

WELCOME

This is the **first** set of weekly challenges.

In this first week, there are 4 challenges for you to explore, interact with and learn from. You don't have to do them in order.

I've tried to make the challenges so that you can print them or at least some of the working away from the screen if you choose to do so! It's been a lot of online learning this year, so if you can, print and grab a pen and paper!

For most of the challenges you are able to upload your answers... please do so!

Enjoy these challenges and get your brains warmed up ready for AS-level mathematics!

Later in the summer, there will be the 6 live online talks – don't miss out! This includes guest speakers on different aspects of mathematics including Ben Sparks!



Rheolir gan Brifysgol Abertawe, Sefydliad Gwyddorau
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Managed by Swansea University, Wales Institute
of Mathematical and Computational Sciences



Challenge 1:

Futoshiki is the Japanese word for inequality.

In each row and column, you must have once and only once the digits 1, 2, 3 and 4.

In each row and column, you must also obey the inequality symbols shown between adjacent boxes.

You have a choice of Futoshiki below. You can do both if you wish!

To submit: In the Desmos activity (page 2 or 3) – annotate your choice of puzzle.

You may wish to print this out to scribble on!

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4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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Challenge 2: In the Desmos activity; play & explore the quadratics on pages 4 & 5

Next....Choose one of the quadratics below:

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$y = x^2 + 6x + 8$	$y = x^2 - 3x - 10$	$y = x^2 - 6x + 9$	$y = 2x - x^2 + 24$

Explore it, sketch it, manipulate it, draw it, play with it using both Desmos or pencil and paper.

Now explain it!

Using the one of the templates on the next two pages (either print off or annotate on the pdf), produce a one-page-explainer to show as much about your chosen quadratic as possible:

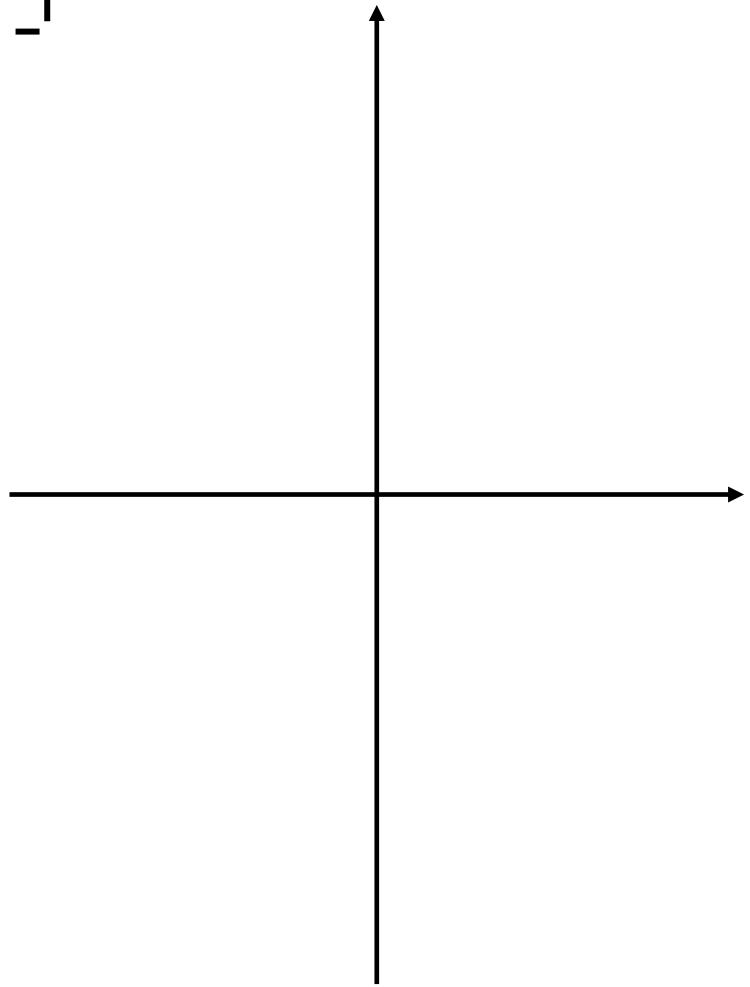
1. Express your quadratic in three different forms, given in the boxes.
2. Annotate how to change between the three different forms.
3. Sketch what it looks like, showing the intercepts etc.
4. Annotate how the three different forms relate to different features of the graph.
5. It is always possible to write a quadratic in three different forms?

The more stars, the more you might need to think. If you want to do more than one graph, just use another template.

To submit: When you have done as much as possible, upload a photo or screen grab of your answers to the Desmos activity (page 6) .

$$y = x^2 + bx + c$$

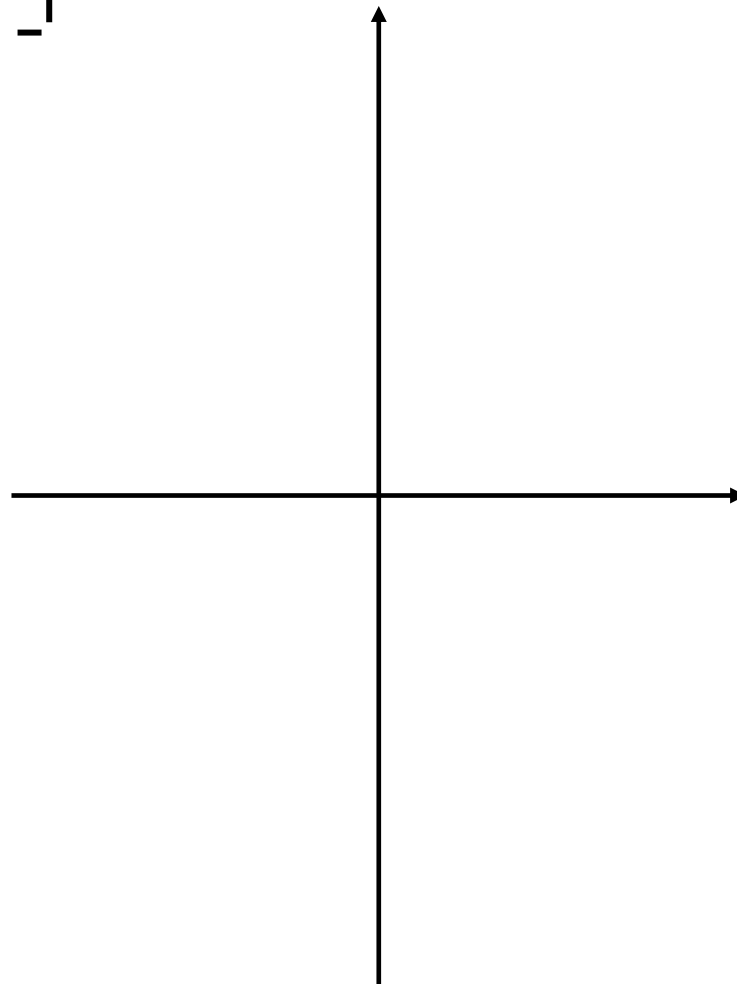
$$y = (x - m)(x - n)$$



$$y = (x - p)^2 + q$$

$$y = ax^2 + bx + c$$

$$y = (rx - m)(sx - n)$$



$$y = u(x - p)^2 + q$$

Challenge 3:

The Quadratic Formula

The quadratic formula, can be derived in lots of different ways.

Watch the 4 videos in the Desmos activity page 7, you might wish to fast forward, rewind or skip bits!

To submit (go to the Desmos activity page 8):

Answer the following questions:

- Which method do you prefer, and why?
- Which method contains a mistake(s)? What is the mistake?
- Which method do you think is the least efficient, and why?

And...

Can you **find another way to do it**? Submit a photo or screen grab of another way of deriving the quadratic formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Challenge 4:

1691 is a year that has rotational symmetry.....

- a) Which was the most recent year to have rotational symmetry?
- b) When will be the next year to have rotational symmetry?

**To submit: In the Desmos activity (page 9) – annotate your choice of puzzle.
You may wish to print this out to scribble on!**

