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SMART EXAM RESOURCES
SUBJECT:COORDINATED SCIENCES [PHYSICS]
PAPER 4
MOMENT OF A FORCE
SET 2 QP-MS

1 Fig. 3.1 shows a man transporting some luggage in a small boat.

Fig. 3.

The man lifts the boat off the water and attaches it to a trolley.

The man exerts a downwards force **F** which keeps the boat in equilibrium as shown in Fig. 3.3.

The wheels of the trolley act as a pivot.

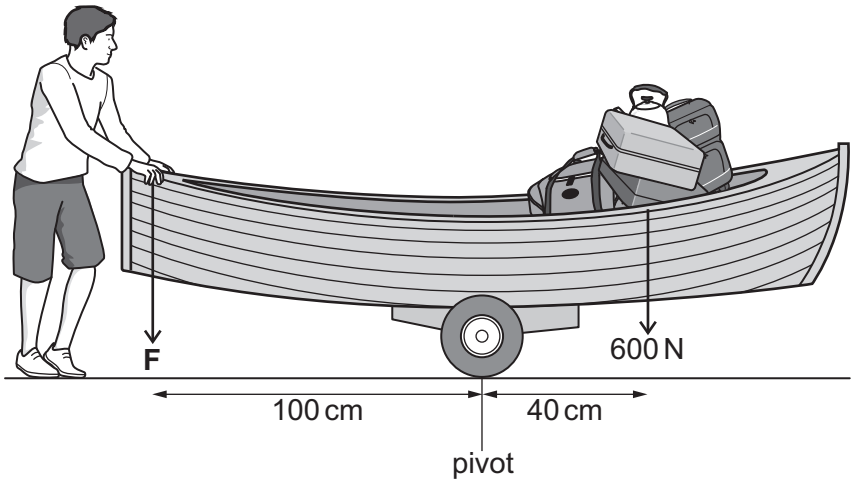

Fig. 3.3

Use the principle of moments to calculate the size of the force **F**.

force = ... N [3]

MARK SCHEME:

(b)	(M =) f × d **or** 600 × 40 **or** 24000 (Ncm) ; (F =) 24000 / 100 ; (F =) 240 (N) ;	**3**

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2 Fig. 3.1 shows a crane lifting a wooden crate.

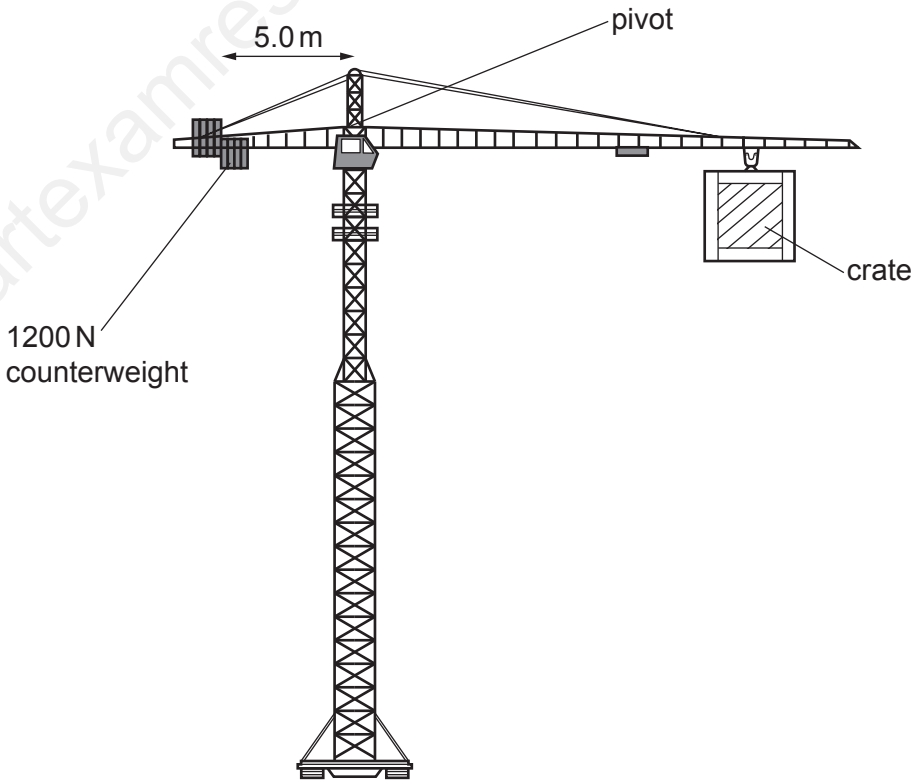

Fig. 3.1

(a) The crane is in equilibrium.

(i) The 1200 N counterweight is 5.0 m away from the pivot.

Calculate the moment of the counterweight about the pivot.

moment = ... Nm [2]

(ii) Determine the moment of the crate about the pivot.

moment = ... Nm [1]

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MARK SCHEME:

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Question	Answer	Marks
(a)(i)	(M =) F × d OR 1200 × 5 ; (M =) 6000 (Nm) ;	2
(a)(ii)	6000 ;	1

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3 A wheel on a car needs changing. Fig. 8.2 shows a spanner being used to turn a wheel nut.

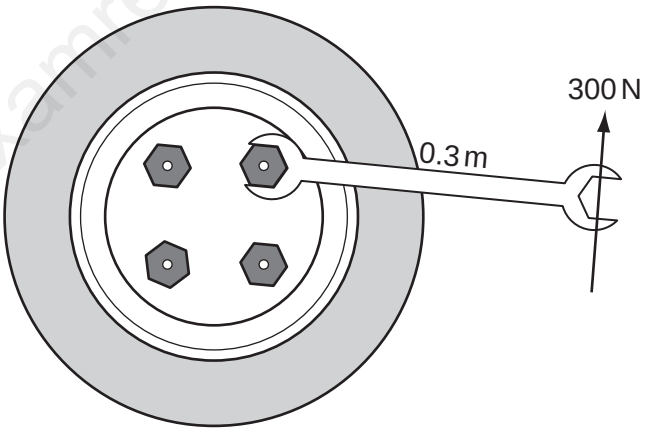

Fig. 8.2

(i) Calculate the turning effect (moment) of the spanner.

State the formula that you use and show your working.

formula

working

..... [2]

(ii) Give **two** ways in which you could increase the spanner's turning effect.

1 .....

.....

2 .....

..... [2]

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MARK SCHEME:

(i) (turning effect =) force × distance ;
= 0.3 × 300 = 90 Nm ; [2]

(ii) increase force ;
increase distance / use a longer spanner ; [2]

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4 Fig. 7.1 shows a crane for use on building sites.

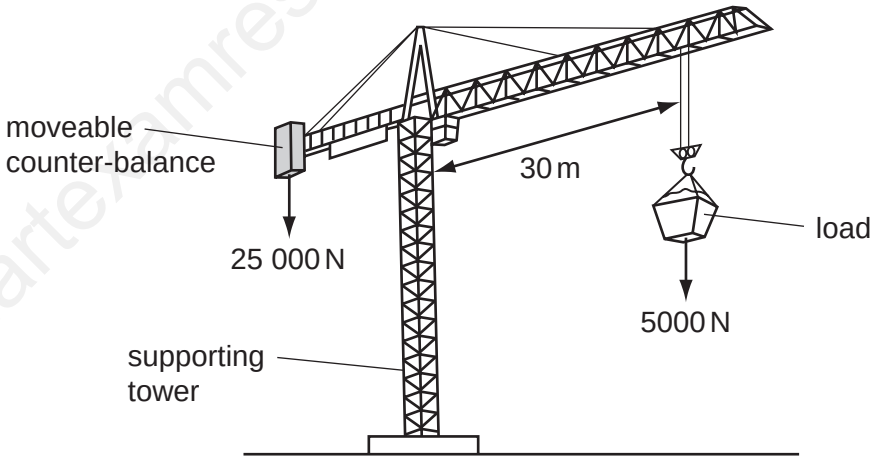

Fig. 7.1

(a) Explain in terms of forces why the crane needs a counter-balance.

.....

.....

..... [2]

(b) The crane in Fig. 7.1 is balanced.

Calculate the moment of the load about the crane's supporting tower. Then calculate the distance of the counterbalance from the crane's supporting tower.

State the formula that you use for your calculations and show your working.

formula used

working

moment of load .....

distance of counterbalance ..... [3]

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MARK SCHEME:

(a) clockwise moment has to equal anticlockwise moment / $F_1d_1 = F_2d_2$, owtte ;
to stop crane tipping over when lifting weight ;

(b) (moment =) force × distance / weight × distance ;
(= 5000 × 30) = 150 000 Nm ;
(150 000 / 25 000) = 6 m ;

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