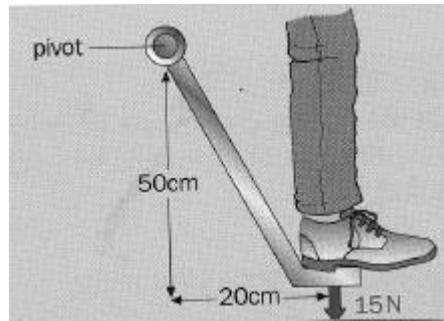


Moments

Exercise A

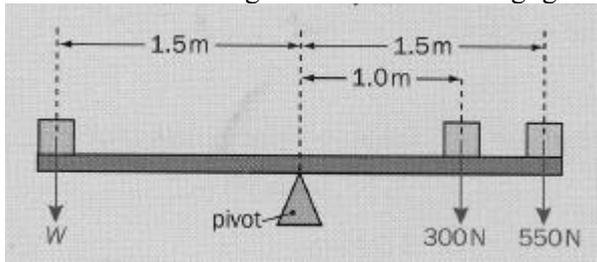
1. Calculate the moment of the pushing force on the pedal in the diagram.



- 2.

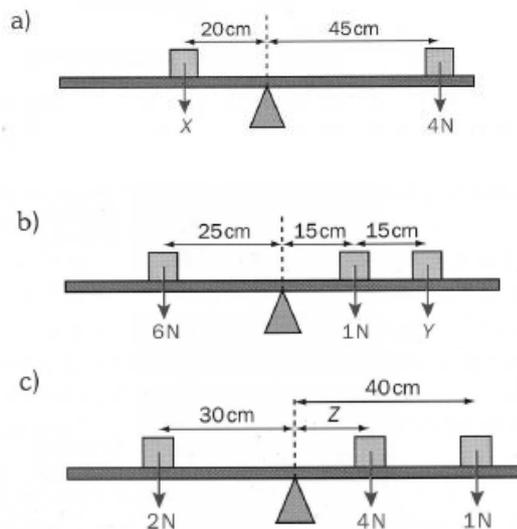
The seesaw in the diagram is balanced. Use the principle of moments to calculate the weight, W .

Assume that the weight of the seesaw is negligible.



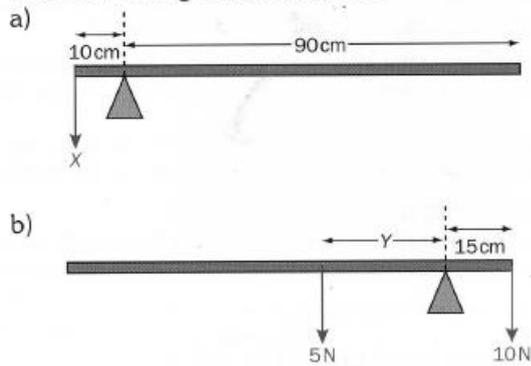
- 3.

The diagrams show rulers balanced at their centres of gravity. What are the missing values X , Y and Z ?



4.

The uniform rulers in the diagrams are balanced.
The rulers are 1.0 m long and weigh 1.0 N.
Find the missing values X and Y .



Exercise B

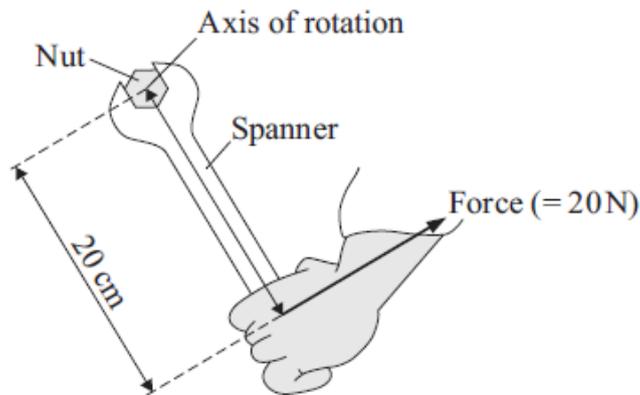
1.

A spanner gives a turning effect to undo a nut.

(a) Complete the sentence.

The turning effect of a force is called the of the force.
(1 mark)

(b) The diagram shows a spanner being used.



Calculate the spanner's turning effect in newton metres.

Show clearly how you work out your answer.

.....
.....

Turning effect = Nm
(2 marks)

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

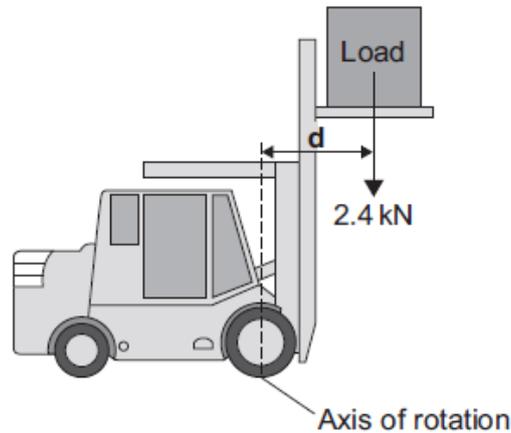
1

2

(2 marks)

2.

The diagram shows a fork-lift truck with a load of 2.4 kN. The clockwise moment caused by this load is 2880 Nm.



(a) Use the equation in the box to calculate the distance **d**.

moment = force × perpendicular distance from the line of action of the force to the axis of rotation
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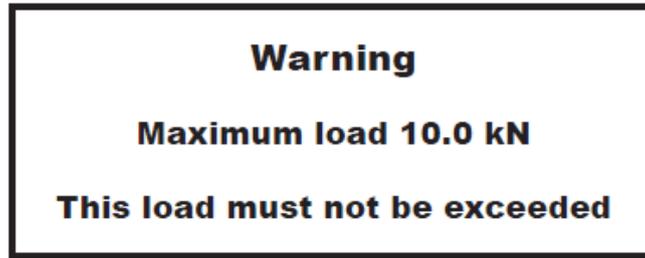
Show clearly how you work out the answer and give the unit.

.....
.....
.....

Distance **d** =

(3 marks)

- (b) This warning notice is in the driver's cab.



Explain in terms of moments why the maximum load must not be exceeded.

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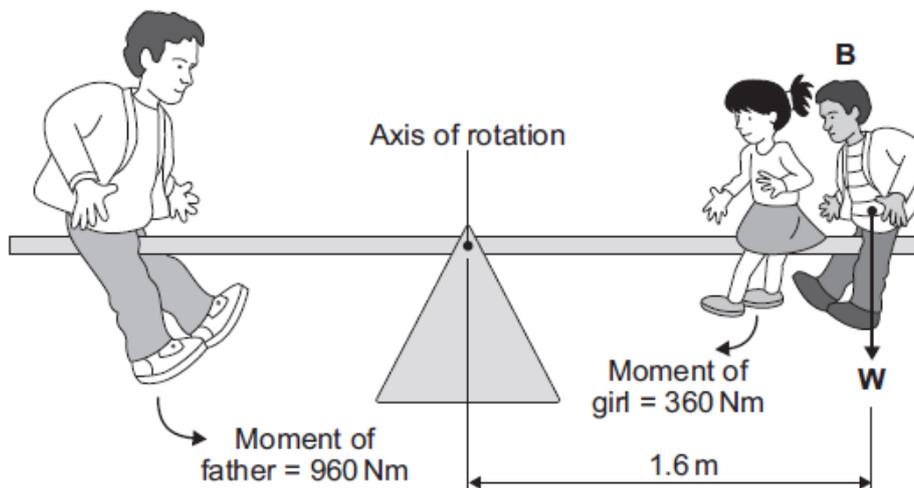
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(2 marks)

3.

The diagram shows a father and his two children sitting on a playground see-saw. The see-saw is not moving.



(a) What is the total clockwise moment of the two children about the axis of rotation?

.....

Explain the reason for your answer.

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(3 marks)

(b) (i) What is the clockwise moment of the boy, **B**, about the axis of rotation?

.....

Moment = Nm
(1 mark)

(b) (ii) Use the information in the diagram and the equation in the box to calculate the weight, **W**, of the boy, **B**.

$\text{moment} = \text{force} \times \text{perpendicular distance from the line of action of the force to the axis of rotation}$
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Show clearly how you work out your answer.

.....

.....

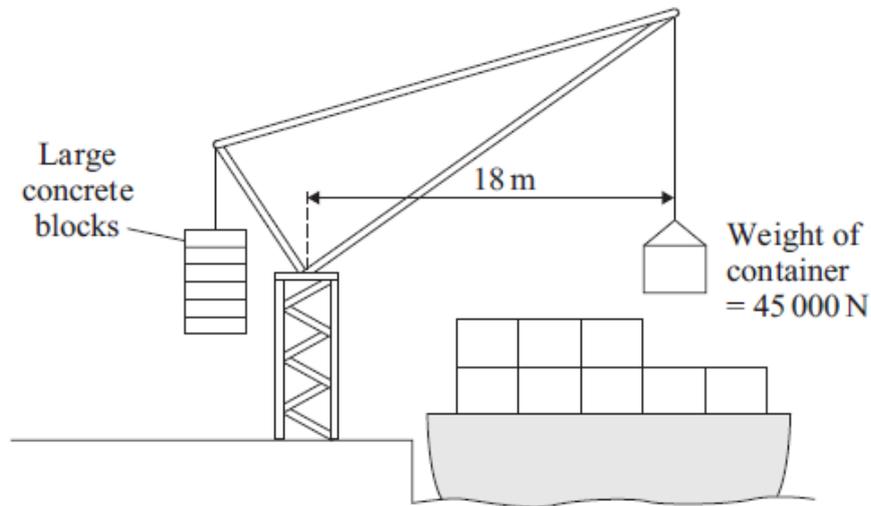
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Weight of boy **B** = N
(2 marks)

4.

The diagram shows a crane which is loading containers onto a ship.



- (a) Use the equation in the box to calculate the moment of the container which is being loaded.

$\text{moment} = \text{force} \times \text{perpendicular distance from the line of action of the force to the axis of rotation}$
--

Show clearly how you work out your answer and give the unit.

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Moment of the container =
(3 marks)

- (b) Suggest and explain the purpose of the large concrete blocks.

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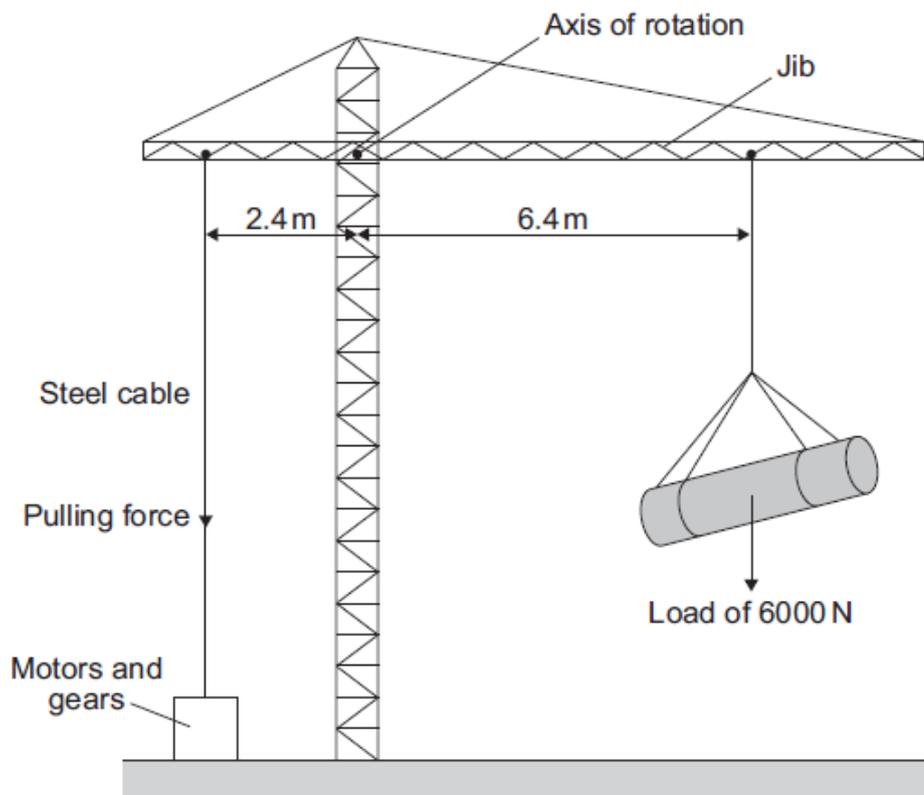
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(3 marks)

5.

The diagram shows a design for a crane. The crane is controlled by a computer.



The purpose of the motors and gears is to change the pulling force in the steel cable. This is done so that the jib stays horizontal whatever the size of the load or the position of the load.

Use the equation in the box to answer questions (a) and (b).

$$\text{moment} = \text{force} \times \text{perpendicular distance from the line of action of the force to the axis of rotation}$$

(a) Calculate the moment caused by the load in the position shown in the diagram.

Show clearly how you work out your answer and give the unit.

.....
.....

Moment =

(3 marks)

(b) Calculate the pulling force that is needed in the steel cable to keep the jib horizontal.

Show clearly how you work out your answer.

.....
.....

Pulling force = N
(2 marks)

