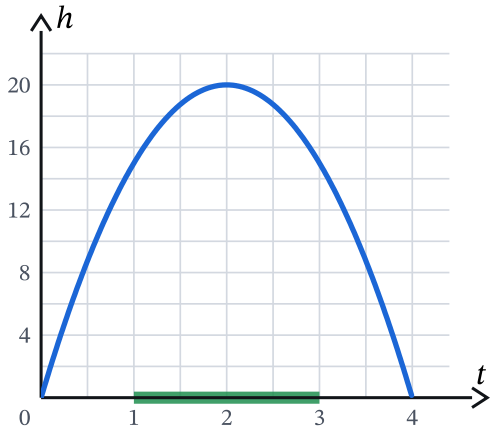
Names (pair) _____ Date _____

Modelling: Projectiles and Data

Example



$h(t) = -5t^2 + 20t$

Greatest height: the vertex $t = 2$ s, $h = 20$ m. The ball lands when $h(t) = 0$: $t = 4$ s.

Above 15 m: $-5t^2 + 20t > 15$, i.e. $t^2 - 4t + 3 < 0$, so $1 < t < 3$ (green).

The model only makes sense for $0 \le t \le 4$.

1 IN PAIRS **A throw from a tower.** A ball is thrown from the top of a tower. Its height is $h(t) = -5t^2 + 10t + 15$ (metres, seconds). One student calculates, the other draws a sketch.

a) How high is the tower? ☐ m

b) The greatest height and when: ☐ m, $t =$ ☐ s

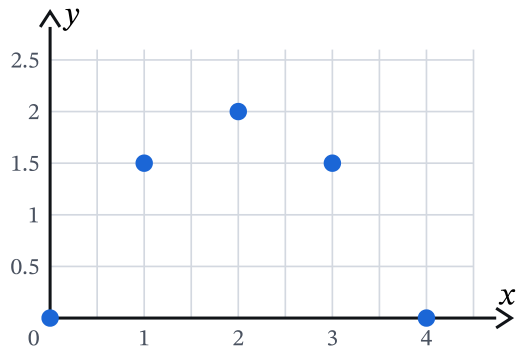
c) When does the ball hit the ground? $t =$ ☐ s

d) When is the ball higher than 15 m? ☐

Sketch:

Names (group) _____ Date _____

2 IN A GROUP **A model from data.** We measured the height y (m) of a water jet at a distance x (m) from the pipe. The group looks for a parabola through the points.



x	0	1	2	3	4
y	0	1.5	2	1.5	0

Vertex: $V(\square, \square)$. Model: $y = a(x - \square)^2 + \square$

From the point $(4, 0)$: $a =$ ☐ Height at $x = 2.5$: ☐ m

For which x does the model make sense? ☐

3 ON YOUR OWN **A bridge.** The arch of a bridge is a parabola. The span is 40 m and the highest point is 10 m above the road. Set up a coordinate system, write the model and work out the height of the arch 10 m from one end.

$y =$ ☐ height: ☐ m

The Parabola app · otooly.com/parabola-explorer

Mode **Three forms**: enter your model and check that it passes through the measured points.

★ ON YOUR OWN **Exit card.** A ball: $h(t) = -5t^2 + 15t$. How long is it in the air? ☐ s