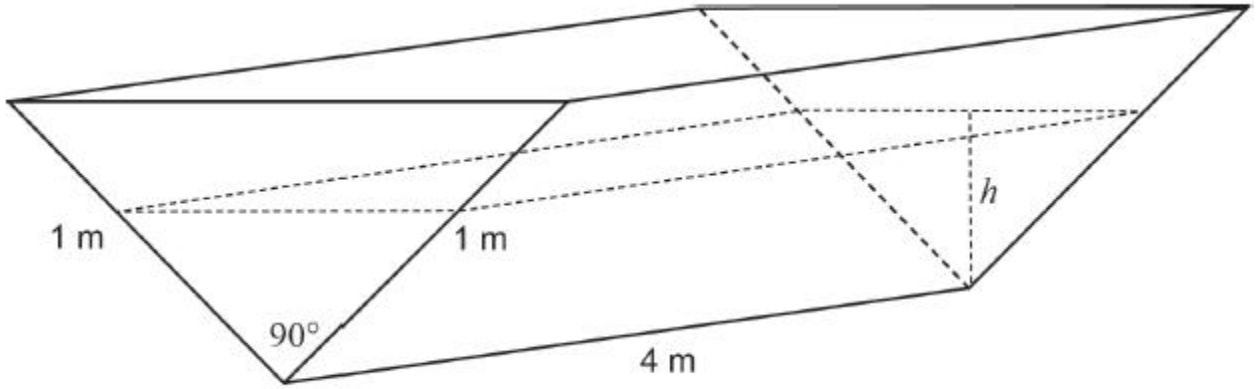
Question 15 **(10 marks)**

A four metre long water tank, open at the top, is in the shape of a triangular prism. The triangular face is a right isosceles triangle with congruent sides of one metre length.



Initially the tank is completely full with water, but it develops a leak and loses water at a constant rate of 0.08 cubic metres per hour.

Let $h =$ the depth of water, in metres, in the tank after t hours.

(a) Show that the volume of water in the tank V cubic metres, is given by the expression $V(h) = 4h^2$. (2 marks)

(b) Determine the rate of change of the depth, correct to the nearest 0.01 metres per hour, when the depth is 0.6 metres. (3 marks)

Assume that the rate of leakage stays constant at 0.08 cubic metres per hour.

(c) Show that the differential equation that relates $\frac{dh}{dt}$ with the depth h is given by $\frac{dh}{dt} = -\frac{1}{100h}$. (1 mark)

(d) Hence determine the relationship for the depth h at any time t hours. (4 marks)