

Mathematics Transition 1

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Introduction

In order to prepare for taking A-level maths next year, you need to ensure you are fluent in all aspects of GCSE maths, particularly algebra, and you need to be able to approach problems with a confident, logical mindset.

Success in A-Level Mathematics relies on an excellent attitude to learning and commitment to your studies. Whilst you are completing this transition work, if you struggle with any of the content you need to seek help from website platforms you have used during your studies, <u>Corbett Maths</u> (no login required) and <u>SPARX Maths</u> (if you current have an account set up by your school).

There are 2 compulsory tasks to complete before starting in September, they are outlined on the next pages.

Equipment needed

In addition to the usual equipment you were required to bring during your GCSEs you will need the following:

- 1) A large lever arch folder.
- 2) You will also need 24 A4 file dividers.
- 3) A more advance calculator. As part of the A-Level Mathematics and Further Mathematics course students are required to purchase a more powerful calculator that is capable of solving complex equations and is invaluable when working with statistics. There are 3 possible calculators you can choose from, some of you may already have one as they were allowed for your GCSEs.
 - a. <u>Casio fx-991EX</u>: This is an older model which some pupils may have already purchased for their GCSEs.
 - b. <u>Casio fx-991CW</u>: This is the new version of the calculator above. It does all of the same things and some additional functions as well. They can be found for approximately £25 from supermarkets and stationery shops.
 - c. <u>Casio FX-CG50</u>: A more expensive calculator (approximately £120) They are allowed in your A-Level exams. There is a new version on the way however I cannot say when this will be available.

Additional resources to help you prepare.

As mentioned above it is important that you start Year 12 with an excellent attitude and be prepared to go above what is necessarily set as independent learning tasks. There are plenty of resources available online, please see below for a few extra ideas to help you prepare for A-Level Maths. You can scan the QR codes or click them to take you to the correct pages.

Bridging the Gap

An A-Level maths tutor who produces videos and online resources. This page gives you the basics and videos with a A-Level spin. We do not recommend paying £95 per hour for the 1-1 tuition.

AMSP Transition to A-Level Essential Skills

AMSP produce amazing resources and these were designed for students to complete independently and will develop fluency in the fundamental techniques and the key mathematical concepts that underpin A level Mathematics.

OCRs Bridging the gap

Produced by OCR (an exam board) this is a bit more "old school" textbook style with examples and exercises. They have some tricky questions which will test your abilities.

TL Maths

Very good videos for A-Level maths and they have made a series of bridging videos to help with the transition.









Transition Piece 1

Task 1a – SPARX Booklet (Compulsory)

The Sparx booklet gives you 39 questions which involve important building blocks for A-Level Maths. You must complete all 39 questions, if your school uses SPARX you are likely to still have access to it over the summer, the booklet gives you SPARX codes so you can watch the videos to help if needed.

Task 1b- SPARX Booklet (Extension) (Optional)

This task is **optional**, however if you complete it and hand it into your maths teacher in your 1st lesson you will be entered into a prize draw for a **£10 Amazon Voucher**. In Sixth Form it is important to think about what extra things you can be doing, not just the bare minimum.

Task 2a – Chapter 2 Surds (Compulsory)

Taking notes is a large part of A-Level, you need to complete the notes either by using the QR code linked videos or completing them yourself.

Task 2b – Chapter 11 Triangle Geometry (Compulsory)

Taking notes is a large part of A-Level, you need to complete the notes either by using the QR code linked videos or completing them yourself.

During your first lesson your teacher will ask to see the notes you have made, therefore ensure these are completed and marked in green pen.

Task 1a

GCSE to A-Level



sparxmaths.com

In this booklet, there are a range of questions from key topics that you will have seen in GCSE and will be helpful for AS Level and A-Level.

Each topic has three sections:

- Introduce questions allow you to practise the key concepts.
- **Strengthen** questions build on your knowledge of the key concepts.
- **Deepen** questions will challenge your understanding.

Unless otherwise indicated, you may use a calculator.

Use the grid below to keep track of your progress in each topic. Tick the sections you have attempted. If you use Sparx Maths you can find even more questions by searching for the Sparx topic codes in Independent Learning.

	1	S	D	Sparx topic codes	Teacher comment
Surds	0	0	0	U499 U707 U281	
Expanding brackets	0	0	0	U768 U606	
Factorising quadratics	0	0	0	U178 U858	
Simplifying expressions	0	0	0	U662 U437	
Operations with algebraic fractions	0	0	0	U685 U457 U824	
Solving quadratic equations	0	0	0	U228 U960 U665 U150	
Quadratic graphs	0	0	0	U589 U769 U601	
Linear simultaneous equations	0	0	\bigcirc	U760 U757	
Straight-line graphs	0	0	\bigcirc	U315 U477 U848 U669 U377 U898	
Right-angled trigonometry	0	0	\bigcirc	U283 U545 U170	
Further trigonometry	0	0	\bigcirc	U952 U591	

Key facts and formulae:

The Quadratic formula:

The solution of
$$ax^2 + bx + c = 0$$

where $a \neq 0$

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

Trigonometry:

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c}$$
 $\cos A = \frac{b}{c}$ $\tan A = \frac{a}{b}$



In any triangle ABC where a, b and c are the length of the sides:

sine rule:
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$



	Answer:
Q2 Rationali Give you	se the denominator of $\frac{15 + \sqrt{3}}{10\sqrt{3}}$ ir answer as a fraction in its simplest form.



Q3	Rationalise the denominator of $\frac{2\sqrt{7}}{3+\sqrt{7}}$
	Give your answer in its simplest form.
	Answer:
	<u></u>
Q4	Write $\sqrt{12} + \frac{33}{\sqrt{3}}$ in the form $r\sqrt{3}$, where r is an integer.
	Answer:

Q1	Expand and fully simplify $2(4d + 5)(3d + 1)$
	Answer:
Q2	Expand and fully simplify $(x + 1)(x^2 + 3x + 5)$
	Answer:

Q3	Expand and fully simplify $(3n + 4)(5n + 2) + 5(n + 7)$
	Answer:
-	
Q4	Expand and fully simplify $(t - 2)(t + 5)(t - 4)$
	Answer:

Q1	Fully factorise x^2 - 16	
		Answer:
-		
Q2	Fully factorise $2r^2$ + 15 r + 7	
		Answer:
Q3	Fully factorise $5x^2 + 22x + 8$	
		Answer:

Simplifying expressions

Strengthen



Operations with algebraic fractions



Answer:

Operations with algebraic fractions

Q3	Write the following as a single fraction in its simplest form: $\frac{2x^2 - 11x + 12}{x + 5} \div (4x^2 - 6x)$
	Give your answer fully factorised.
	Answer:
Q4	Fully simplify $\frac{4ab^2}{k} \times \frac{3ak}{12k} \times \frac{7}{5ab}$
	Give your answer as a fraction.
	Answer:







Q3	Using the quadratic formula, sc	blve $6x^2 - 35 = -11x$	
		Answer:	
Q4	Solve $3r(3r - 4) = 2$		
	Give your answers to 2 d.p.		
		Answer:	
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P is the turning point of the curve.

Work out the coordinates of P.

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Work out the coordinates of the turning point of the curve $y = x^2 - 5x + 1$

Answer: (_____, ____)

Q1





P is the turning point of the curve.

Work out the coordinates of P.



The diagram below shows the graph of $y = 2x^2 - 5x - 3$

Use the diagram to estimate the solutions to $2x^2 - 5x - 3 = -2x + 2$ Give any decimal answers to 1 d.p.



Answer:

Q3







Q3

Q4

Solve the following simultaneous equations:

$$7y + 2x = \frac{23}{2}$$

$$5y + 3x = 9$$
Answer: $x = \dots \qquad y = \dots$
Solve the following simultaneous equations:
$$4.6t + 8.1u = 104$$

$$3.8t - 2.7u = -8$$

Q1	A straight line has a gradient of $-\frac{3}{4}$, and passes through the point (32, 12)
	Work out the equation of the line.
	Answer
	Alswel.
Q2	The diagram below shows point P and Line A. Line B is perpendicular to line A and passes through point P.
	What is the equation of line B?
	y x p (3, 5) x y y y y y y y y
	Answer:











Task 1b

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Expand and fully simplify $(4 + \sqrt{7})^2 - (4 - \sqrt{7})^2$ Q1 Answer: Q2 Work out the value of x in the equation below. $x(\sqrt{11} - 2) = 21$ Give your answer in the form $a + b\sqrt{11}$, where a and b are integers. Answer:







Q3

Q4

Write the following expression in the form $\frac{1}{ax^b} + \frac{1}{cy^d}$ where a, b, c, and d are integers.

$$\left(\frac{1}{5x} + \frac{1}{4y}\right) \left(\frac{1}{25x^2} - \frac{1}{20xy} + \frac{1}{16y^2}\right)$$

Answer:

Show that $(x^{2} + 1)(y^{2} + 4) \equiv (xy - 2)^{2} + (2x + y)^{2}$



Q1	Fully factorise 49 h^2 - m^2	
	An	iswer:
Q2	Fully factorise 7 b - b^2 - 10	
	An	izwer.
-		
Q3	Fully factorise 4 k^2 - 25 n^2 - (2 k - 5 t	$(n)^2$
	An	swer:





Operations with algebraic fractions



Q2

Fully simplify
$$\frac{7}{36-x^2} - \frac{3}{6+x}$$

Give your answer fully factorised.

Answer:

Write the following as a single fraction in its simplest form:

$$6 - (x+4) \div \frac{x^2 + 11x + 28}{x - 7}$$

Give your answer fully factorised.

Answer:



Q1	Solve $x(x+4) - 4(5x+9) = 0$
	Answer:
Q2	Jessica thinks of a positive number, n , which is less than 1 She adds this number to its reciprocal and gets 2.9
	Work out the value of n . Give your answer as a fraction in its simplest form
	Answer:





G3 Solve
$$\frac{4}{y-1} - \frac{5}{y+2} = \frac{3}{y}$$

Answer: ______
G4 $x = \frac{-3 \pm \sqrt{29}}{2}$
There is only one equation of the form $x^2 + bx + c = 0$ that gives these values of x as solutions.
Work out the values of b and c .





The diagram below shows the graph of $y = 2x^2 + 4x - 1$ The equation $2x^2 + 4x - 1 = k$ has solutions at x = -3 and x = 1

What is the value of k?



Answer: *a* = _____ *b* = _____



Q3

- A curve has the equation $y = -x^2 + 16x 65$
- a) Work out the turning point of the curve.

Answer: a) (_____, ____)

b) By considering the position of the turning point and the shape of the curve, work out how many real roots $y = -x^2 + 16x - 65$ has.

Answer: b)







Q3

Q4

Solve the following simultaneous equations:

$$\frac{4}{7x-4} = \frac{1}{6y}$$

$$\frac{5x}{3y+2} = 4$$
Answer: $x = \dots, y = \dots$
Solve the following simultaneous equations:
$$2^{x} = 4^{(7-2y)}$$

$$3^{(5x-13y)} = 81$$
Answer: $x = \dots, y = \dots$

Straight-line graphs Deepen Write an expression, in terms of h_i , for the gradient of a line **perpendicular** to the Q1 line segment joining (3h, 20) to (6h, 8)Give your answer as a fully simplified fraction. Answer: The triangle ABC has an area of 24 square units. Q2 What are the coordinates of point B?





Line A has the equation y + 2x = 14The gradient of line B is twice the gradient of line A.

Work out the ratio of the length of OQ to the length of OR. Give your answer in its simplest form.



A circle, centre O, passes through the point (6, -12), as shown.

Work out the equation of the tangent to the circle at this point. Give your answer in the form y = mx + c, where m and c are integers or fractions in their simplest form.



Q4

Q3





Q2



Q3

Q4



The graph below shows the line with equation y = 5x + 2The axes both have the same scale.

Calculate the size of angle θ . Give your answer in degrees to the nearest integer.











Video 1 – Introducing Surds

- 1) Give 2 examples of a surd.
- 2) Give an example of 2 square root terms which are not surds
- 3) How do you simplify:

a. $\sqrt{8}$

b. $\sqrt{12}$

4) Why would using $\sqrt{6} \times \sqrt{2}$ not work?

5) What is the general rule of simplifying?



Click or Scan the QR code to take you to a full playlist for this chapter.

Video 2 - Simplifying

1) √18

2) √200

3) $\sqrt{48}$

4) $\frac{\sqrt{12}}{\sqrt{300}}$

5) $\sqrt{24} \times \sqrt{150}$

Video 3 - Adding/Subtracting Surds

1) $\sqrt{20} + \sqrt{180}$

2) $\sqrt{63} - \sqrt{28}$

3) $\sqrt{108} + \sqrt{72}$

<u>Chapter 2</u> <u>Indices & Surds</u>

Video 4 – Expanding brackets

1) $\sqrt{3}(\sqrt{2}+5)$

Video 5 – Expanding brackets

1) $6(\sqrt{3} + \sqrt{6})$

2) $\sqrt{5}(8-\sqrt{7})$

- 3) $\sqrt{6}(\sqrt{15}-2\sqrt{2})$
- 4) $\sqrt{12}(\sqrt{50} + 3\sqrt{10})$

Video 6 – Expanding Double Brackets

1) $(2+\sqrt{2})(3-\sqrt{5})$

Video 7 – Expanding Double brackets

1)
$$(2-\sqrt{5})(2+\sqrt{5})$$

2)
$$(3+\sqrt{2})(2+\sqrt{3})$$

3)
$$(\sqrt{2}+1)(\sqrt{3}-\sqrt{5})$$

4)
$$(2\sqrt{3} + 3\sqrt{5})(2\sqrt{2} - 3\sqrt{5})$$

Video 8 – Rationalising the Denominator

- 1) Why is rationalising the denominator a good idea?
- 2) $\frac{1}{\sqrt{2}}$

<u>Video 9</u> – Rationalising the Denominator 1) $\frac{2}{\sqrt{3}}$

2) $\frac{10}{\sqrt{5}}$

3)
$$\frac{9}{2\sqrt{3}}$$

Video 10 – More Complex Rationalising the Denominator

1)
$$\frac{1}{1+\sqrt{2}}$$

- 2) What would multiplying by $\frac{1+\sqrt{2}}{1+\sqrt{2}}$ not work?
- 3) What mathematical property are you utilising here to eliminate the Surds from the denominator?

Video 11 – More Complex Rationalising the Denominator

1)
$$\frac{2}{\sqrt{2}+2}$$

2)
$$\frac{3}{4-\sqrt{5}}$$

3)
$$\frac{1+\sqrt{2}}{3-\sqrt{2}}$$

4) $\frac{4+2\sqrt{3}}{3+3\sqrt{2}}$

Video 12 – Rationalising the Denominator Problem Solving



 ΔABC has area 5. Find the exact perpendicular height of the triangle

2) Rationalise the denominator of $\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$

Video 13– Solving Equations Involving Surds

1) Solve $x\sqrt{2} + 5 = x - \sqrt{2}$

Chapter 2 Indices & Surds

Video 14 – More Examples of Solving Equations with Surds

Solve:

1) $\sqrt{2}(x-3) = 4(x+\sqrt{2})$

2) $x - \sqrt{48} = 2\sqrt{3} - 2x$

3) $x\sqrt{18} - 4 = \sqrt{8}$

4)
$$x\sqrt{5} + 2 = \sqrt{20}(x - 1)$$

Video 15 – Simultaneous Equations and Surds

Find the exact coordinates of intersection of the two lines:

$$y = \sqrt{2}x + \sqrt{3} - 2$$
$$y = \sqrt{3}x + \sqrt{3} - \sqrt{6}$$

Video 16 – Prove a Surd is Larger than 2

Prove that $\frac{1}{3\sqrt{2}-4} > 2$

<u>Chapter 11</u> Triangle Geometry

Video 1- Proof of Sine Rule



Transition Piece 1 Task 2b



Click or Scan the QR to take you to a full playlist for the videos (you will need to skip the 1st 6 videos)

Video 2 - Using the Sine Rule





<u>Chapter 11</u> Triangle Geometry

Transition Piece 1 Task 2b





Video 4 – Proof of Cosine Rule



Video 5 – Using the Cosine Rule





Video 6 - Find all the missing sides and angles of a triangle



<u>Chapter 11</u> Triangle Geometry

Transition Piece 1 Task 2b

Video 7 - Proof of area of a triangle



Video 8 - Finding the Area of Triangles

