HIGH STORRS SIXTH FORM BRIDGING WORK

HIGH STORRS SCHOOL

Designed for Success

2023

Mathematics & Further Mathematics

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High Storrs School Mathematics Department

A-Level Bridging Unit – Assessment 22-23

Name:	
Score:	**/125**

Top 3 topics you need to study further are:
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🙂
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	Section	☺	😐	☹	Marks
A	**INDEX LAWS 1**				/14
B	**INDEX LAWS 2**				/15
C	**SURD LAWS 1**				/12
D	**SURD LAWS 2**				/8
E	**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 22-23

Bridging Unit – 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, but 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 these skills you can find some help here:

Each task in this Bridging Unit has a topic title – use these to help you find appropriate revision resources from the following sites:

www.youtube.com You may find the 'Khan Academy' and 'Hegarty Maths' channels particularly useful

https://revisionmaths.com/gcse-maths-revision

http://www.mathsmadeeasy.co.uk/gcsemathsrevisionresources.htm

There are many other good resources out there – find ones that suit you.

During your A Level studies you will be expected to work independently to practise the work taught in lesson. The above websites are excellent resources you may want to use again in the future.

You should show all of your working out, working down the page.

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

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

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

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

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

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

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

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

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

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	$\frac{6}{5+\sqrt{3}}$ **(3)**

Mark: _____ /8

SECTION 3: BRACKETS

E. EXPANDING BRACKETS

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

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

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

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.

eg.	$3x^2 + 13x + 2 = 0$ $a = 3, b = 13, c = 2$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-13 \pm \sqrt{(13)^2 - 4(3)(2)}}{2(3)}$ $x = \frac{-13 + \sqrt{145}}{6} = -0.159$ or $x = \frac{-13 - \sqrt{145}}{6} = -4.17$		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.
a	$4x^2 + 4x - 7 = 0$ **(3)**	b	$2x^2 - 8x - 5 = 0$ **(3)**

Mark: _____ /6

I: COMPLETING THE SQUARE

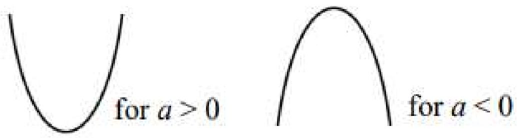
Completing the square for a quadratic $x^2 + bx + c$ rearranges it into the form $(x + p)^2 + q$.

eg.	Complete the square for $x^2 + 6x + 7$ $= (x + 3)^2 - 9 + 7$ $= (x + 3)^2 - 2$ Solve $x^2 + 6x + 7 = 0$ $(x + 3)^2 - 2 = 0$ $(x + 3)^2 = 2$ $x + 3 = \pm\sqrt{2}$ $x = -3 \pm \sqrt{2}$		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 $x =$
a	Complete the square for $x^2 - 8x + 20$ **(3)**	b	Solve by completing the square $x^2 + 6x - 12 = 0$ **(4)**

Mark: _____ /7

J: QUADRATIC GRAPHS

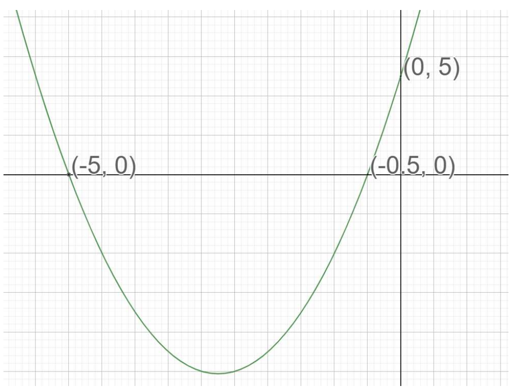
The graph of the function $ax^2 + bx + c = 0$ forms a shape called a parabola.



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).

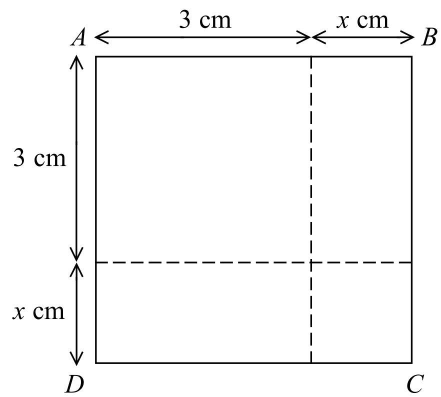
Sketch the following graphs. Label the intersects with the axes.

eg.	$y = 2x^2 + 11x + 5$ $y = (2x + 1)(x + 5)$ If $y = 0$, $(2x + 1)(x + 5) = 0$ then $x = -\frac{1}{2}$ or $x = -5$  		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)
a	$y = x^2 + 10x + 24$ **(3)**	c	$y = -x^2 + 5x + 6$ **(3)**

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)

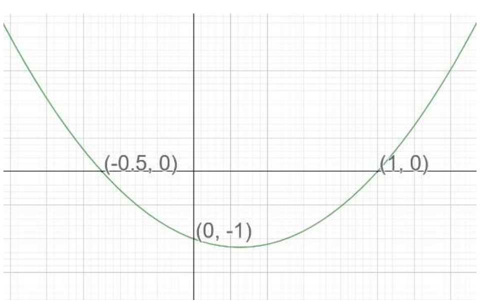
f Shaun is solving a quadratic equation, using the formula.
He correctly substitutes values for a, b and c to get:

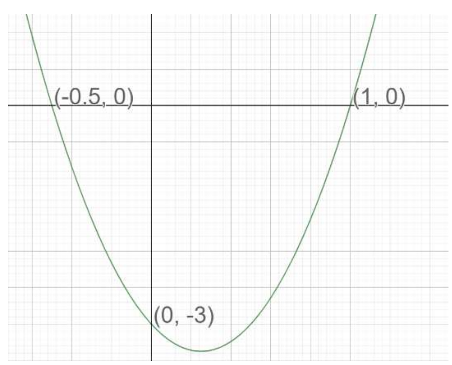
$$x = \frac{3 \pm \sqrt{37}}{2}$$

What is the equation Shaun is trying to solve?

(2)

g Suggest an equation for each of these quadratic graphs:





(5)

Mark: _____ /18