Turning Effect of Force – 2019 June

1. 0625/31/M/J/19/No.2

Fig. 2.1 shows a man pushing down on a lever to lift one end of a heavy log.

Fig. 2.1

(a) State the term used to describe the turning force exerted by the man.

..... [1]

(b) **(i)** Fig. 2.2 shows the forces acting as the man starts to lift the heavy log.

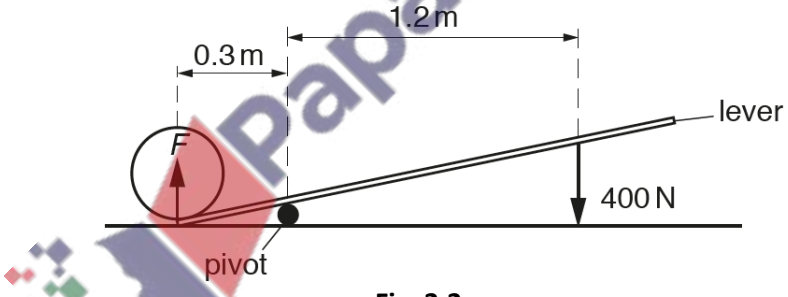

Fig. 2.2

Calculate the force *F*, exerted by the lever on the heavy log.

force *F* = ... N [3]

(ii) Describe how the man can use a smaller force to lift the heavy log.

.....

..... [1]

[Total: 5]

2. 0625/33/M/J/19/No.3

Fig. 3.1 shows a wheelbarrow and Fig. 3.2 shows the dimensions of its wheel.

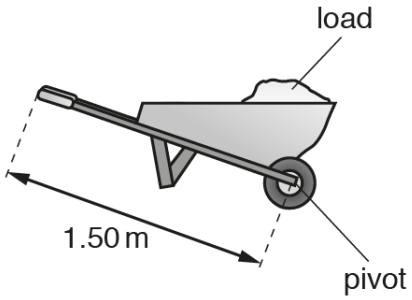

Fig. 3.1

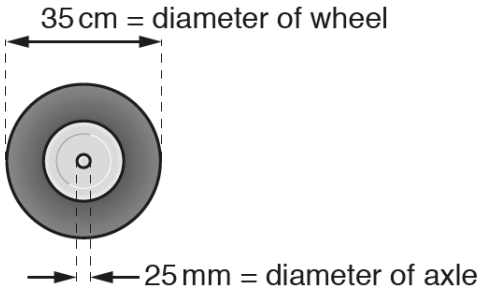

Fig. 3.2

(a) Complete the table to show the diameter of the wheel and axle in metres.

	measurement	measurement in metres
diameter of wheel	35 cm	
diameter of axle	25 mm	

[2]

(b) The mass of the wheelbarrow is 20 kg. The mass of the load in the wheelbarrow is 30 kg.

Calculate the total weight of the wheelbarrow and its load.

weight of wheelbarrow and load = ... N [3]

(c) A man lifts the handle of the wheelbarrow. He applies a force of 140 N, as shown in Fig. 3.3.

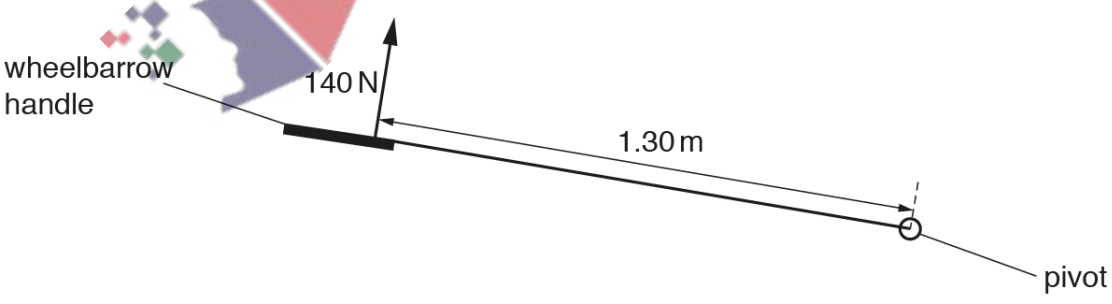

Fig. 3.3

Calculate the moment of the force about the pivot. Include the unit.

moment = ... [4]

[Total: 9]

3. 0625/33/M/J/19/No.4

Fig. 4.1 shows a flat-top cone and a sphere, resting on a table.

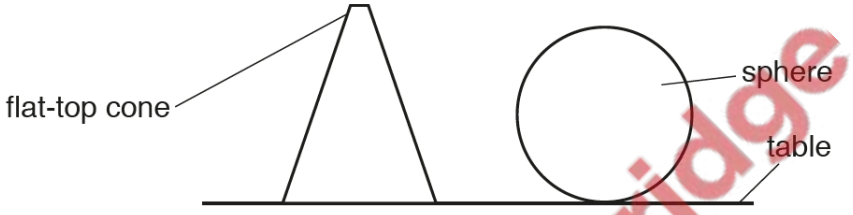

Fig. 4.1

(a) On Fig. 4.1, mark a cross on each object to show the position of the centre of mass of each object. [2]

(b) The cone is inverted and balanced on its top, as shown in Fig. 4.2.

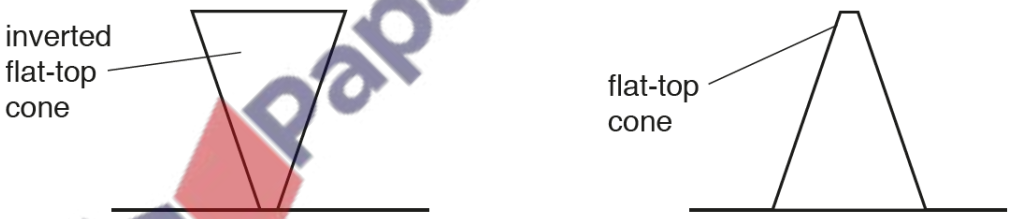

Fig. 4.2

Explain why the flat-top cone is less stable when it is inverted.

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..... [3]

[Total: 5]

4. 0625/41/M/J/19/No.2

Fig. 2.1 shows a sign that extends over a road.

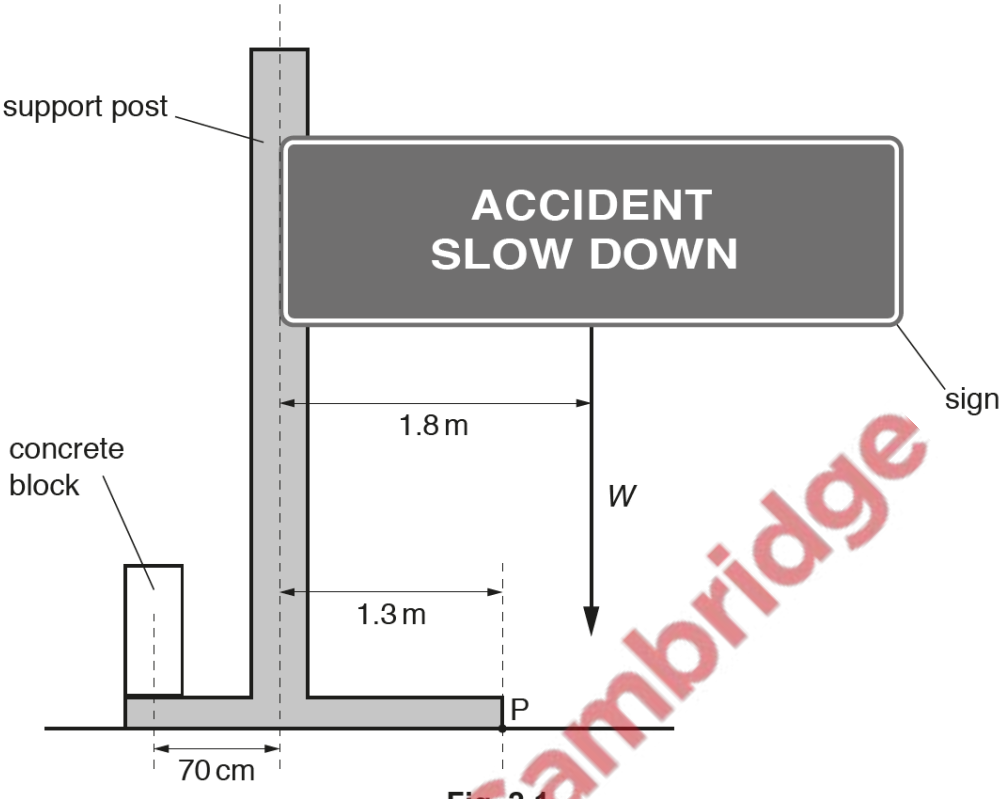

Fig. 2.1

The mass of the sign is 3.4×10^3 kg.

(a) Calculate the weight W of the sign.

W = ... [2]

(b) The weight of the sign acts at a horizontal distance of 1.8 m from the centre of the support post and it produces a turning effect about point P.

Point P is a horizontal distance of 1.3 m from the centre of the support post.

(i) Calculate the moment about P due to the weight of the sign.

moment = ... [3]

(ii) A concrete block is positioned on the other side of the support post with its centre of mass a horizontal distance of 70 cm from the centre of the support post.

1. State what is meant by *centre of mass*.

.....

..... [1]

2. The weight of the concrete block produces a moment about point P that exactly cancels the moment caused by the weight *W*.

Calculate the weight of the concrete block.

weight = ... [2]

(c) The concrete block is removed. The sign and support post rotate about point P in a clockwise direction.

State and explain what happens to the moment about point P due to the weight of the sign as it rotates.

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..... [2]

[Total: 10]

5. 0625/32/F/M/19/No.4

Fig. 4.1 shows a truck lifting a heavy load.

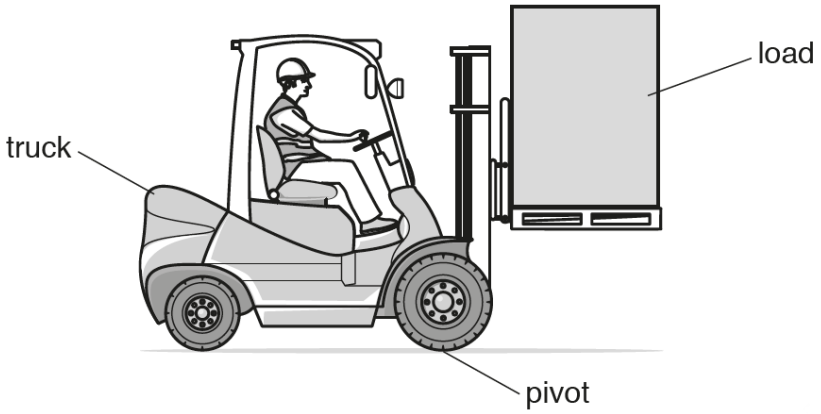

Fig. 4.1

(a) **(i)** The truck is stationary. Identify the quantities that determine the work done as it lifts the load.

Tick the box next to each correct quantity.

- ☐ distance
- ☐ force
- ☐ time [1]

(ii) Draw a ring around the unit for work done from the list.

joule newton pascal watt [1]

(b) Identify the quantities that determine the power of the truck.

Tick the box next to each correct quantity.

- ☐ energy transferred
- ☐ temperature
- ☐ time [1]

(c) The truck has a pivot near the front wheel. Fig. 4.2 represents the pivot and the vertical forces acting on the truck.

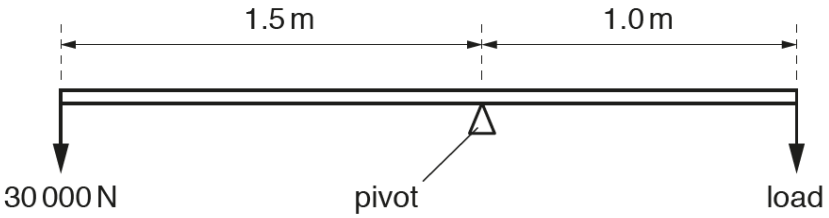

Fig. 4.2

The truck is in equilibrium.

Calculate the load.

load = ... N [3]

(d) Fig. 4.3 shows another truck lifting a pile of identical bricks.

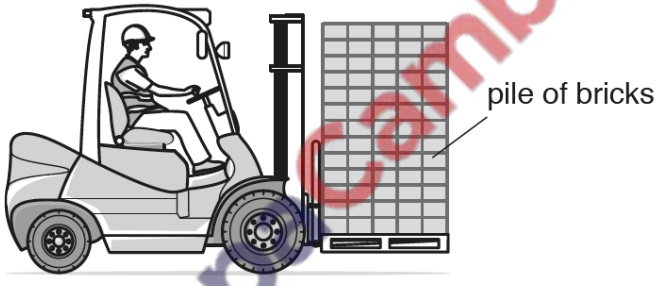

Fig. 4.3

(i) On Fig. 4.3, draw a cross to indicate the centre of mass of the pile of bricks. [1]

(ii) The truck can tilt the pile of bricks backwards, as shown in Fig. 4.4.

Fig. 4.4

Explain how tilting the pile of bricks backwards makes the truck more stable.

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..... [1]

[Total: 8]