Answer **all** the questions in the spaces provided.

1 **(a)** A toy car moves up a ramp and travels across a gap to land on another ramp, as illustrated in Fig. 1.1.

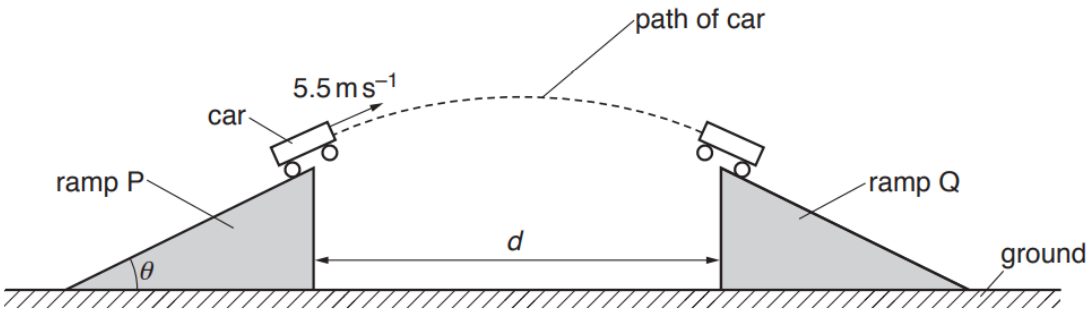

Fig 1.1

The car leaves ramp P with a velocity of 5.5 m s^{-1} at an angle θ to the horizontal. The car lands at the top of ramp Q. The tops of both ramps are at the same height and are distance d apart. Air resistance is negligible.

Taking $\theta = 33°$, determine

(i) the time taken for the car to travel between the ramps

time = ... s [2]

(ii) the horizontal distance d between the tops of the ramps

d = ... m [2]

(iii) Calculate the ratio

$$\frac{\text{kinetic energy of the car at its maximum height}}{\text{kinetic energy of the car as it leaves ramp P}}$$

ratio = ... [2]

(b) A uniform beam AB of length 6.0 m is placed on a horizontal surface and then tilted at an angle of 31° to the horizontal, as shown in Fig. 1.2.

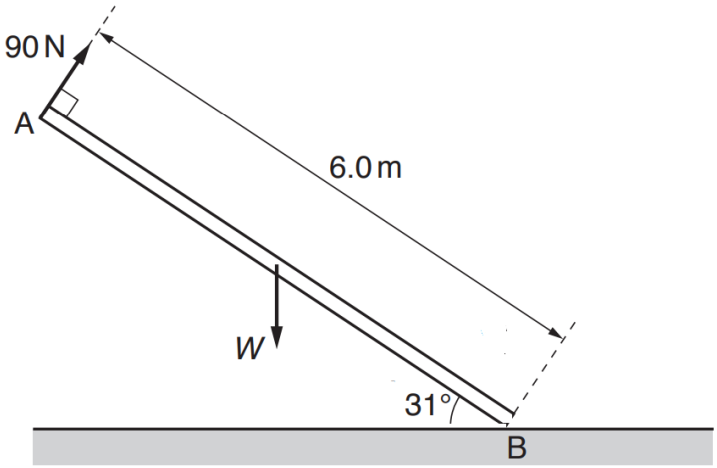

Fig 1.2

The beam is held in equilibrium by three forces that all act in the same plane. Two of the forces are shown in Fig. 1.2.

A force of 90 N acts perpendicular to the beam at end A. The weight *W* of the beam acts at its centre of gravity. The third force *F* acts at the end B of the beam by the ground.

(i) Draw the force *F* showing its direction.

[1]

(ii) Calculate weight W of the beam.

W = ... N [2]

(iii) Determine the magnitude of force F.

F = ... N [3]

[Total: 12]