Modelling

Example

A spear is thrown over level ground from the top of a tower.

The height, in metres, of the spear above the ground after t seconds is modelled by the function: $h(t) = 12.25 + 14.7t - 4.9t^2, \quad t \geq 0$

a) Interpret the meaning of the constant term 12.25 in the model.

b) After how many seconds does the spear hit the ground?

c) Write $h(t)$ in the form $A - B(t - C)^2$, where A, B and C are constants to be found.

d) Using your answer to part c or otherwise, find the maximum height of the spear above the ground, and the time at which this maximum height is reached?

Test Your Understanding

A rectangular car park has a perimeter of 184 metres, and the diagonal of the car park measures 68 metres.

(i) By labelling the length of the car park as x metres, formulate an equation and check that x = 32 satisfies the equation. Hence find the dimensions of the car park.

(ii) Sketch the graph of the quadratic expression in part (i), and interpret each intersection with the x-axis in terms of the car park.