

Problems with Mixed Units

Starter

1. **(Review of last lesson)** Annabel ran a road race at an average speed of 10 km/h. She completed the race in 2 hours 15 minutes. What was the distance of the road race?

Working: $S = 10, T = 2\text{h } 15\text{m} = 2\frac{1}{4}\text{h}$ or 2.25h
Using $D = S \times T$: $D = 10 \times 2.25 = 22.5$
The distance of the road race was 22.5 km.

E.g. 1 Convert 1 hour 35 minutes to just hours.

Working: **Divide the minutes by 60:** 1 hour 35 minutes $\equiv 1\frac{35}{60} = 1\frac{7}{12} \approx 1.58\text{h}$

E.g. 2 Convert 2.7 hours to hours and minutes.

Working: **Multiply the decimal part of the hours by 60:**
 $2.7\text{h} \equiv 2\text{h } (0.7 \times 60)\text{m} = 2\text{h } 42\text{m}$

E.g. 3 Given that 1 mile \approx 1.6 km, convert:

- (a) 56 miles to km (b) 56 km/h to mph

Working: (a) 56 miles $\equiv 56 \times 1.6 = 89.6$ km
(b) 56 km/h $\equiv 56 \div 1.6 = 35$ mph

E.g. Convert 7 m/s to km/h.

Working: 7 m/s means 7 metres in 1 second
m/s to m/min: Will I travel further or less far in one minute?
I will travel further so multiply by 60: $7\text{ m/s} = (7 \times 60) = 420\text{ m/min}$
m/min to m/h: Will I travel further or less far in one hour?
I will travel further so multiply by 60: $420\text{ m/min} = (420 \times 60) = 25200\text{ m/h}$
Now convert to km: $25200\text{ m/h} \equiv 25.2\text{ km/h}$
So $7\text{ m/s} \equiv 25.2\text{ km/h}$
The full calculation could look like:
 $7\text{ m/s} = 7 \times 60\text{ m/min} = 7 \times 60 \times 60\text{ m/h} = \frac{7 \times 60 \times 60}{1000}\text{ m/h} = 25.2\text{ km/h}$

E.g. Convert 85 km/h to m/s. Give your answer to 3 s.f..

Working: 85 km/h means 85 km in 1 hour
km/h to km/min: Will I travel further or less far in one minute?
I will travel less far so divide by 60: $85 \text{ km/h} = \frac{85}{60} \text{ km/min}$
km/min to km/s: Will I travel further or less far in one second?
I will travel less far so divide by 60: $\frac{85}{60} \text{ km/min} = \frac{85}{60 \times 60} \text{ km/s}$
Now convert to m: $\frac{85}{60 \times 60} \text{ km/s} = \frac{85}{60 \times 60} \times 1000 \approx 23.6 \text{ m/s}$
So $85 \text{ km/h} \equiv 23.6 \text{ m/s}$ (3 s.f.)
The full calculation could look like:
 $85 \text{ km/h} = \frac{85}{60} \text{ km/min} = \frac{85}{60 \times 60} \text{ km/s} = \frac{85 \times 1000}{60 \times 60} \text{ m/s} \approx 23.6 \text{ m/s}$

E.g. 4 Convert 19 m/s to km/h.

Working: $19 \text{ m/s} = 19 \times 60 \text{ m/min}$
 $= 19 \times 60 \times 60 \text{ m/h}$
 $= \frac{19 \times 60 \times 60}{1000} \text{ km/h}$
 $= 68.4 \text{ km/h}$

go further in one minute so multiply
go further in one hour so multiply
convert from m to km

E.g. 5 Convert 4 km/h to m/s. Give your answer to 3 s.f..

Working: $4 \text{ km/h} = \frac{4}{60} \text{ km/min}$
 $= \frac{4}{60 \times 60} \text{ km/s}$
 $= \frac{4 \times 1000}{60 \times 60} \text{ m/s}$
 $= 1.11 \text{ m/s}$

go less far in one minute so divide
go less far in one second so divide
convert from km to m

Video: [Converting km/h to m/s](#)
Video: [Converting m/s to km/h](#)
Video: [Converting times](#)

[Solutions to Starter and E.g.s](#)

Exercise

p118 Ex 18.3 Qu 1-4 (converting units)
p118 Ex 18.3 Qu 5-10 (converting speeds)