High Storrs Sixth Form

2024 Bridging Work

Subject: Mathematics - Further

Name: _____

HIGH STORRS SCHOOL

Designed for Success

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High Storrs School Mathematics Department

A-Level Bridging Unit – Assessment

Name:	
Score:	/125

Feedback

This bridging unit has been designed to test you on key GCSE skills that you will need to be fluent in at A Level. You should have been taught all of these topics at GCSE but may need to revise / practice some of them. Use the QR code above to access the Corbett Maths website which contains lots of videos and practice questions. The video link numbers are included in the title for each section.

Section		☺	😐	☹	Marks
A	INDEX LAWS 1				/14
B	INDEX LAWS 2				/15
C	SURDS 1				/12
D	SURDS 2				/8
E	EXPANDING BRACKETS				/15
F	FACTORSING				/15
G	SOLVING QUADRATIC EQUATIONS BY FACTORISING				/9
H	SOLVING QUADRATIC EQUATIONS USING THE FORMULA				/6
I	COMPLETING THE SQUARE				/7
J	QUADRATIC GRAPHS				/6
K	MIXED HARDER QUESTIONS FROM ALL SECTIONS				/18

High Storrs School Mathematics Department

A-Level Bridging Unit – Assessment

Bridging Unit – Mathematics and Further Mathematics

The purpose of this bridging unit is to allow you to practise the skills from the first 2 chapters of the A Level book. These are all GCSE skills which underpin the A Level syllabus and so fluency and confidence with these skills is essential for later success.

We would recommend you spread this work out throughout the Summer holidays; this should aid your long term retention of these skills.

Each section has one of more examples to get you started but if you are not confident with any of the skills you should spend some time practicing it, in addition to the questions in this bridging unit.

If you need a helpful video or some extra practice questions for any of the skills included in this bridging unit you can find them on the Corbett Maths website. Scan the QR code or search for Corbett Maths. The video number(s) for each skill are included with the title. Use them to find the relevant videos / practice questions on the Corbett Maths website.	

In your responses you should show all of your working out, working down the page.

Use the number of marks for each question as a guide to how much working out you should show.

E.g.:

Q1. Expand and simplify $(x + 3)(x - 5)$

$= x^2 - 5x + 3x - 15$

$= x^2 - 2x - 15$

You need to hand in this work on your first maths lesson.

Bring it with you on your first day in school in case you have maths on that day.

SECTION 1: INDICES

A. INDEX LAWS 1 Video 174

$$a^m \times a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

Use the above index laws to simplify each of the following:

e.g.	$3x^2 \times 2x$ $= 6x^3$	a	$5y \times 3y$ **(1)**
b	$a^3 \times a^5$ **(1)**	c	$7b^4 \times 8b^3$ **(1)**
d	$2ab \times 4a^2b^3 \times 9a^7$ **(2)**	e	$\frac{f^9}{f^7}$ **(1)**
f	$\frac{k^{12}}{k^4}$ **(1)**	g	$\frac{8x^5 \times 3x^8}{4x^4}$ **(2)**
h	$\frac{20x^7y^4}{5x^4y^3}$ **(2)**	i	$\left(\frac{4x^3}{3}\right)^2$ **(3)**

Mark: ____ /14

B. INDEX LAWS 2 **Videos 173, 175**

Given that

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$$

$$a^{-m} = \frac{1}{a^m}$$

and using the index laws from section A,

i) evaluate the following

e.g.	4^{-2} $= \frac{1}{4^2}$ $= \frac{1}{16}$	e.g.	$8^{\frac{2}{3}}$ $= \sqrt[3]{8}^2$ $= 2^2$ $= 4$
a	3^{-2} **(1)**	b	$4^{\frac{3}{2}}$ **(2)**
c	$32^{-\frac{3}{5}}$ **(2)**	d	$\left(\frac{36}{49}\right)^{-\frac{3}{2}}$ **(3)**

ii) simplify the following

e.g.	$(4x^3)^{\frac{1}{2}}$ $= 4^{\frac{1}{2}} \times (x^3)^{\frac{1}{2}}$ $= \sqrt{4} \times x^{3\times\frac{1}{2}}$ $= 2x^{\frac{3}{2}}$	a	$(16x^4)^{\frac{1}{2}}$ **(2)**
b	$\left(\frac{a^3}{y^2}\right)^{-3}$ **(2)**	c	$\left(\frac{9x^2}{16y^3}\right)^{-\frac{3}{2}}$ **(3)**

Mark: ____ /15

SECTION 2: SURDS

C. SURDS 1 Videos 305, 306, 308

$$\sqrt{ab} = \sqrt{a} \times \sqrt{b}$$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

Simplify the following

e.g.	$\sqrt{28}$ $= \sqrt{4} \times \sqrt{7}$ $= 2\sqrt{7}$	e.g	$\frac{2\sqrt{6}}{\sqrt{3}}$ $= 2 \times \sqrt{\frac{6}{3}}$ $= 2\sqrt{2}$
e.g	Expand and simplify $(\sqrt{2}+5)(\sqrt{2}-3)$ $= \sqrt{4} - 3\sqrt{2} + 5\sqrt{2} - 15$ $= 2 + 2\sqrt{2} - 15$ $= 2\sqrt{2} - 13$	a	$\sqrt{32}$ **(1)**
b	$\frac{2\sqrt{12}}{\sqrt{3}}$ **(2)**	c	$4\sqrt{24}$ **(1)**
d	$\sqrt{50} - \sqrt{72} + \sqrt{18} - \sqrt{32}$ **(2)**	e	$\frac{27\sqrt{96}}{3\sqrt{3}}$ **(2)**
f	Expand and simplify $(\sqrt{2}+8)(\sqrt{2}-7)$ **(2)**	g	Expand and simplify $(8+\sqrt{3})(8-\sqrt{3})$ **(2)**

Mark: ____ /12

D. SURDS 2 **Video 307**

To rationalise the denominator means to find an **equivalent fraction** with a rational denominator.
You must ensure there are no surds on the denominator.
You also need to leave the fractions in their lowest terms.

Rationalise the denominator:

e.g.	$\frac{2}{\sqrt{3}}$ $= \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{2\sqrt{3}}{3}$	e.g	$\frac{6}{5\sqrt{3}}$ $= \frac{6}{5\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ $= \frac{6\sqrt{3}}{5 \times 3}$ $= \frac{2\sqrt{3}}{5}$
e.g	$\frac{6}{5+\sqrt{3}}$ $= \frac{6}{5+\sqrt{3}} \times \frac{6}{5-\sqrt{3}}$ $= \frac{36}{(5+\sqrt{3})(5-\sqrt{3})}$ $= \frac{36}{25-5\sqrt{3}+5\sqrt{3}-3}$ $= \frac{36}{22}$ $= \frac{18}{11}$	a	$\frac{4}{\sqrt{2}}$ **(2)**
b	$\frac{27\sqrt{96}}{3\sqrt{3}}$ **(3)**	c	$\frac{4}{1+\sqrt{5}}$ **(3)**

Mark: ____ /8

SECTION 3: BRACKETS

E. EXPANDING BRACKETS Videos 14, 15

When you expand a single bracket, you must multiply the term in front (coefficient) of the bracket by each term in the bracket.

When you expand a double bracket you must multiply each term in the first bracket by each term in the second bracket.

Where possible, you should collect like terms.

Expand and simplify if possible:

e.g.	$(x+9)(x+5)$ $= x^2 + 5x + 9x + 45$ $= x^2 + 14x + 45$	eg.	$(x-4)(2x+5)$ $= 2x^2 - 8x + 5x - 20$ $= 2x^2 - 3x - 20$
eg.	$(x+2)(2x+5)(x-4)$ $= (x+2)(2x^2 - 8x + 5x - 20)$ $= (x+2)(2x^2 - 3x - 20)$ $= (2x^3 - 3x^2 - 20x + 4x^2 - 6x - 40)$ $= (2x^3 - 7x^2 - 26x - 40)$	a	$(x+8)(x+3)$ **(2)**
b	$(x+8)(x-2)$ **(2)**	c	$(x-7)(x-2)$ **(2)**
d	$(3x+2)(4x+5)$ **(2)**	e	$(3x+4)^2$ **(2)**
f	$(2x+1)(x-5)$ **(2)**	g	$(x+1)(x-2)(2x+3)$ **(3)**

Mark: ____ /15

F: FACTORISING **Video 118**

Factorising is the opposite process for expanding brackets.

You should be able to factorise into a single bracket and into a pair of brackets.

To factorise a quadratic expression (in the form $ax^2 + bx + c$), find a pair of numbers whose sum is b and product is ac (see the second example).

An expression in the form $x^2 - y^2$ is called the difference of two squares and factorises to $(x + y)(x - y)$.

Factorise the following

e.g.	$x^2 + 6x$ $= x(x + 6)$ *You may not need to show the same amount of working out for the questions in this section.*	eg.	$x^2 + 8x + 12$ $= x^2 + 6x + 2x + 12$ $= x(x + 6) + 2(x + 6)$ $= (x + 2)(x + 6)$
a	$x^2 + 8x$ **(1)**	b	$x^2 + 7x + 12$ **(2)**
c	$x^2 - 8x + 12$ **(2)**	d	$x^2 - 6x + 5$ **(2)**
e	$x^2 - 25$ **(2)**	f	$2x^3 - 9x^2 - 5x$ **(2)**
g	$2x^2 + 16x + 24$ **(2)**	h	$x^2 + 10x + 25$ **(2)**

Mark: ____ /15

SECTION 4: QUADRATICS

G: SOLVING QUADRATIC EQUATIONS BY FACTORISING

Video 266

A quadratic equation is an equation in the form $ax^2 + bx + c = 0,$ where $a \neq 0$.

To solve a quadratic equation you first factorise the quadratic, as you did in exercise F.

Then, if $(ax + b)(cx + d) = 0$, either $(ax + b) = 0$ or $(cx + d) = 0$.

Solve each of these equations to find the possible values of x.

e.g.	$x^2 + 3x + 2 = 0$ $(x + 2)(x + 1) = 0$ $x + 2 = 0 \; or \; x + 1 = 0$ $x = -2 \; or \; x = -1$	eg.	$2x^2 - 7x - 4 = 0$ $2x^2 - 8x + x - 4 = 0$ $2x(x - 4) + 1(x - 4) = 0$ $(2x + 1)(x - 4) = 0$ $2x + 1 = 0 \; or \; x - 4 = 0$ $x = -\frac{1}{2} \; or \; x = 4$
a	$x^2 + 8x + 12 = 0$ **(2)**	b	$4x^2 + 3x - 1 = 0$ **(2)**
c	$x^2 + 12x + 36 = 0$ **(2)**	d	$6x^2 - 19x + 10 = 0$ **(3)**

Mark: ____ /9

H: SOLVING QUADRATIC EQUATIONS USING THE FORMULA

Video 267

Some quadratics cannot be factorised.

These (and all quadratic equations) can be solved using the quadratic formula:

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

NB. If a quadratic can be factorised you should solve by factorising.

Solve using the quadratic formula. Give your answers correct to 3 significant figures.

<table>
<tr>
<td>eg.</td>
<td>$3x^2 + 13x + 2 = 0$

$a = 3, b = 13, c = 2$

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

$x = \frac{-13 \pm \sqrt{(13)^2 - 4(3)(2)}}{2(3)}$

$x = \frac{-13 + \sqrt{145}}{6} = -0.159$
or
$x = \frac{-13 - \sqrt{145}}{6} = -4.17$</td>
<td colspan="2">Write down the values of a, b and c

Write down the formula

Substitute the values of a, b and c into the formula. Put them in brackets to prevent errors with your calculator.

Type into your calculator with + first to gain the first solution.

Change + to – to gain the second solution.

Give answers in exact form or correct to 3 significant figures, as required by the question.</td>
</tr>
<tr>
<td>a</td>
<td>$4x^2 + 4x - 7 = 0$

(3)</td>
<td>b</td>
<td>$2x^2 - 8x - 5 = 0$

(3)</td>
</tr>
</table>

Mark: ____ /6

I: COMPLETING THE SQUARE **Video 267a**

Completing the square for a quadratic $x^2 + bx + c$ rearranges it into the form $(x + p)^2 + q$.

<table>
<tr><td>eg.</td><td>Complete the square for $x^2 + 6x + 7$
$= (x + 3)^2 - 9 + 7$
$= (x + 3)^2 - 2$

Solve $x^2 + 6x + 7 = 0$
$(x + 3)^2 - 2 = 0$
$(x + 3)^2 = 2$
$x + 3 = \pm\sqrt{2}$
$x = -3 \pm \sqrt{2}$</td><td colspan="2">Write in the form $\left(x + \frac{b}{2}\right)^2 - b^2 + c$

Simplify $-b^2 + c$

To solve by completing the square, first write in completed the square form, then rearrange to $x =$</td></tr>
<tr><td>a</td><td>Complete the square for
$x^2 - 8x + 20$

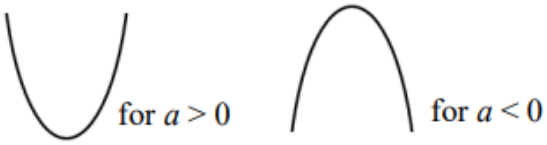
(3)</td><td>b</td><td>Solve by completing the square
$x^2 + 6x - 12 = 0$

(4)</td></tr>
</table>

Mark: ____ /7

J: QUADRATIC GRAPHS **Video 265**

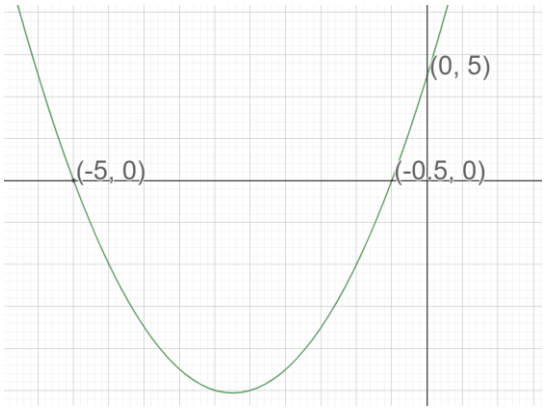
The graph of the function $ax^2 + bx + c = 0$ forms a shape called a parabola.



In the form $y = ax^2 + bx + c$, c is the y=intercept (where the graph crosses the *y*-axis.

In the form $y = (ax + b)(cx + d)$, $-\frac{b}{a}$ and $-\frac{d}{c}$ are the *x*-intercepts (where the graph crosses the x-axis).

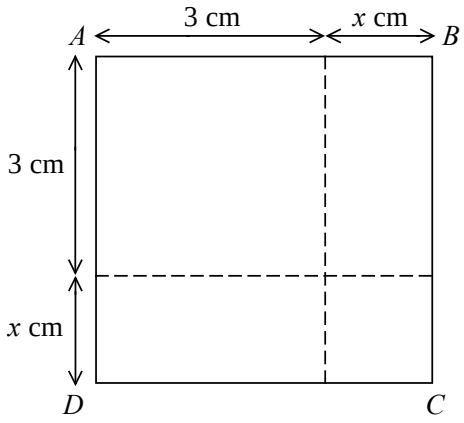
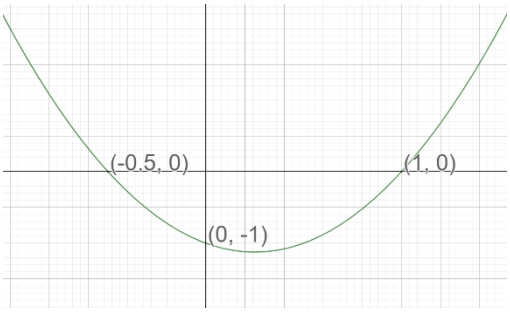
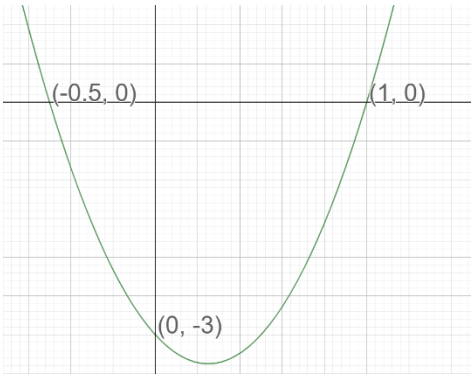
Sketch the following graphs. Label the intersects with the axes.

<table>
<tr><td>eg.</td><td colspan="2">$y = 2x^2 + 11x + 5$
$y = (2x + 1)(x + 5)$
If $y = 0,\ (2x + 1)(x + 5) = 0$
then $x = -\frac{1}{2}$ or $x = -5$
 
</td><td>Crosses the y axis at $y = 5$ (when $x = 0$)
Crosses the x axis at $x = -\frac{1}{2}$ and $x = -5$ (when $y = 0$)
U shape (positive quadratic)</td></tr>
<tr><td>a</td><td>$y = x^2 + 10x + 24$
(3)</td><td>c</td><td>$y = -x^2 + 5x + 6$
(3)</td></tr>
</table>

Mark: ____ /6

K: MIXED HARDER QUESTIONS

a	$16^{\frac{1}{5}} \times 2^{x} = 8^{\frac{3}{4}}$. Find the value of x **(2)**
b	Given that $a = 2^4$ and $b = \frac{1}{4}$, find b in terms of a. Give your answer in the form $b = a^n$, where n is a value to be found. **(2)**
c	Given that $3^{-n} = 0.2$, find the value of $(3^4)^n$ **(2)**
d	Show that $\frac{1}{1+\frac{1}{\sqrt{2}}}$ can be written as $2 - \sqrt{2}$ **(3)**

e	The area of square *ABCD* is 10 cm^2.  Show that $x^2 + 6x = 1$ **(2)**
f	Shaun is solving a quadratic equation, using the formula. He correctly substitutes values for a, b and c to get: $$x = \frac{3 \pm \sqrt{37}}{2}$$ What is the equation Shaun is trying to solve? **(2)**
g	Suggest an equation for each of these quadratic graphs:   **(5)**

Mark: ____ /18