Building quadratic models from information

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Roots are -2,4 and the graph passes through $(0, -16)$. Find its rule. [3 marks]

Use factored form.

At $x = 0$, $-16 = -8a$.

Answer: $y = 2(x + 2)(x - 4)$

2. Vertex is $(3, -2)$ and the graph passes through $(1, 6)$. Find its rule. [3 marks]

Use vertex form.

Substitute $(1, 6)$: $6 = 4a - 2$.

Answer: $y = 2(x - 3)^2 - 2$

3. A rectangle has perimeter 40 cm. Find maximum area and dimensions. [3 marks]

Area is $x(20 - x) = -(x - 10)^2 + 100$.

The vertex is within $0 < x < 20$.

Answer: 100 square centimetres; 10 cm by 10 cm.

4. A ball has height $h = -5t^2 + 20t + 1$ m. Find maximum height/time. [3 marks]

Complete the square: $h = -5(t-2)^2 + 21$.

Interpret the vertex.

Answer: 21 m at $t = 2$ s.

5. A rectangle's length is 3 cm more than its width; area is 40 square centimetres. Find dimensions. [3 marks]

Use $x(x+3) = 40$.

Factor $(x+8)(x-5) = 0$ and reject -8.

Answer: 5 cm by 8 cm.

6. An arch has supports $x = -3$ m, $x = 3$ m and maximum height 9 m. Give its rule/domain. [3 marks]

Use $h = a(x+3)(x-3)$.

At $x = 0$, $9 = -9a$.

Answer: $h = 9 - x^2$, $-3 \le x \le 3$.