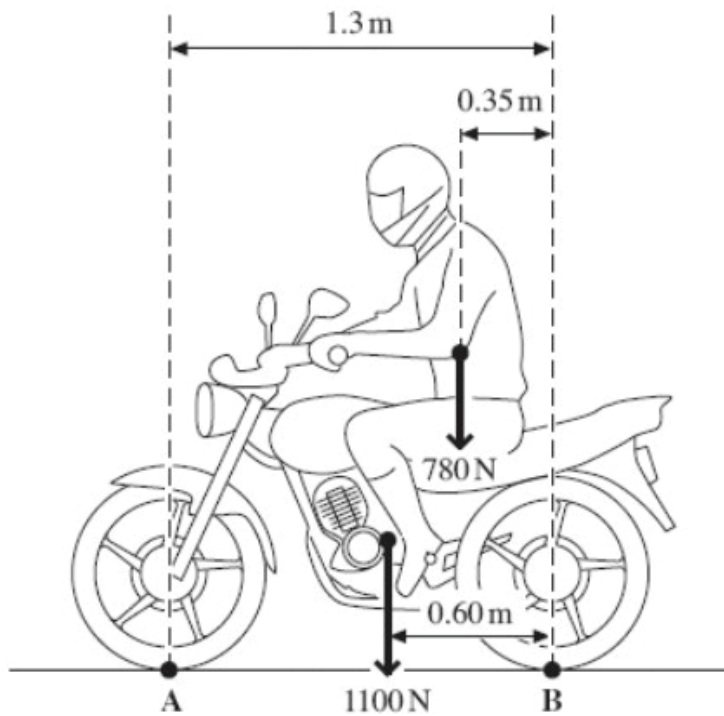


**Eduqas Physics GCSE**  
**Topic 3.3: Moments, levers, and**  
**gears**  
**Questions by topic**

1.

The figure below shows a motorcycle and rider. The motorcycle is in contact with the road at **A** and **B**.



The motorcycle has a weight of 1100 N and the rider's weight is 780 N.

(a) State the Principle of Moments.

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

(2)

(b) Calculate the moment of the rider's weight about **B**. Give an appropriate unit.

answer = .....

(2)

- (c) By taking the moments about **B**, calculate the vertical force that the road exerts on the front tyre at **A**. State your answer to an appropriate number of significant figures.

answer = ..... N

(4)

- (d) Calculate the vertical force that the road exerts on the rear tyre at **B**.

answer = ..... N

(1)

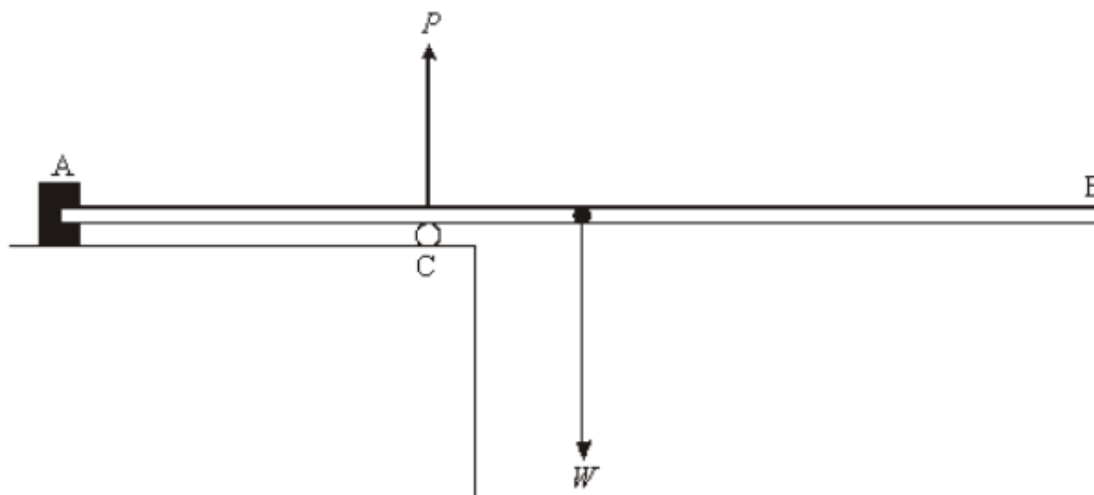
2.

- (a) Define the moment of a force.

.....  
.....

(2)

- (b) The diagram shows a uniform diving board of weight,  $W$ , that is fixed at A. The diving board is supported by a cylinder at C, that exerts an upward force,  $P$ , on the board.



- (i) By considering moments about A, explain why the force  $P$  must be greater than the weight of the board,  $W$ .

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

- (ii) State and explain what would be the effect on the force  $P$  of a girl walking along the board from A to B.

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

(4)  
(Total 6 marks)

3.

Figure 24 shows a submarine underwater.

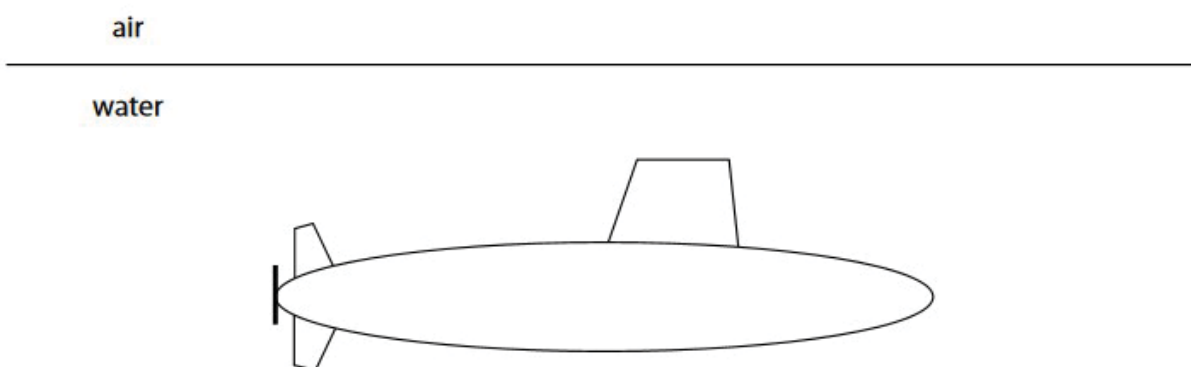


Figure 24

The motor in the submarine turns the gear wheels shown in Figure 25.

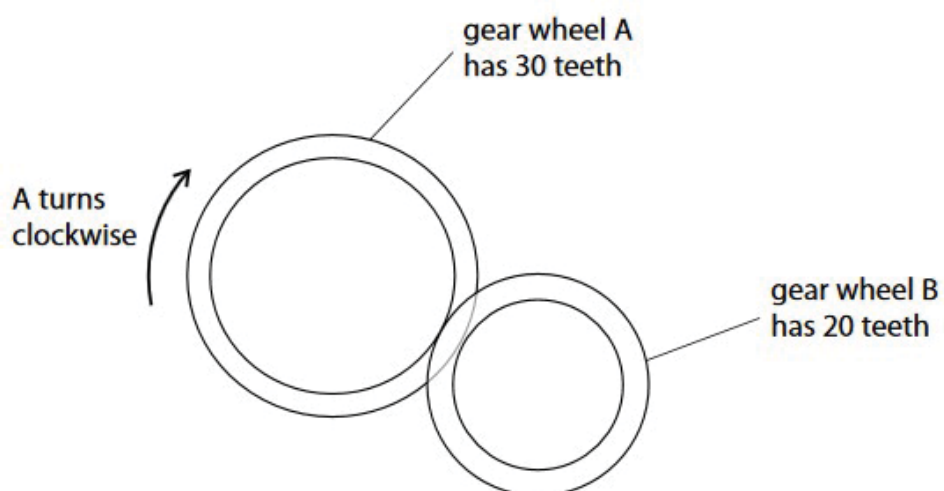


Figure 25

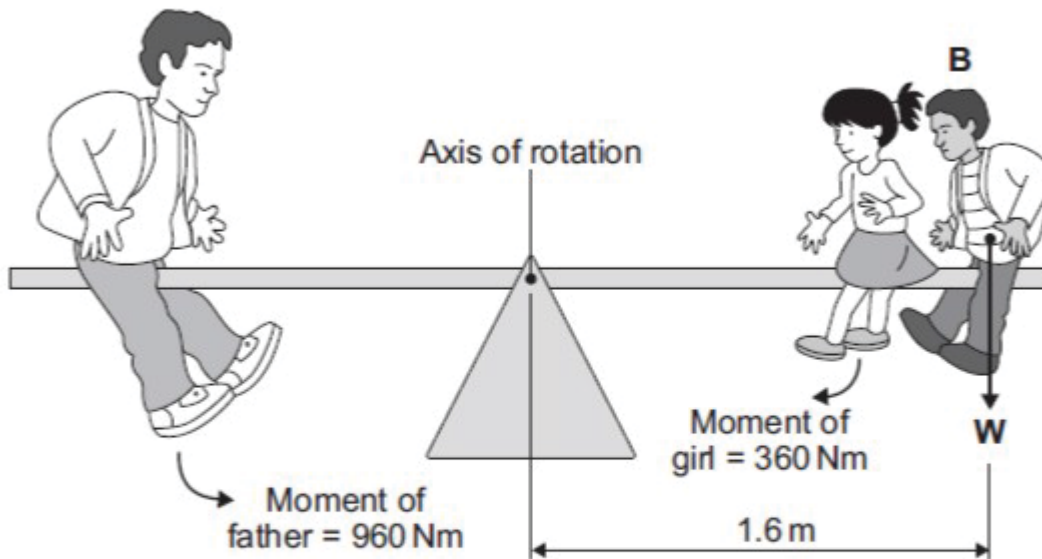
(a) Gear wheel A rotates clockwise through one complete turn.

Which of these is correct for gear wheel B?

	amount that gear wheel B rotates	direction gear wheel B rotates
<input type="checkbox"/> A	1½ turns	clockwise
<input type="checkbox"/> B	1½ turns	anticlockwise
<input type="checkbox"/> C	⅔ of a turn	clockwise
<input type="checkbox"/> D	⅔ of a turn	anticlockwise

4.

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.

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

(3)

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

.....

Moment = ..... Nm

(1)

(ii) Use the information in the diagram to calculate the weight,  $W$ , of the boy, B.

Show clearly how you work out your answer.

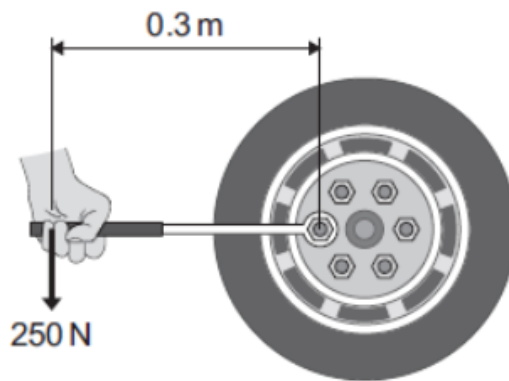
.....  
.....  
.....  
.....

Weight of boy B = ..... N

(2)

5. A company makes a wheel wrench with an extending handle. The company claims that the extending handle makes it easier to loosen the wheel nuts on a car.

The diagram shows the wheel wrench being used without the handle extended.



(a) (i) Use the equation in the box to calculate the moment produced by the force on the wrench.

moment = force × perpendicular distance from the line of action of the force to the axis of rotation
--

Show clearly how you work out your answer.

.....  
.....

Moment = ..... newton metres

(2)

(ii) Units can be written in words or symbols.

Which of the following is the unit for a moment written using symbols?

Draw a ring around your answer.

**nm**

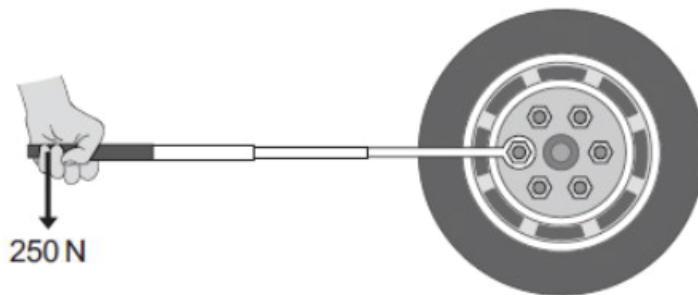
**Nm**

**nM**

**NM**

(1)

(b) The wheel nut will not move and so the handle of the wrench is extended.



It is now easy to loosen the wheel nut using the same force as before.

Explain why.

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

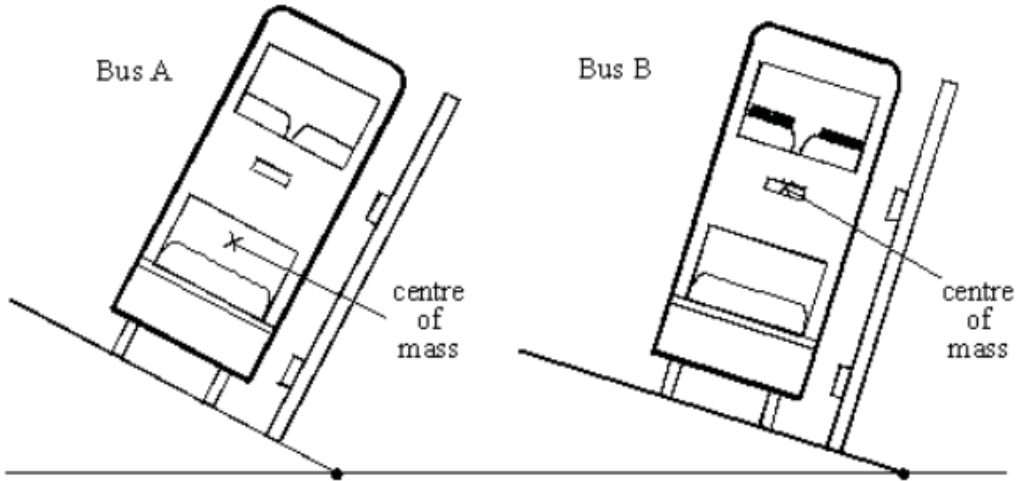
(2)  
(Total 5 marks)



6.

The diagram shows two buses. Bus A is empty. Bus B contains bags of sand upstairs to represent passengers.

Each bus has been tilted as far as it can without falling over.



(a) Each bus will topple over if it is tilted any further.

Explain, in as much detail as you can, why this will happen.

(You can draw on one of the diagrams as part of your answer if you want to.)

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

(2)

(b) What difference does it make to the stability of the bus when the upper deck is full of "passengers"? Explain your answer as fully as you can.

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

(3)

(c) Why are the bags of sand in bus B only put upstairs?

.....  
.....

(1)

(Total 6 marks)

7.

A spanner makes it a lot easier to loosen a bolt.



You cannot usually loosen a bolt with your fingers.

It is easier with a spanner.

Choose words from this list to complete the sentences below.

**lever**

**piston**

**pivot**

**pulley**

**turning effect**

The spanner is a simple .....

You use it to produce a bigger ..... on the bolt.

A longer spanner works better.

This is because there is a bigger distance between your force and the .....

**(Total 3 marks)**