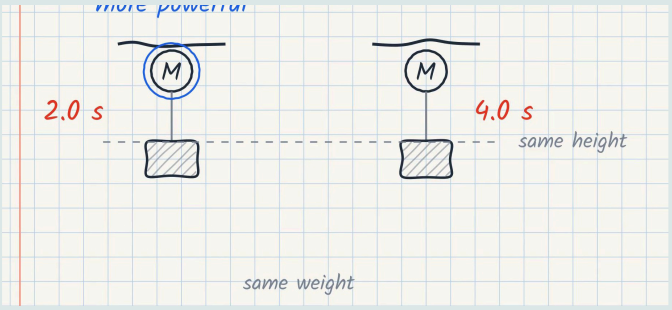
Power

P = E / t and P = W / t

sansara academy
Summary sheet

1 What power means



- **Power** is the rate of energy transfer: how fast energy is transferred, not how much.
- Two motors lift the same load to the same height: the one that does it faster has the greater power.

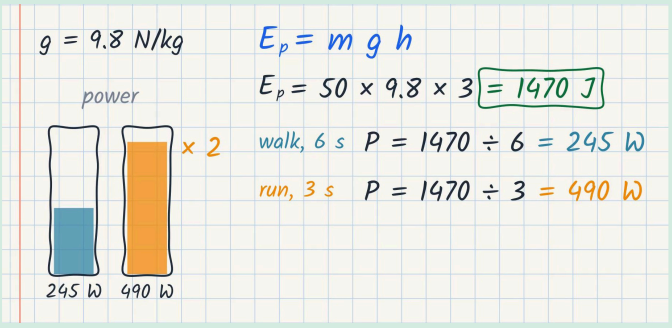
2 The equations

$P = W / t$ power = 245 W

W = work done (J) W = watts (unit)

- P = E / t and P = W / t (W = work done, the energy transferred by a force).
- Power in **watts** (W), energy in joules (J), time in seconds (s). **1 W = 1 J per second**.

3 Your power on the stairs



- Climb 3 m with a mass of 50 kg: E = m g h = 50 × 9.8 × 3 = 1470 J.
- Walk in 6 s: 245 W. Run in 3 s: 490 W. Same energy in less time means more power.

4 An exam-style question

$P = E / t$

Exam-style *convert first*

P = 2.5 kW · t = 2 min · E = ?

P = 2.5 kW × 1000 = 2500 W

t = 2 min × 60 = 120 s

E = P × t

E = 2500 × 120 = 300 000 J

same equation in electricity: E = P t

- **Convert first**: kW × 1000 = W and minutes × 60 = seconds.
- Rearranged: E = P × t. A 2.5 kW kettle for 2 min: 2500 × 120 = 300 000 J.

$P = E / t$

power = energy transferred ÷ time

P	power	watt (W)
E	energy transferred (or W, work done)	joule (J)
t	time	second (s)

Rearrange: E = P × t and t = E ÷ P

Exam tip

To define power, write "the rate at which energy is transferred". The word "rate" is the key.

Check yourself

1. A motor transfers 600 J in 12 s. What is its power?
2. A 2000 W heater runs for 1 minute. How much energy does it transfer?

Answers: 1. P = 600 ÷ 12 = 50 W 2. E = 2000 × 60 = 120 000 J