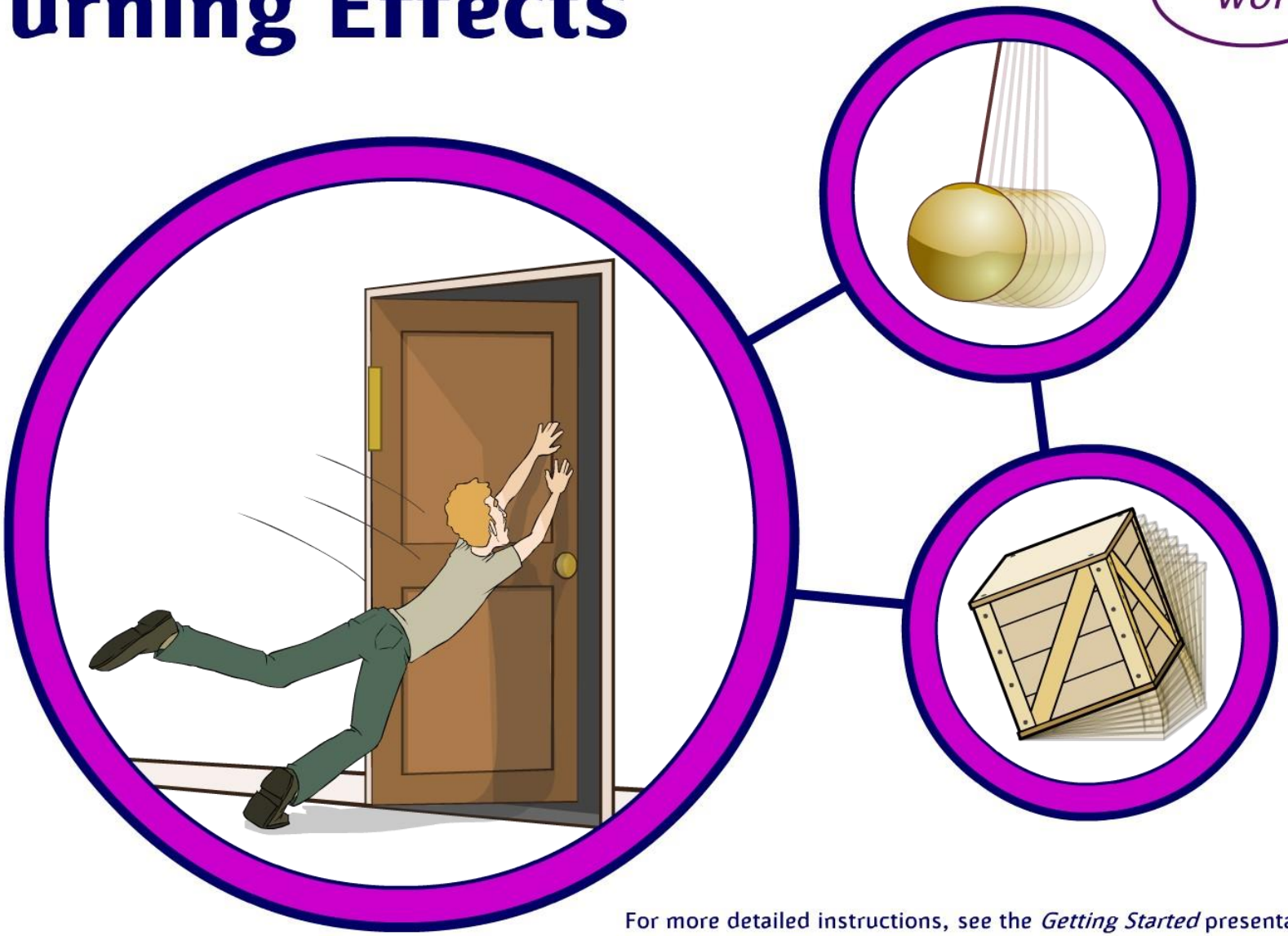
GCSE Separate Sciences

Turning Effects



For more detailed instructions, see the *Getting Started* presentation.

Indicates a Flash activity.

Indicates a virtual experiment.

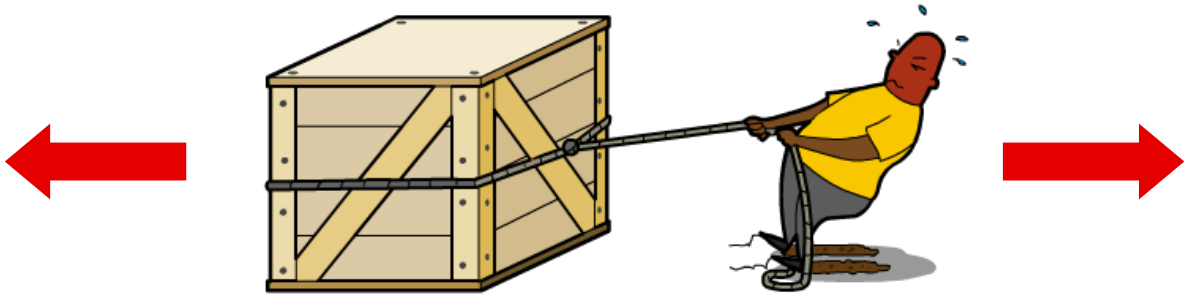
Indicates that there are teacher's notes.

Turning Effects

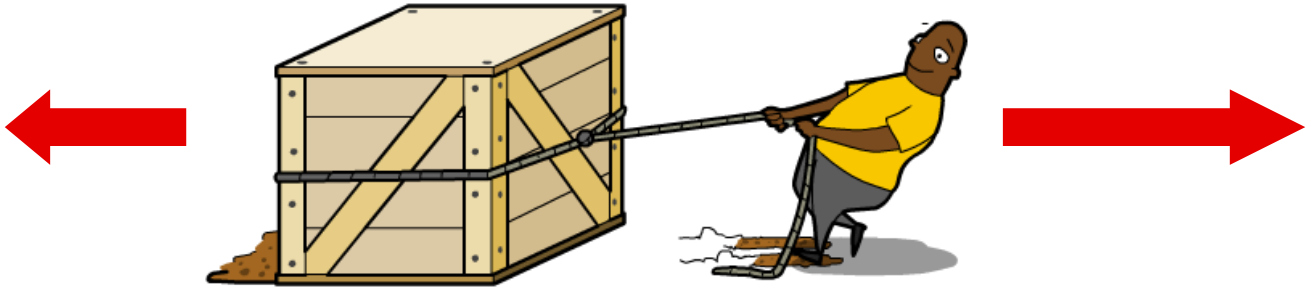
Contents

Balanced and unbalanced forces

When forces in opposite directions have the same value, they cancel each other out. The forces are **balanced**. The object is either stationary or moves at a constant speed.



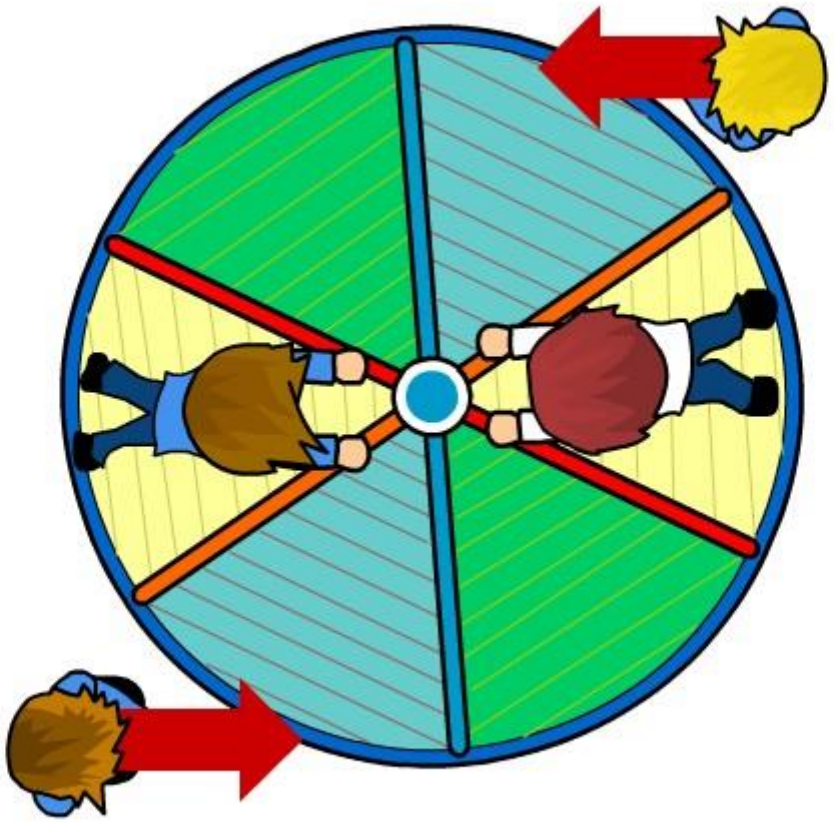
If the forces on an object are not balanced, there is a **resultant force**, and the object accelerates in the direction of this force.



Turning effects from balanced forces

How can balanced forces cause an object to turn?

click and drag the children on the ground to adjust their positions



Examples of turning effects

These are some examples of everyday turning effects:

Can you think of any more?

Turning Effects

Contents

What is a moment?

A **moment** is a turning effect caused by a force.

The size of the turning effect caused by a force depends on two factors. What are they?

The bigger the **force**, the larger the turning effect.

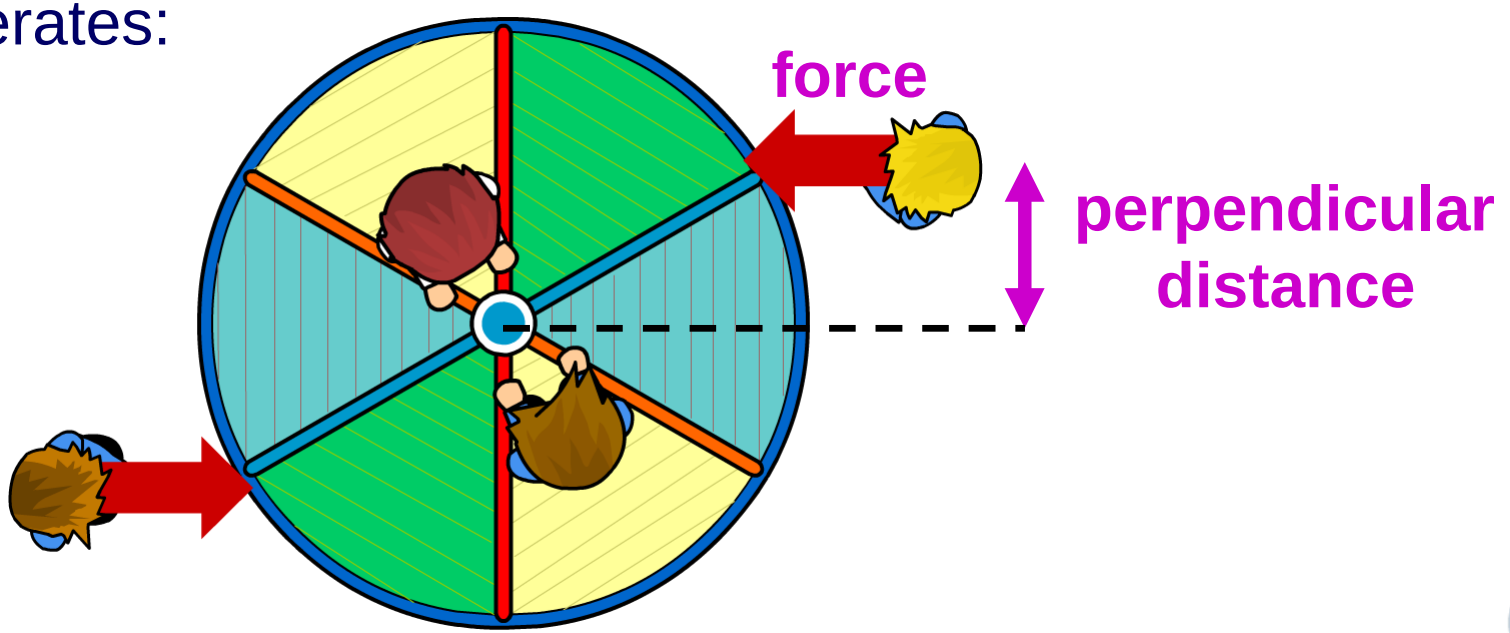
The larger the **perpendicular distance** from the pivot to the point where the force is applied, the larger the turning effect.

The moment equation

The size of a moment obeys the **moment equation**:

moment (Nm) = force (N) × perpendicular distance from pivot (m)

In this example, the forces are constant, but the larger the perpendicular distance, the faster the roundabout accelerates:



Understanding moments

5. Which wheelbarrow is easier to lift?

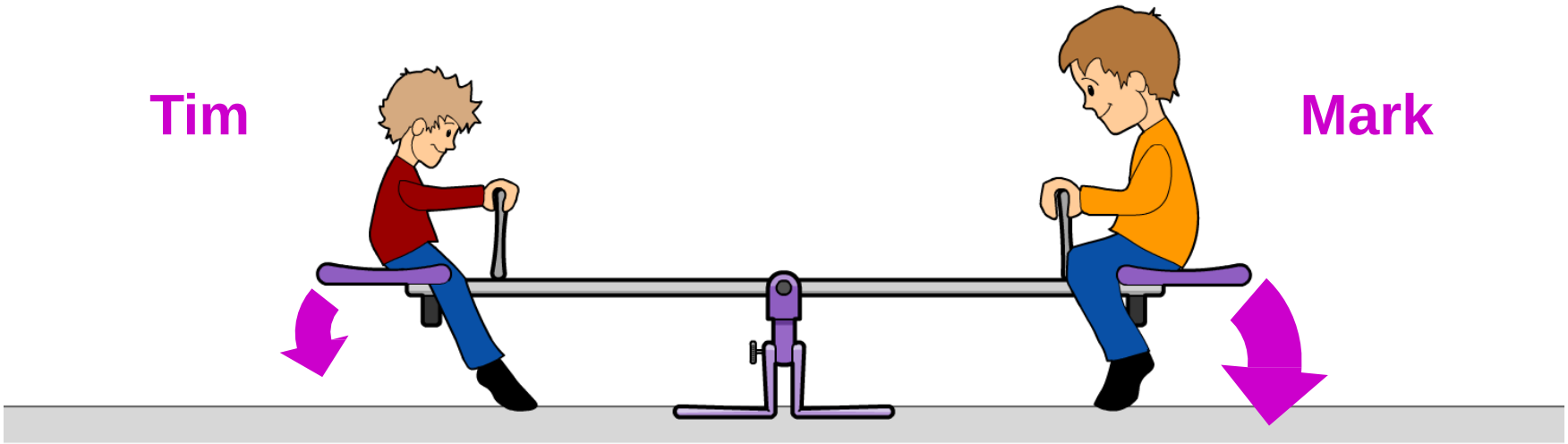
Correct!

The load in this wheelbarrow is closer to the pivot, reducing its clockwise moment, **and** the handles on the wheelbarrow are longer, increasing the anticlockwise moment of the lifting force.

Well done!

Clockwise and anticlockwise moments

When Mark and Tim lift their feet off the ground, what will happen to the see-saw?



The force of gravity creates a turning effect on each person. On the left-hand side, it creates an **anticlockwise** moment. On the right-hand side, it creates a **clockwise** moment.

The clockwise moment is **larger** than the anticlockwise moment, so the see-saw will turn in a **clockwise direction**.

The principle of moments

If an object is balanced about a pivot, then we can say that:

sum of anticlockwise moments = **sum of clockwise moments**

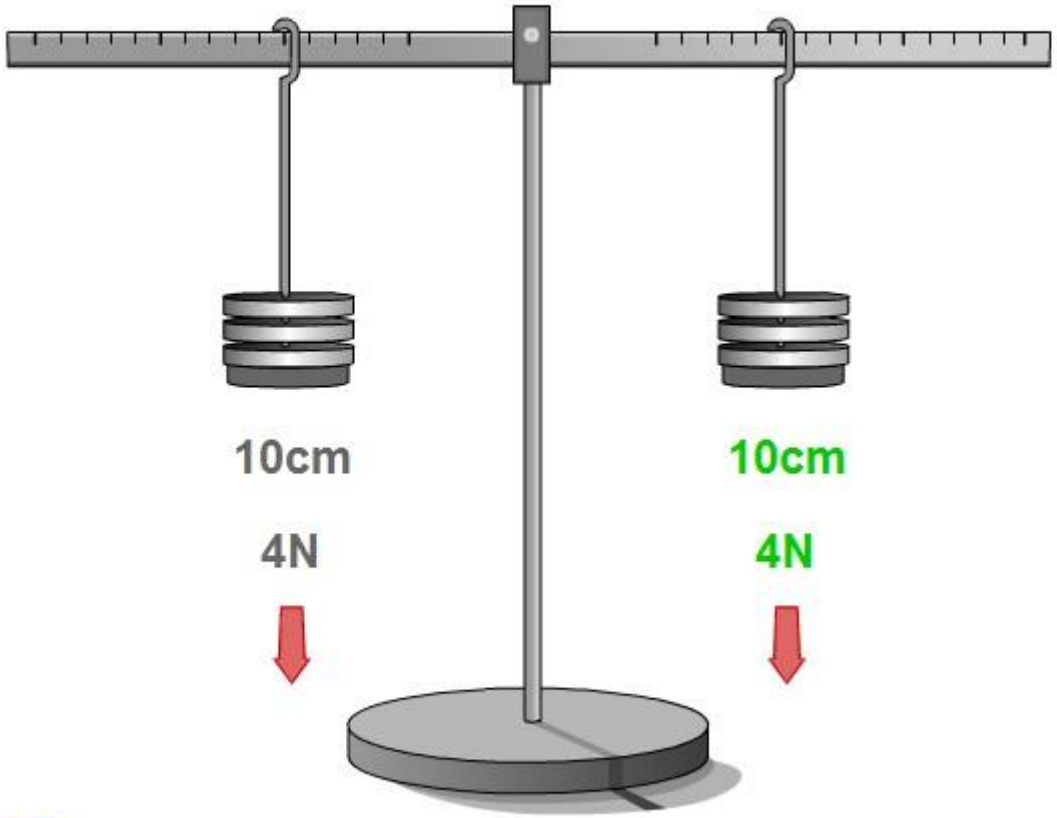
This is the **principle of moments**.

So, the forces on an object must obey two conditions to keep the object completely stationary:

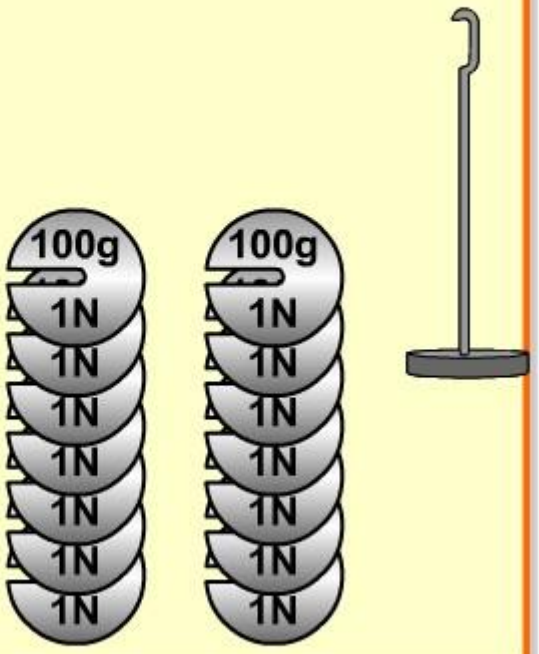
1. The forces must be balanced.
2. The **moments** must be balanced.

Using the principle of moments

Can you balance the scales?



weight bank



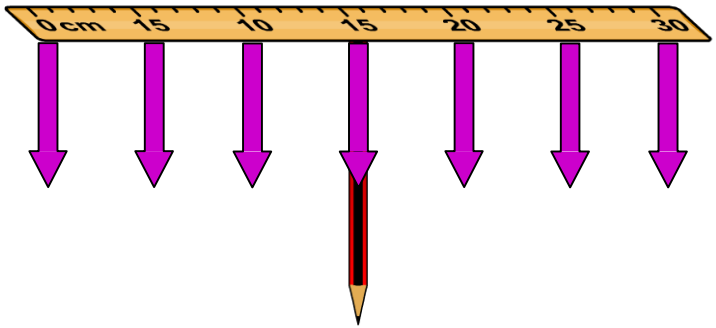
show mass

Turning Effects

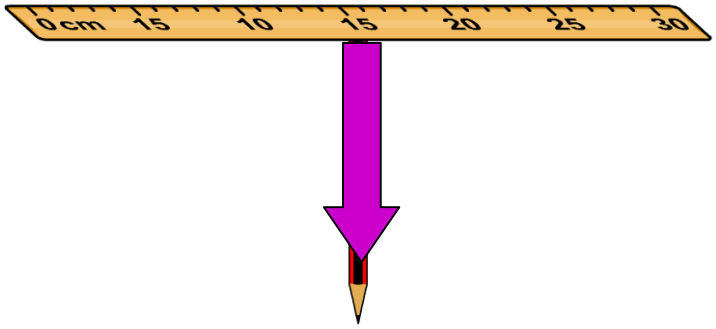
Contents

What is a centre of mass?

Can you balance a ruler on the flat end of a pencil?
If so, where do you put the pencil to make it balance?



The ruler is stationary when the moments from the weights of its entire length balance out.



This is equivalent to one weight force acting through the centre of the ruler.

The point at which all the mass of an object seems to be concentrated is called its **centre of mass**.