Section 1: Displacement and distance

Crucial points

1. **Don't confuse vectors and scalars**
   Remember, a scalar quantity, like distance or distance travelled, has only magnitude (size), whereas a vector quantity like position or displacement has both magnitude and direction. Saying a ship is 25 km away gives its distance from you (a scalar quantity). If you are told it is 25 km away on a bearing of 067°, you know its position (a vector quantity).

2. **Make sure that you know the differences between displacement, position, distance and distance travelled**
   The Notes and Examples for this section make the differences clear.

3. **Don't misinterpret the position–time graph of a particle**
   The position-time graph of a particle shows how the position of a particle changes with time. This is not the same as the path of the particle, which gives the route it travels.

4. **Don't confuse speed and velocity**
   Speed is a scalar quantity and so has only magnitude; velocity is a vector and so has both magnitude and direction. Speed is the magnitude of velocity. Speed is the rate at which distance (a scalar) changes with time. Velocity is the rate at which displacement (a vector) changes with time.

5. **Don't confuse distance-time graphs and position-time graphs**
   Distance is a scalar and distance travelled can only increase with time, so a distance-time graph must have a positive gradient at all times. The gradient of a distance-time graph gives the speed of the particle.

   Position is a vector. Position is the displacement of a particle from the origin. Position can increase or decrease with time, so a position-time graph can have a positive or negative gradient at different times. The gradient of a position-time graph gives the velocity of the particle.