Change What’s Underneath

RP11-V1 · storyboard · RP11 Change the unit in the denominator. Read each picture with its sentences.

Picture 1

A train travels at 90 km/h. How many kilometres does it travel per minute?

$$\frac{90\ \text{km}}{1\ \text{h}} \times \frac{1\ \text{h}}{60\ \text{min}}$$ hours on top, so they cancel

$$= \boxed{1.5\ \text{km per minute}}$$

1. A train travels at 90 kilometres per hour.
2. How many kilometres does it travel per minute?
3. Hours are underneath in the rate, so the factor has hours on top.
4. They cancel.
5. 90 divided by 60 is 1.5 kilometres per minute.

Picture 2

Trap $90\ \mathrm{km/h} \rightarrow \mathrm{km/min}$

$$\times\ \frac{90\ \mathrm{km}}{1\ \mathrm{h}} \times \frac{60\ \mathrm{min}}{1\ \mathrm{h}} = 5400$$

$$\checkmark\ \frac{90\ \mathrm{km}}{1\ \mathrm{h}} \times \frac{1\ \mathrm{h}}{60\ \mathrm{min}} = 1.5$$

6. Watch for the trap: a factor with hours underneath.
7. Then the hours don't cancel, and you get 5400.
8. In a minute the train goes less far than in an hour.

Picture 3

How many metres per second is 90 km/h?

$$\frac{90\ \text{km}}{1\ \text{h}} \times \frac{1000\ \text{m}}{1\ \text{km}} = \frac{90\,000\ \text{m}}{1\ \text{h}}$$ first the unit on top

$$\frac{90\,000\ \text{m}}{1\ \text{h}} \times \frac{1\ \text{h}}{3600\ \text{s}}$$ then the unit underneath

$$= \boxed{25\ \text{m/s}}$$

9. How many metres per second is 90 kilometres per hour?
10. One unit at a time.
11. First the kilometres on top: times 1000 metres over 1 kilometre gives 90 thousand metres per hour.
12. Then the hours underneath: times 1 hour over 3600 seconds.
13. 90 thousand divided by 3600 is 25 metres per second.

Picture 4

Trap $90\ \text{km/h} \to \text{m/s}$

$\times\ 90 \times 1000 = 90\,000\ \text{m/s}$

✓ $90 \times 1000 \div 3600 = 25\ \text{m/s}$

14. Watch for the trap: changing only the unit on top.
15. For metres per second, change both: the kilometres and the hours.