

Modelling with quadratics



Gold

A ball is thrown straight up into the air and it hits the ground on its way down again. The height at which it is thrown, in meters, above the ground t seconds after release can be modelled by the following function:

$$h(t) = 4t + 5 - 3t^2, t \geq 0$$

- a** At what height was the ball released?
- b** Use the model to find the time at which the ball hits the ground.
- c** Rearrange $h(t)$ into the form $A - B(t - C)^2$ and give the exact values of the constants A , B and C .
- d** Using your answer to part **c** or otherwise, find the maximum height of the ball, and the time at which this maximum height is reached, giving your answers correct to 2 decimal places.

Silver

Eli sells vases at a weekend market. He sold 45 vases at £14 each one weekend. He wants to sell more vases the next weekend.

- a** The number of vases sold can be modelled by the equation $s = 185 - Tp$, where £ p is the price of each vase and T is a constant. Find the value of T .

To model his total revenue £ r , Eli multiplies the number of vases sold by the price of each vase. Eli writes this as $r = p(185 - Tp)$.

- b** Rearrange r into the form $A - B(p - C)^2$, where A , B and C are constants to be found.

Bronze

Solve the following equations, giving your answers correct to 3 significant figures:

- a** $4 - 5x^2 - 2x = 0$
- b** $t^2 + 6t + 1 = 4$
- c** $2x(x + 3) + 2 = -2x$