

# Moments and Levers

KS3 Physics · Follows the national curriculum

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## 1. Worked example

**A 15 N force acts 0.4 m from a pivot. Find its moment.**

Step 1 · Formula

Moment (N m) = force (N) × perpendicular distance from the pivot (m).

Step 2 · Calculate

$15 \times 0.4 = 6 \text{ N m}$ .

**Answer: 6 N m**

Check: Unit: newton metres (N m).

## 2. Now try one with the steps

**A 400 N child sits 1.5 m from the pivot of a seesaw. Where must a 300 N child sit to balance?**

Step 1 · Left moment

Step 2 · Balance

Step 3 · Solve

**Answer:**

## 3. Practice

Show your working. The marks tell you how much is expected.

1. What is a moment? [1]

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2. Write the equation for the moment of a force. [1]

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3. What is the unit of a moment when force is in N and distance in m? [1]

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4. A 10 N force acts 2 m from a pivot. What is its moment, in N m? [1]

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5. A 50 N force acts 0.3 m from a hinge. What is its moment, in N m? [1]
- \_\_\_\_\_
- \_\_\_\_\_
6. Explain why door handles are placed far from the hinges. [2]
- \_\_\_\_\_
- \_\_\_\_\_
7. A 400 N child sits 1.5 m from the pivot of a seesaw. What moment does she produce, in N m? [1]
- \_\_\_\_\_
- \_\_\_\_\_
8. Where must a 300 N child sit to balance the seesaw in the last question, in metres from the pivot? [2]
- \_\_\_\_\_
- \_\_\_\_\_
9. State the principle of moments. [1]
- \_\_\_\_\_
- \_\_\_\_\_
10. A metre rule balances at its centre. A 2 N weight hangs 40 cm to the left of the pivot. What force at 20 cm to the right will balance it, in newtons? [2]
- \_\_\_\_\_
- \_\_\_\_\_
11. A nut needs a moment of 10 N m. What force is needed with a 0.5 m spanner, in newtons? [2]
- \_\_\_\_\_
- \_\_\_\_\_
12. On a balanced beam, 3 N hangs 0.2 m and 2 N hangs 0.5 m to the left of the pivot. What force at 0.4 m to the right balances it, in newtons? [3]
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
13. A crowbar has an effort of 100 N applied 1.2 m from the pivot. The load is 0.1 m from the pivot. What force, in newtons, does the crowbar exert on the load? [3]
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
14. Explain why a tower crane has a heavy concrete counterweight on its short arm. [2]
- \_\_\_\_\_
- \_\_\_\_\_

## 4. Before you hand it in

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### Measuring the distance from the end of the lever.

Measure each distance from the pivot to the line of the force.

### Mixing cm and m.

Use the same unit on both sides (both N cm or both N m).

### Adding forces instead of moments.

Work out each moment ( $F \times d$ ) first, then add the moments on each side.