

8.1) Constructing a model

Worked example

A stone is thrown from the top of a cliff into the sea. The height of the stone above sea level, h m, at time t seconds after it is thrown can be modelled using the equation $h = -5t^2 + 15t + 90$

- a) Find the height of the stone above sea level:
 - i) When it is released
 - ii) 8 seconds after it is thrown
- b) Use the model to predict the height of the stone above sea level after 20 seconds.
- c) Comment on the validity of this prediction.
- d) The model is only valid from the time the stone is thrown until the time it enters the sea. Find the range of values of t for which the model is valid.

Your turn

A basketball is thrown into a net. The height of the basketball above the ground can be modelled using the equation $h = 2 + 1.1x - 0.1x^2$, where x m is the horizontal distance travelled.

- a) Find the height of the basketball:
 - i) When it is released
 - ii) At a horizontal distance of 0.5 m
- b) Use the model to predict the height of the basketball when it is at a horizontal distance of 15 m from the player.
- c) Comment on the validity of this prediction.
- d) The model is only valid when the balls is above the ground. Find the range of values of x for which the model is valid.

- a)
 - i) 2 m
 - ii) 2.525 m

b) -4 m

c) Height cannot be negative, so the model is not valid when $x = 15$ m

d) $0.00 \leq x < 12.59$ (2 dp)