Quadratic Equations

Year 11
Mathematical Methods

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 Mathematical Methods course.

- Understand how we can solve quadratic equations using simple factorisation
- Solve application problems relating to Quadratic Equations

Recap of past learning

This part of the course takes time to look at Quadratic Equations. We have already covered much of this work in Year 10 and so it should be revision. The tools we learn with Quadratic Equations will prove invaluable in many later sections of the course.

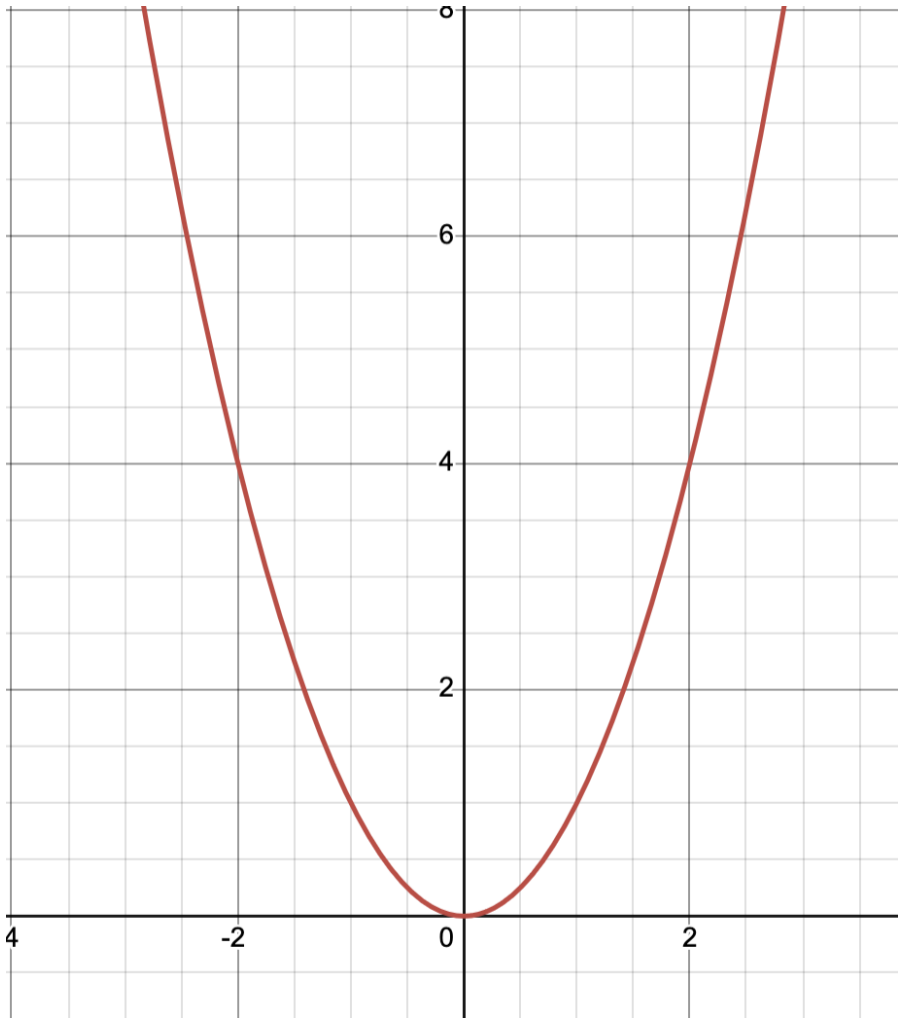
Algebra is key! If you are already unsure of how to apply some of the more “basic” algebra to problems, you need to spend time improving those skills.

Many people struggle with Year 11 work as a result of a lack of understanding of the Year 10 work.

RECAP: What is a quadratic?

A quadratic equation is a function which looks like either an ‘n’ or ‘u’ in shape.

There are a number of important points we need to be able to find to help us sketch a quadratic function.



In its most basic form we can see it is symmetrical about the y=axis. Has one turning point around the origin.

RECAP: What is a quadratic?

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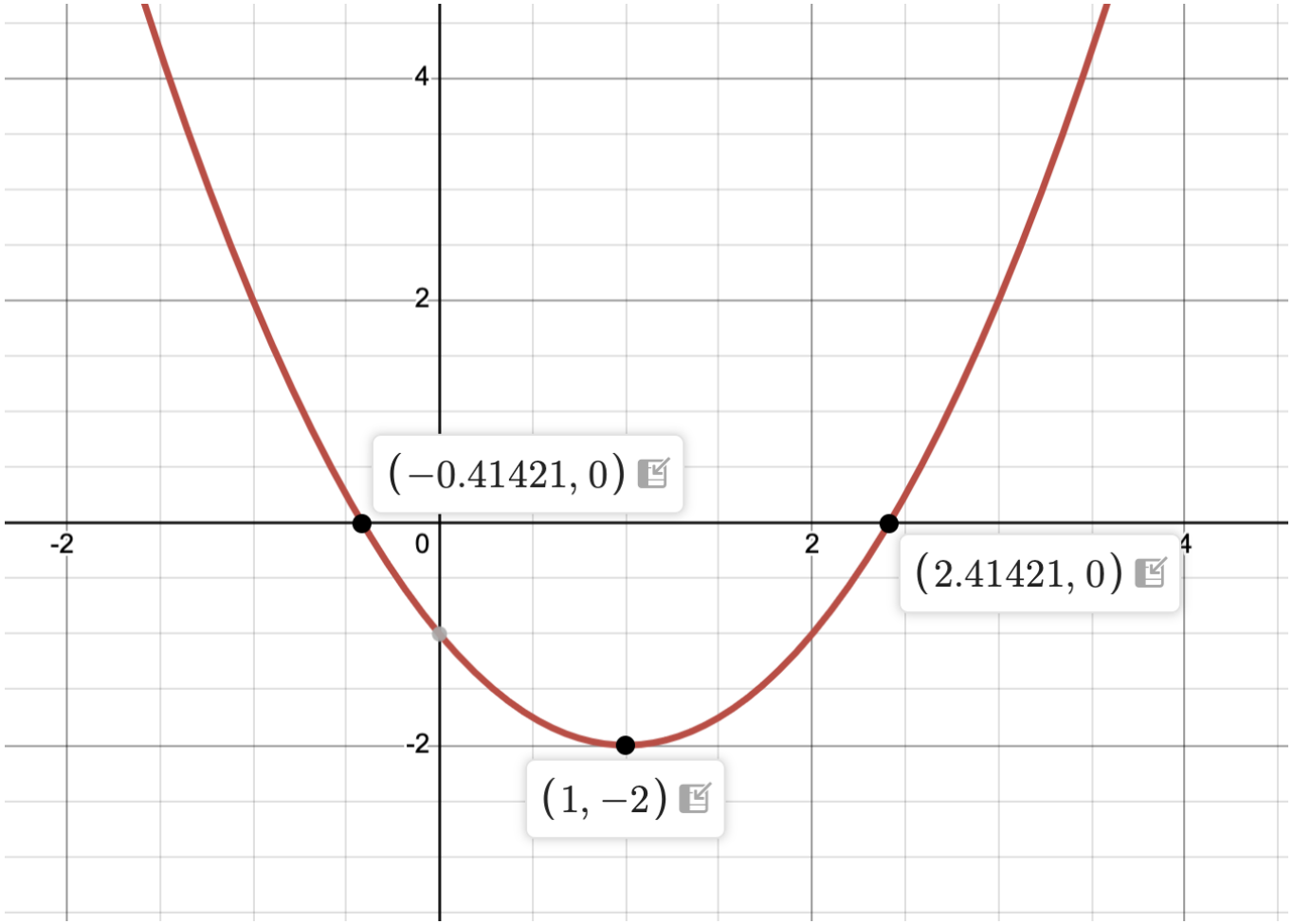


This is a more complex quadratic which requires us to use algebra to find the x-axis crossing points, minimum point and y-axis crossing point.

RECAP: Solving basic quadratics

There are 3 main types of quadratic equations we can be asked to solve.

Knowing the type will tell us the tool we need to use.

Type 1: $x^2 - 4 = 0$

Notice there is no 'x' term.

Type 2: $x^2 - 4x = 0$

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0$ $x = 4$

Notice there is an x-term but no constant

Type 3: $x^2 - 3x + 2 = 0$

This has both an 'x' and constant term. This is what we will be looking at during this lesson.

The ‘T’ method

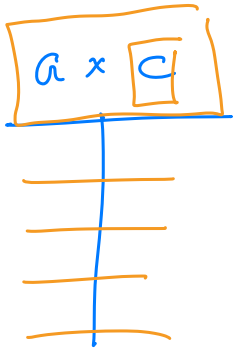
I was taught something called the ‘T’ method and it makes a lot of sense to use. I know there are many people out there who teach the ‘cross’ method and tell you to do it in your head … but I prefer to know leave things to chance!

The best way to teach it is to show examples!

The T-Method works on a huge number of quadratics. If it doesn’t, it means it will need to be solved using the Quadratic Formula.

$$ax^2 + bx \boxed{+} c$$

$$\pm$$



Example 1

Solve $x^2 + 11x + 24 = 0$.

Note: I will use the T-method as it is a TYPE 3 Quadratic.

$x^2 + 3x + 8x + 24 = 0$

$x(x+3) + 8(x+3) = 0$

$(x+3)(x+8) = 0$

NFC : $x + 3 = 0$ or $x + 8 = 0$

$x = -3$ $\quad$ $x = -8$

$+24$

1 24

2 12

3 8 ←

4 6

6 4

8 3

12 2

24 1

Example 2

Solve $2x^2 + 5x - 12 = 0$.

Note: I will use the T-method as it is a TYPE 3 Quadratic.

$2x^2 - 3x + 8x - 12 = 0$

$x(2x - 3) + 4(2x - 3) = 0$

$(2x - 3)(x + 4) = 0$

NR : $2x - 3 = 0$ $\quad x + 4 = 0$

$2x = 3$ $\quad x = -4$

$x = \frac{3}{2}$

-24

1	24
2	12
-3	8

4 6

Applications of Quadratics

Everything you are going to learn in this course is going to be used in Application Style questions. These questions tend to be the ones Methods students struggle with. It is important not to shy away from these questions but to practice, practice and practice some more.

It doesn't matter how many times you trip up. The more you do, the better you will be.

And there are only so many ways we can ask the questions!

Example 3

This is a question I see time and time again.

The perimeter of a rectangle is 20 cm and its area is 24 cm^2. Calculate the length and width of the rectangle.

$P = 2x + 2y$

$20 = 2x + 2y \div 2$

$10 = x + y$

$x = 10 - y$

$y = 4 \quad x = 6$

$y = 6 \quad x = 4$

$xy = 24$

$(10 - y)y = 24$

$10y - y^2 = 24$

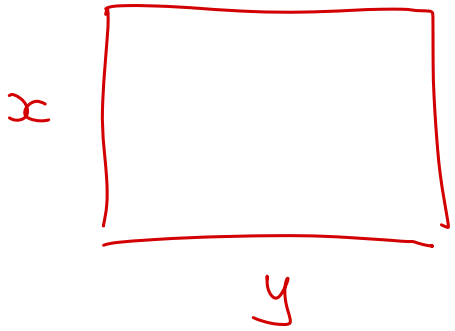
$y^2 - 10y + 24 = 0$

$y^2 - 4y - 6y + 24 = 0$

$y(y-4) - 6(y-4) = 0$

$(y-4)(y-6) = 0$

$y = 4$ or $y = 6$



+24

-1	-24
-2	-12
-3	-8
-4	-6

Learning Objectives: Revisited

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