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

1 Fig. 3.3 shows the pedal of the bicycle as the athlete pedals.

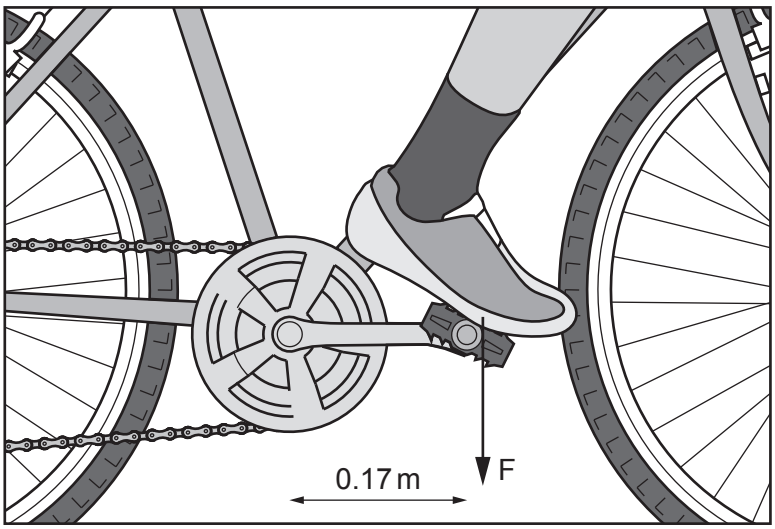

Fig. 3.3

The moment of the force applied by the athlete is 35.7 N m.

Use Fig. 3.3 to calculate the force exerted by the athlete on the pedal.

force = ... N [2]

MARK SCHEME:

(force =) moment / distance / 35.7 / 0.17 ; (force =) 210 (N) ;	**2**

2 **(a)** Fig. 9.1 shows a butterfly resting on a leaf attached to the branch of a tree.

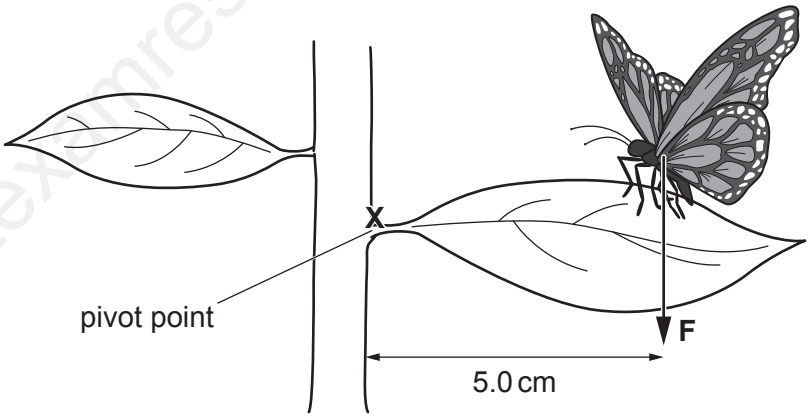

Fig. 9.1

(i) State the name of the force labelled **F**.

..... [1]

(ii) The leaf will break off the branch if the moment about the pivot point **X** is greater than 0.14 N cm.

The leaf does not break off the branch when the butterfly rests on it.

Calculate the maximum mass of the butterfly.

The gravitational field strength, *g*, is 10 N / kg.

maximum mass = ... kg [3]

MARK SCHEME:

(a)(i)	weight ;	**1**
(a)(ii)	(weight =) moment / distance / 0.14 / 5.0 ; (weight =) 0.028 (N) ; (mass = W/g = 0.028 / 10 =) 0.0028 (kg) ;	**3**

3 Some students are investigating moments and turning effects. Fig. 6.1 shows a beam of uniform density in equilibrium. The beam has a mass of 20 g on one end and a stone on the other.

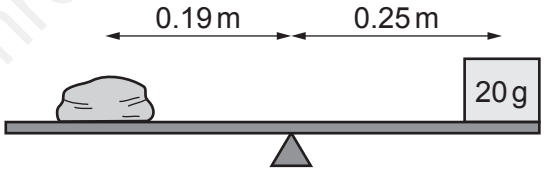

Fig. 6.1

(a) State the meaning of the word equilibrium.

.....

..... [1]

(b) **(i)** Calculate the weight of the 20 g mass.
gravitational field strength g = 10 N / kg

weight =..... N [3]

(ii) Calculate the mass of the stone.

State the unit for your answer.

mass = ... unit ..... [4]

MARK SCHEME:

Question	Answer	Marks
(a)	no resultant force and no resultant turning effect ;	1
(b)(i)	0.02 **or** 20×10^{-3} (kg) ; (W =) mg or 0.02×10 ; 0.2 (N) ;	3
(b)(ii)	clockwise moment = force × distance **or** 0.2×0.25 **or** 0.05 ; anti-clockwise moment = clockwise moment ; F = 0.05 ÷ 0.19 **or** 0.263 / m = 0.263 ÷ 10 **or** 0.026 (kg) **or** 26 (g) ; g / kg ;	4

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

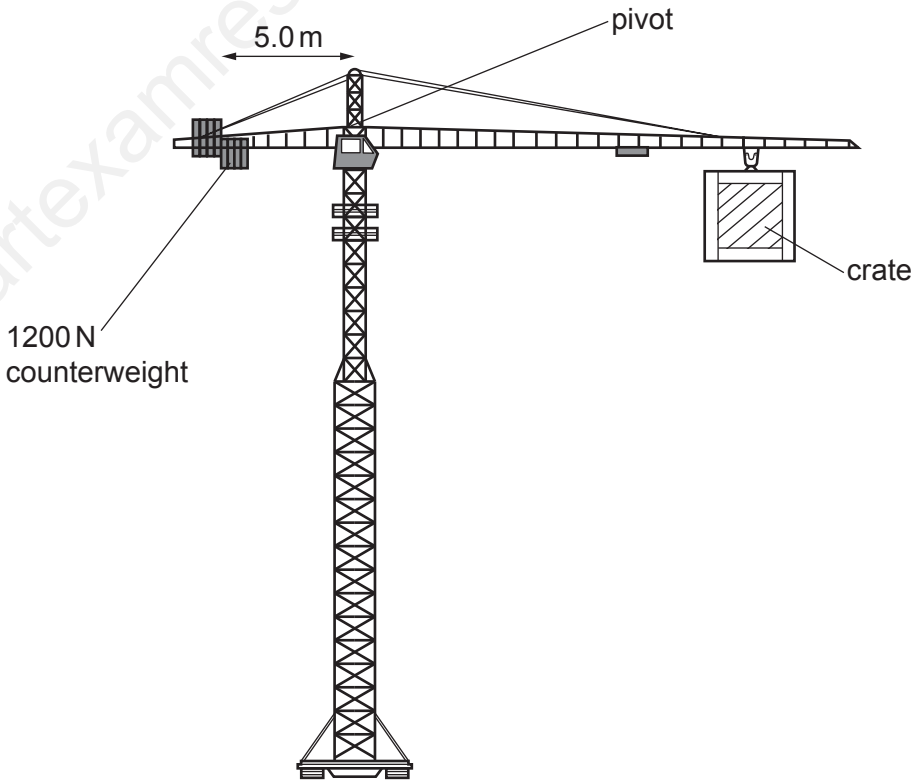

Fig. 3.1

(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]

MARK SCHEME:

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

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

Fig. 3.1

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.

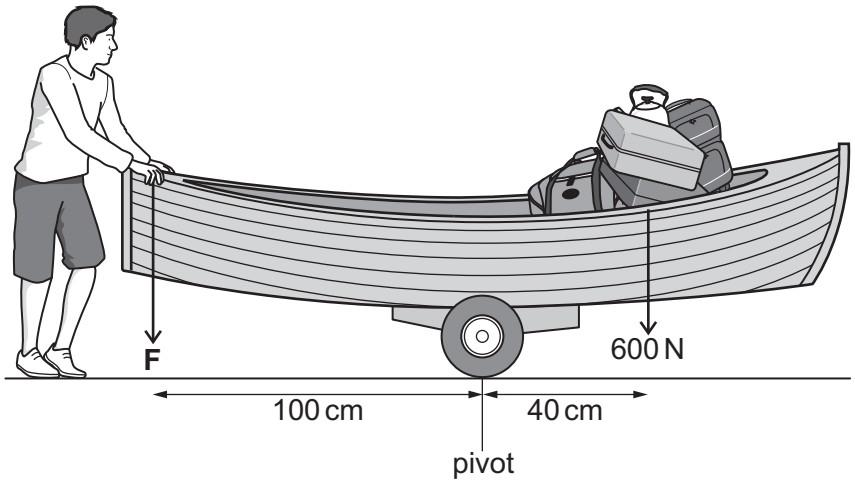

Fig. 3.3

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

force = ... N [3]

MARK SCHEME:

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