$\text{length of handle} = 34 \text{ cm}$$