1 **(a)** A body has an initial velocity u and a constant acceleration a in the same direction. After time t, the body has moved a distance s and has a final velocity v. The motion can be summarised by the following equations

$$v = u + at$$

$$s = \frac{1}{2}(u + v)t$$

Using the above equations, derive an expression for v in terms of u, a and s.

[1]

(b) Fig. 1.1 shows a basketball player practicing a layup where the basketball of diameter 0.23 m is tossed vertically upwards close to the rim of the hoop into the hoop.

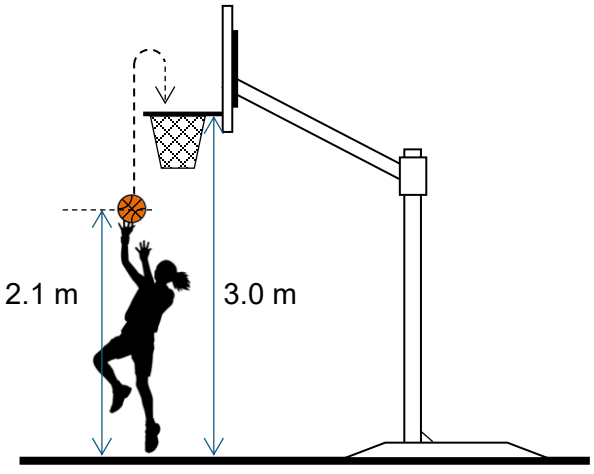


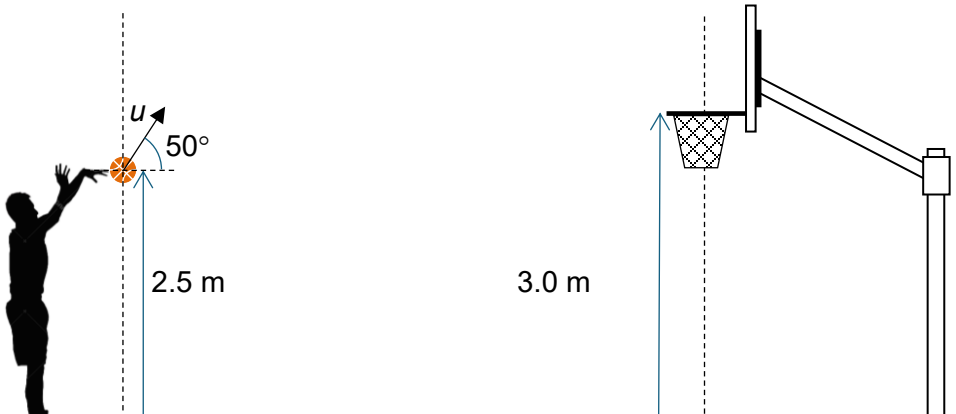
Fig. 1.1

Determine the minimum vertical velocity of release required in order for the basketball to enter the basket when it is thrown upwards from a height of 2.1 m.

minimum vertical velocity = ... m s^{-1} [3]

(c) Fig. 1.2 shows another basketball player taking a jumpshot from the three-point line of a basketball court. He releases the basketball at an angle of 50° above the horizontal with speed *u* at line A at a height of 2.5 m above the ground. The hoop is at line B, 3.0 m above the ground and 6.7 m from line A.

The basketball takes 1.3 s to travel from line A to line B.



(i) Show that the speed u is 8.0 m s^{-1}.

[1]

(ii) Hence, calculate the height of the basketball above the ground at line B.

height = ... m [3]