Solutions

Each answer shows the steps, then the **result**.

2.1

- the change in the **observed frequency** when the source **moves relative to** the observer

2.2

- it **increases**

2.3

- **minus** ($-$) in the denominator when the source moves **towards** the observer

2.4

- each new wavefront is emitted from slightly **closer** to the observer, so the wavefronts ahead are **closer together** (shorter λ)

3.1

- source moving **towards** $\Rightarrow$ minus sign

$$f_o = \frac{(340 \text{ m s}^{-1})(800 \text{ Hz})}{340 \text{ m s}^{-1} - 30 \text{ m s}^{-1}} = \frac{2.72 \times 10^5 \text{ m s}^{-2}}{310 \text{ m s}^{-1}} = \mathbf{877} \text{ Hz}$$

3.2

- source moving **away** $\Rightarrow$ plus sign

$$f_o = \frac{(340 \text{ m s}^{-1})(800 \text{ Hz})}{340 \text{ m s}^{-1} + 30 \text{ m s}^{-1}} = \frac{2.72 \times 10^5 \text{ m s}^{-2}}{370 \text{ m s}^{-1}} = \mathbf{735} \text{ Hz}$$

3.3 B

- moving **away** stretches successive wavefronts, so λ rises; v is fixed by the medium, so f **falls**
- **A** is an *approaching* source (why a passing siren drops in pitch)

3.4

- as the ambulance approaches, the wavefronts ahead are **bunched closer together**
- shorter $\lambda \Rightarrow$ **higher frequency** (higher pitch)