Mixed Review – Quadratic Relations

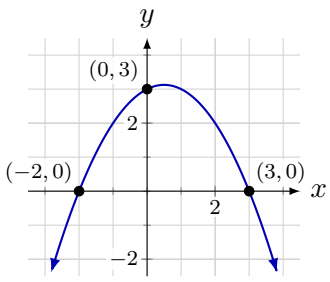
The questions are in mixed order. Decide how to start each one. Work on your own paper. Fill in the table in question 5 on this sheet.

1. A girl jumps off a diving board into a pool. The end of the board is 1.5 m above the water. She jumps from the end. Her path is modelled by $y = -\frac{1}{2}(x-1)^2 + 2$. Let x be her horizontal distance from the end of the board, in metres. Let y be her height above the water, in metres.

a) Which feature of the parabola is 1.5: the vertex, a zero, or the y-intercept? Show that the model gives 1.5.

b) What is her horizontal distance from the end of the board when she reaches the water? Use the step pattern or a table of values.

2.



Which equation matches this graph? Explain why you chose it. Then explain why each of the other three equations does not match.

A $y = -\frac{1}{2}(x-2)(x+3)$ **B** $y = -\frac{1}{2}(x+2)(x-3)$

C $y = -(x+2)(x-3)$ **D** $y = \frac{1}{2}(x+2)(x-3)$

3. A parabola has zeros -4 and 8. Its maximum value is 9. Find its equation in vertex form. Start by finding the vertex.

4. Ana says: "7^{-1} is less than 7^0. This is because $7^0 = 0$, and 7^{-1} is a negative number." Ana is right that 7^{-1} is less than 7^0. But both of her reasons are wrong. Explain why each reason is wrong. Give the values of 7^{-1} and 7^0.

5. A candle burns. Its height was measured every 10 minutes.

Time (min)	Height (mm)	First differences	Second differences
0	200		
10	183		
20	168		
30	151		
40	136		
50	119		

a) Check the Time column first. Then complete the difference columns. Is the relation linear, quadratic, or neither? The heights were measured. So the differences may not be exactly equal.

b) Predict the height of the candle after 80 minutes. Explain how you found it. Is this an interpolation or an extrapolation?

6. Think about the parabola $y = 2(x-3)^2 + k$. Do not make a table. Explain each answer.

a) Give one value of k so that the parabola has no zeros.

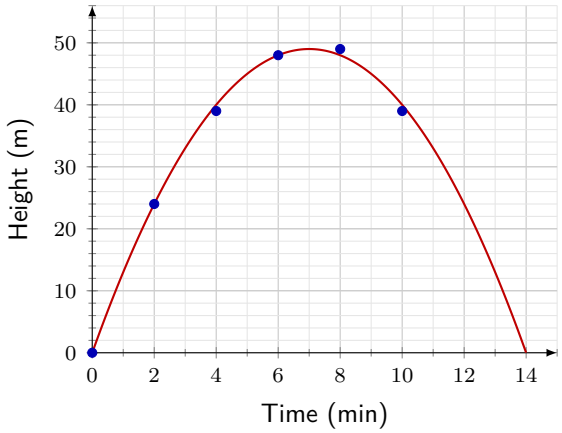
b) Give the value of k so that the parabola has exactly one zero.

c) Give one value of k so that the parabola has two zeros.

d) Now the parabola is $y = -2(x-3)^2 + k$. Which values of k give no zeros?

7. Leo says: "The graph of $y = \frac{1}{3}x^2$ is narrower than the graph of $y = x^2$, because each y-value is divided by 3." Explain Leo's error. Use the point where $x = 3$ in your explanation.

8. A child flies a kite. The kite's height was measured every 2 minutes for 10 minutes. A curve of best fit is drawn and continued to 14 minutes.



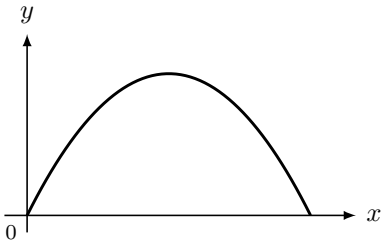
a) Use the curve to find the two times when the curve gives a height of 24 m.

b) The curve gives a height of 0 m at 14 minutes. Is this an interpolation or an extrapolation? Explain why this prediction may be wrong.

9. The opening of a large tent has the shape of a parabola. It is modelled by

$$y = -0.4x(x-5)$$

Let x be the horizontal distance from the left side of the opening, in metres. Let y be the height of the opening, in metres.



a) How high is the opening at its highest point? Show how you know.

b) A box is 1 m wide. It is pushed through the centre of the opening. What is the greatest height the box can have? Explain.

10. The point $(9, 1)$ is on the parabola $y = \frac{1}{4}(x-5)^2 - 3$. Find another point on the parabola with $y = 1$. Use the axis of symmetry. Do not use the equation to calculate. Explain in words why your point must be on the parabola.