

## QUADRATICS AND PARABOLAS

### GENERAL INFORMATION

For year levels: 10, 11, 12

#### Background/Description:

Perfect Squares are produced by squaring a single term. This can be either a number or an expression. When it is an expression we end up with a type of quadratic of the form:

$$(x + a)^2 = x^2 + 2ax + a^2 \text{ or}$$

$$(x - a)^2 = x^2 - 2ax + a^2$$

This activity explores the properties of this family of functions and their graphs, known as parabolas.

#### This activity covers the following Australian Curriculum - Mathematics Content:

Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)

Explore the connection between algebraic and graphical representations of relations such as simple quadratics ... using digital technology as appropriate (ACMNA239)

Solve simple quadratic equations using a range of strategies (ACMNA241)

### EXPLORING PERFECT SQUARES

- 1) If you do not already have a copy of Geogebra on your device, download it [here](#). For PC's and Macs the Classic 5 is recommended. This software is free and by downloading the prepared files you do not need to worry about internet speeds.
- 2) Download and open the Geogebra applet: Exploring Perfect Squares
- 3) Read through and follow the instructions on the left side of the page.

**Use the checkboxes to progressively show more sections of the applet.**

- 4) Enter a value for **a**.  
Write down the resulting equation. (**Drag the red point down to show it.**)

- 5) Explain the effect of changing the value of **a**:

When **a** is positive \_\_\_\_\_

When **a** is negative \_\_\_\_\_

**Drag the red point down until the next section appears.**

- 6) Change the value of  $x$  by dragging the blue point. What effect does this have on the line segments?

**Drag the red point down until the next section appears.**

There will be some text and a square at the bottom of the screen. (Scroll down if you can't see it.)

- 7) Draw an example of the square for one value of  $a$ , say  $a = 2$ .

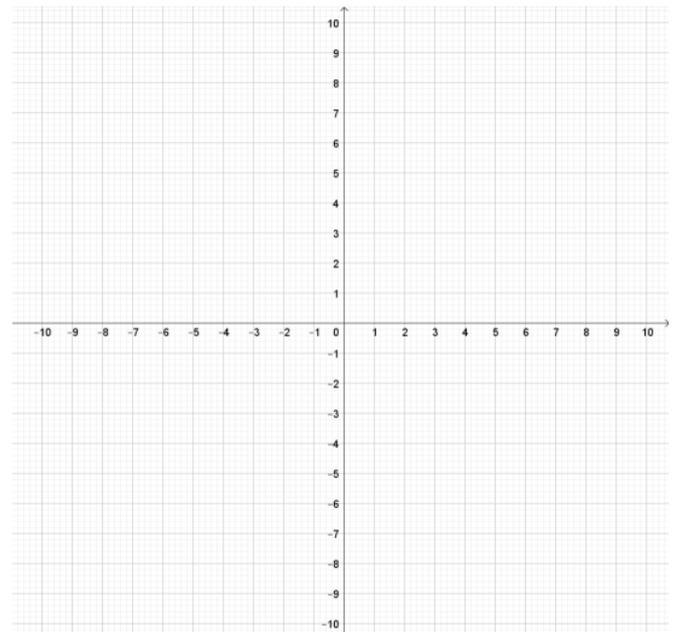
- 8) What do the coordinates of the red point on the graph represent?

- 9) Describe the motion of the red point as you change the value of  $x$  (drag the blue point as before.)

- 10) Draw the parabola formed by a square of side length  $x + 2$ .

- 11) Use integer values of  $a$  between  $-5$  and  $5$  and describe the effect on the parabola.

- 12) What does the factor form of a quadratic tell us about the turning point of the parabola that can be drawn from it?



- 13) Now download and open the **Am I a Perfect Square?** applet to practice what you have learned and find out more.

## FURTHER INFORMATION

[https://amsi.org.au/teacher\\_modules/Quadratic\\_Function.html](https://amsi.org.au/teacher_modules/Quadratic_Function.html)