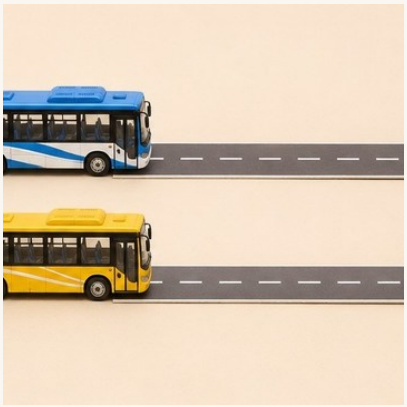
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Time and motion





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Time and motion

Finding a steady event



THE IDEA

A clock depends on a repeatable process. A sundial uses the Sun's apparent motion.

Sand and water clocks use flow under suitable conditions. Modern clocks count regular vibrations. Daylight and flow conditions limit some early devices.

CHECK YOUR THINKING

Why is an irregular drip a poor clock?

A A drip is too small to see.

B Equal drip counts may represent unequal time intervals.

B. Equal drip counts may represent unequal time intervals.

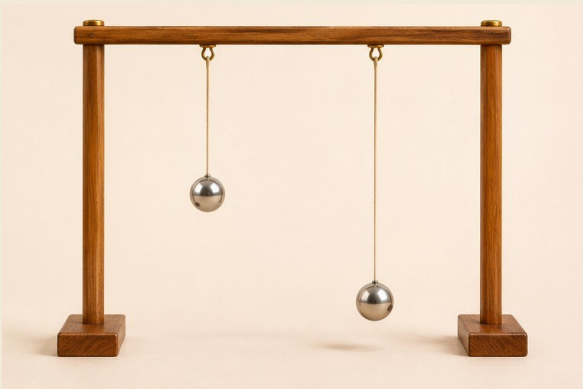
A RELATED EXAMPLE

What is one oscillation?

A pendulum passes through the middle twice in one complete swing. From the left extreme it travels through the middle, reaches the right extreme and returns to the left. The time for one complete oscillation is its period.

Time and motion

Which pendulum takes longer?



THE IDEA

For small swings, a longer pendulum has a longer period. Compare lengths from the support to the centre of the bob.

Keep the release angle small and similar. A heavier bob alone does not make the period longer in the simple model.

CHECK YOUR THINKING

Which change tests length fairly?

A Change string length while keeping the release conditions similar.

B Change the length and count different fractions of a swing.

A. Change string length while keeping the release conditions similar.

A RELATED EXAMPLE

Who is faster?

Over the same distance, a shorter time means a greater average speed. A runner doing 100 m in 20 s averages 5 m/s. Speed compares distance with time, so a longer distance alone does not prove greater speed.

Time and motion

Time many swings

Timing full oscillations

20 swings	32 seconds
10 swings	? seconds

THE IDEA

Suppose 20 full swings take 32 seconds. One period averages 32 ÷ 20 = 1.6 seconds.

Timing several swings reduces the relative effect of starting or stopping a little late. The SI unit of time is the second, symbol s.

CHECK YOUR THINKING

What would 10 swings take at this period?

A About 1.6 s.

B About 16 s.

B. About 16 s.

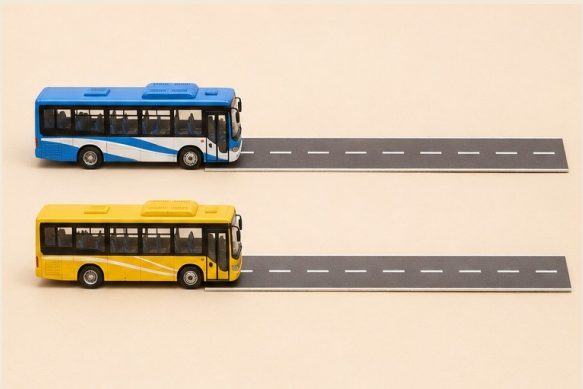
A RELATED EXAMPLE

Spacing tells a story

Positions at equal times show how far an object went in each interval. Equal gaps along a straight path fit uniform linear motion. Different gaps show non-uniform motion. A single average speed can hide both pauses and faster stretches.

Time and motion

Choose compatible units



THE IDEA

Match distance and time units. At a steady 60 km/h, a bus travels for 20 minutes. Convert first: 20 ÷ 60 = ⅓ hour.

Distance = speed × time = 60 × ⅓ = 20 km. Multiplying 60 by 20 would mix hours with minutes.

CHECK YOUR THINKING

At 45 km/h, how far in 30 minutes?

A 22.5 km.

B 90 km.

A. 22.5 km.

LOOK AGAIN

Could two very different journeys have the same average speed?

Yes. A 20 km trip in 1 hour and a 40 km trip in 2 hours both average 20 km/h. Speeds within either trip can still vary.

Time and motion

Compare two journeys fairly

Two journeys

Runner A	180 m in 30 s
Runner B	240 m in 60 s

THE IDEA

Runner A covers 180 m in 30 s. Runner B covers 240 m in 60 s. Calculate each average using metres and seconds.

Compare 180 ÷ 30 with 240 ÷ 60. Explain why the greater distance alone does not identify the faster runner.

CHECK YOUR THINKING

Who has the greater average speed?

A. A: 6 m/s, compared with B: 4 m/s.

B. B, because 240 metres is farther.

A. A covers more distance per second on average. Both distance and elapsed time matter.

LOOK AGAIN

Can covering more distance still mean a lower average speed?

Runner A averages 180 ÷ 30 = 6 m/s. Runner B averages 240 ÷ 60 = 4 m/s. B covers more ground but takes twice as long.

ONE LAST CHALLENGE

What is the average speed for the whole trip?

A cyclist covers 12 km in one hour, rests for half an hour, then covers another 6 km in half an hour.



THE REVEAL

9 km/h.

The trip covers 18 km in 2 hours, including the rest. Divide total distance by total elapsed time.

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