

GCSE Physics

Worksheet: Moments, levers and gears

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Moments, levers and gears

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

0 1 . 1 A force is applied further from the pivot of a lever, without changing its size.
What happens to the moment of the force?

Tick (✓) **one** box.

It increases

☐

It decreases

☐

It stays the same

☐

It becomes zero

☐

[1 mark]

0 1 . 2 Which **two** of these are examples of a lever?
Tick (✓) **two** boxes.

A pair of scissors

☐

A brick

☐

A see-saw

☐

A ball

☐

[2 marks]

0 1 . 3

Write down the equation that links distance (d), force (F) and moment of a force (M).

.....

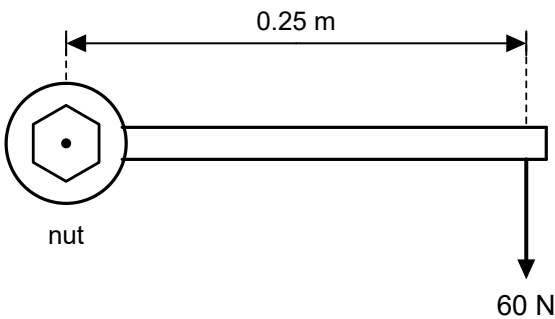
.....

[1 mark]

0 2

A mechanic uses a spanner to tighten a nut. Figure 1 shows the force the mechanic applies to the spanner.

Figure 1



0 2 . 1

The turning effect of a force is called the moment of the force.
Calculate the moment of the 60 N force about the centre of the nut.
Use the equation:
moment of a force = force $\times$ distance

.....

.....

.....

.....

Moment = N m

[2 marks]

0 2 . 2

Does the 60 N force in Figure 1 turn the spanner clockwise or anticlockwise?

.....

.....

.....

.....

[1 mark]

0 2 . 3

Another nut is very tight. The mechanic needs a bigger moment to undo it but cannot push any harder.
Suggest what the mechanic could do.

.....

.....

[1 mark]

0 3

Gear A has 12 teeth. It meshes with gear B, which has 36 teeth.

0 3 . 1

Gear A makes 12 complete turns.
Calculate the number of complete turns made by gear B.

.....

.....

.....

.....

Turns of gear B =

[2 marks]

0 3 . 2

Gear A turns clockwise.

In which direction does gear B turn?

.....

.....

.....

.....

[1 mark]

0 4

Gear A has 10 teeth. It meshes with gear B, which has 20 teeth.

0 4 . 1

Gear A makes 4 complete turns.

Calculate the number of complete turns made by gear B.

.....

.....

.....

.....

Turns of gear B =

[2 marks]

0 4 . 2

Gear A turns clockwise.

In which direction does gear B turn?

.....

.....

.....

.....

[1 mark]

0 5

A mechanic uses a spanner to tighten a nut. The mechanic applies a force of 65 N at right angles to the spanner, 0.40 m from the centre of the nut.

0 5 . 1

Calculate the moment of the force about the centre of the nut.

Use the equation:

moment of a force = force $\times$ distance

.....

.....

.....

.....

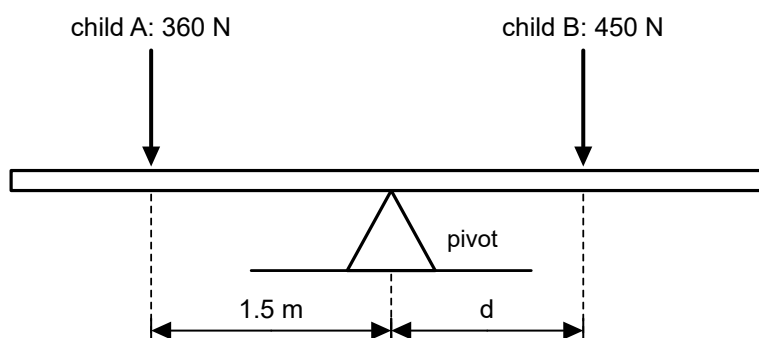
Moment = N m

[2 marks]

0 6

Figure 2 shows two children sitting on a see-saw. The see-saw is balanced. The weight of the see-saw acts at the pivot.

Figure 2



0 6 . 1

Write down the equation that links distance (d), force (F) and moment of a force (M).

.....

.....

[1 mark]

0 6 . 2

Calculate the moment of child A's weight about the pivot.

.....

.....

.....

.....

Moment = N m

[2 marks]

0 6 . 3

Calculate distance d .

.....

.....

.....

.....

.....

d = m

[3 marks]

0 6 . 4

Child A moves closer to the pivot.
Explain what happens to the see-saw.

.....

.....

.....

.....

[2 marks]

.....

0 7

A see-saw is pivoted at its centre and is balanced. One child, of weight 420 N, sits 1.5 m from the pivot. A second child, of weight 300 N, sits on the other side of the pivot.

0 7 . 1

Calculate the distance of the second child from the pivot.

.....

.....

.....

.....

.....

Distance = m

[3 marks]

0 8

Gear A has a radius of 4.0 cm. It meshes with gear B, which has a radius of 11.0 cm. A motor exerts a moment of 1.1 N m on gear A.

0 8 . 1

Calculate the force that the teeth of gear A exert on the teeth of gear B.

.....

.....

.....

.....

.....

Force = N

[3 marks]

0 8 . 2

Calculate the moment of this force about the centre of gear B.

.....

.....

.....

.....

Moment = N m

[2 marks]

.....

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Moments, levers and gears · 32 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: It increases

01.2 [2 marks]

Correct: A pair of scissors; A see-saw

01.3 [1 mark]

Answer: $M = F d$

- $M = F d$ (1)

Notes: Allow moment = force $\times$ distance, or any correct rearrangement.

Question 2 (4 marks)

02.1 [2 marks]

Answer: 15 N m

- $M = 60 \times 0.25$ (1)
 - 15 (N m) (1)
-

02.2 [1 mark]

Answer: Clockwise.

- clockwise (1)
-

02.3 [1 mark]

Answer: Use a longer spanner, so the force acts further from the pivot.

- use a longer spanner / apply the force further from the nut (pivot) (1)
-

Question 3 (3 marks)

03.1 [2 marks]

Answer: 4

- gear B has 3 times as many teeth as gear A, so it makes 1 turn for every 3 turns of A (1)
 - $12 \div 3 = 4$ (1)
-

03.2 [1 mark]

Answer: Anticlockwise.

- anticlockwise (1)
-

Question 4 (3 marks)

04.1 [2 marks]

Answer: 2

- gear B has 2 times as many teeth as gear A, so it makes 1 turn for every 2 turns of A (1)
 - $4 \div 2 = 2$ (1)
-

04.2 [1 mark]

Answer: Anticlockwise.

- anticlockwise (1)
-

Question 5 (2 marks)

05.1 [2 marks]

Answer: 26 N m

- $M = 65 \times 0.40$ (1)
 - 26 (N m) (1)
-

Question 6 (8 marks)

06.1 [1 mark]

Answer: $M = F d$

- $M = F d$ / moment = force $\times$ distance (1)

06.2 [2 marks]

Answer: 540 N m

- $M = 360 \times 1.5$ (1)
- 540 (N m) (1)

06.3 [3 marks]

Answer: 1.2 m

- (balanced so) total clockwise moment = total anticlockwise moment (1)
- $450 \times d = 540$ (1)
- $d = 1.2$ (m) (1)

Notes: Allow ECF from the previous part.

06.4 [2 marks]

Answer: Child A's moment decreases, so the clockwise moment of B is bigger and B's end goes down.

- the (anticlockwise) moment of child A decreases / is now less than the (clockwise) moment of child B (1)
- so the see-saw turns clockwise / child B's end goes down (1)

Question 7 (3 marks)

07.1 [3 marks]

Answer: 2.1 m

- (balanced, so) clockwise moment = anticlockwise moment (1)
 - $420 \times 1.5 = 300 \times d$ (1)
 - $d = 2.1$ (m) (1)
-

Question 8 (5 marks)

08.1 [3 marks]

Answer: 27.5 N

- $4.0 \text{ cm} = 0.04 \text{ (m)}$ (1)
 - $1.1 = F \times 0.04$ (1)
 - $F = 27.5 \text{ (N)}$ (1)
-

08.2 [2 marks]

Answer: 3.025 N m

- $M = 27.5 \times 0.11$ (1)
- 3.025 (N m) (1)

Notes: Allow ECF from the previous part.
