

A LEVEL MATHEMATICS

ESSENTIAL PREPARATION FOR YOUR COURSE

As A level study is much more challenging than your GCSE Mathematics course, we want you to be as prepared as possible to meet these challenges in September. Much of A level Mathematics is based upon the ability to use algebraic techniques appropriately, which should have been well developed during your GCSE studies.

If you can complete most of the questions set over the next two pages correctly, you will be well prepared for your course. If you are finding them a challenge try refreshing your memory by looking at any GCSE higher text book, revision guide or use Mymaths www.mymaths.co.uk.

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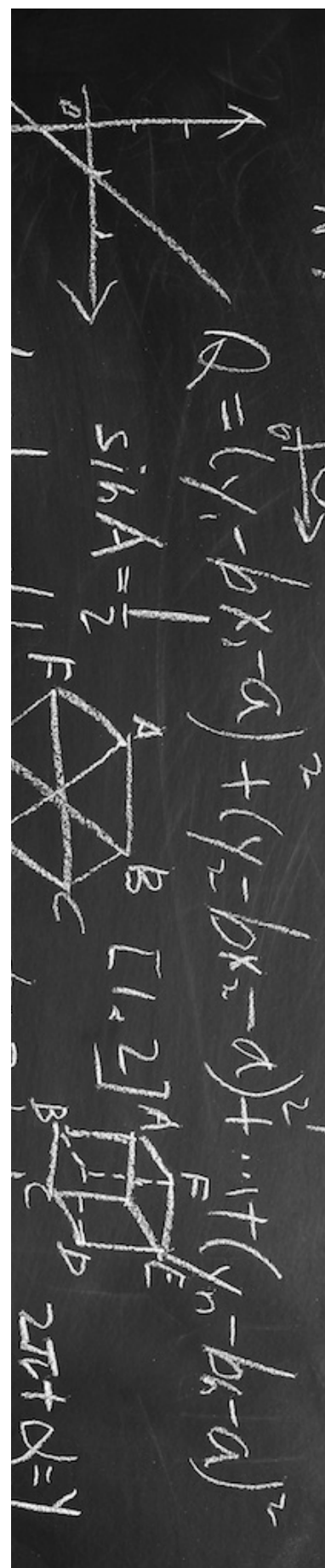
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If you are using Mymaths you will find information in the following sections: Number –Indices-powers and roots

- Number – Adding subtracting multiplying fractions and dividing fractions
- Algebra – expansion of brackets –algebraic manipulation
- Algebra – solving linear and quadratic equations
- Algebra – solving simultaneous equations
- Algebra – simplifying

Enjoy your summer. Looking forward to seeing you in September.

The Maths Team at Halesowen College



A LEVEL MATHEMATICS

Section 1: Laws of Indices

1. Express the following in their simplest form:

[a] $81^{-\frac{1}{4}}$ [b] $64^{\frac{1}{6}}$ [c] 27^0 [d] $4^{-\frac{3}{2}}$ [e] $64^{\frac{5}{6}}$
 [f] $\left(\frac{125}{8}\right)^{\frac{1}{3}}$ [g] $\left(\frac{16}{9}\right)^{-\frac{3}{2}}$

2. Simplify the following expressions:

[a] $\frac{a^5 \times a^2}{a^4 \times a^4}$ [b] $(2p)^5$ [c] $\left(\frac{1}{2}q\right)^4$ [d] $(x^2y)^3$ [e] $\frac{(2ab^2)^3}{(3ab)^2}$

Section 2: Algebraic Fractions

1. Cancel these fractions as far as possible:

[a] $\frac{3x^2}{7x}$ [b] $\frac{8x^2(x+3)}{4x}$ [c] $\frac{8x+16}{2x-4}$

2. Express as a single fraction:

[a] $3 + \frac{2}{x}$ [b] $\frac{1}{x+1} - \frac{3}{x-2}$ [c] $\frac{a}{b} - \frac{2a}{3b}$

3. Simplify these expressions:

[a] $\frac{3x+9}{4} \times \frac{x}{3(x+3)}$ [b] $\frac{x+3}{x^2} \times \frac{x}{4}$
 [c] $\frac{x(x-3)}{3} \div \frac{x-3}{x}$ [d] $12x(x+2) \div \frac{3x+6}{x}$

Section 3: Factorising

[a] $8x^2y + 28xy^2$ [b] $3\pi a^2 + 4\pi ab$ [c] $y^2 + 3y^2 - y$ [d] $4x(2x+3) - 3(2x+3)$

Section 4: Quadratic Equations

1. Solve the following:

[a] $x^2 - 7x + 10 = 0$ [b] $x^2 - 14x + 40 = 0$ [c] $2x^2 + 9x + 9 = 0$

2. Factorise the following:

[a] $y = x^2 - 9$ [b] $y = x^2 - 16$
 [c] $y = 4x^2 - 16$ [d] $y = 9x^2 - 25$

3. Complete the square of the following:

[a] $x^2 + 6x + 1 = 0$ [b] $x^2 - 4x - 2 = 0$ [c] $-x^2 + 10 - 4x = 0$

A LEVEL MATHEMATICS

Section 5: Changing the subject of a formula

In each case, make the letter given at the end the subject of the formula.

(a) $s = \frac{a}{1-r}, \quad r$

(b) $A = 2\pi r(r+h), \quad h$

(c) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}, \quad f$

(d) $h = \frac{1}{2}gt^2, \quad t$

(e) $v^2 = w^2(a^2 - x^2), \quad x$

(f) $V = \frac{1}{3}\sqrt{\frac{s^3}{8\pi}}, \quad s$

Section 6: Linear Simultaneous Equations

1. Solve these simultaneous equations:

[a] $7x - 3y = 48$
 $x + 0.5y = 5$

[b] $5p + 2q = -30$
 $3p + 4q = -32$

[c] $x = 2y + 1$
 $3x - 4y = 7$

[d] $a - 3b = 11$
 $5a + 2b = 4$

Section 7: Sine rule

- Find the areas of the following triangles, giving your answers correct to 3 significant figures.
 - $x = 43 \text{ cm}, y = 65 \text{ cm}, Z = 12^\circ$
 - $a = 11.3 \text{ cm}, b = 13.5 \text{ cm}, C = 130^\circ$
- In each of the following triangles find the lengths of the sides, giving your answers to 3 significant figures.
 - $p = 9.2 \text{ cm}, R = 130^\circ, P = 32^\circ$: find q and r .
 - $a = 15.3 \text{ cm}, A = 14^\circ, C = 130^\circ$: find b and c .
- In each of the following triangles find the required angles, giving your answers correct to 1 decimal place.
 - $x = 8.5 \text{ cm}, y = 7.5 \text{ cm}, X = 82^\circ$: find Y, Z .
 - $a = 7.3 \text{ cm}, c = 5.3 \text{ cm}, C = 10^\circ$: find A, B .

Section 8: Cosine rule

- Find the length of the third side of the triangle in the following two cases.
 - $x = 3.8 \text{ cm}, y = 5.2 \text{ cm}, Z = 67.3^\circ$
 - $l = 14.2 \text{ cm}, m = 13.3 \text{ cm}, N = 134.2^\circ$
- Find all the angles of the triangle whose sides are
 - 4.2 cm, 5.3 cm, 6.4 cm,
 - 5.3 cm, 5.2 cm, 9.9 cm.

A LEVEL MATHEMATICS

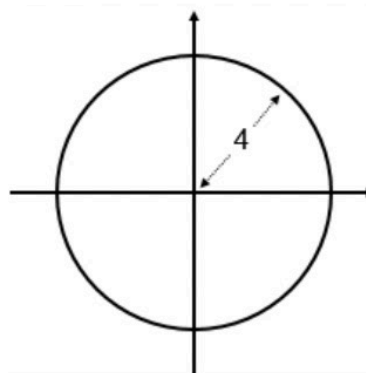
Section 11: Quadratic simultaneous equations

Solve the following equations

Q1.	Q2.
$x + y = 3$	$y - x = 4$
$x^2 + y^2 = 5$	$2x^2 + xy = -1$

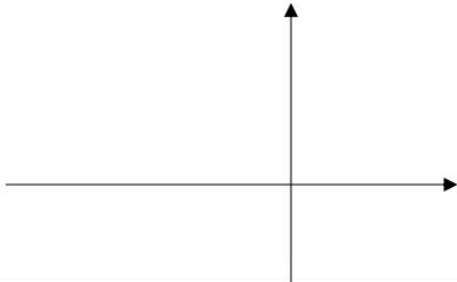
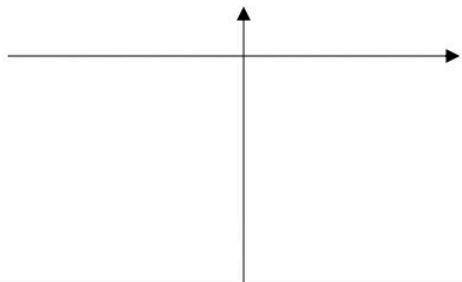
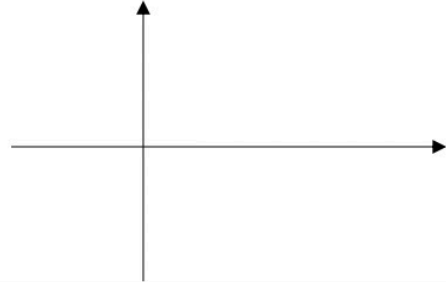

Section 12: Equation of circle

- Write down the equation for the circle shown? What is the centre and radius?
- A circle has an equation $x^2 + y^2 = 85$
Show that the coordinates (6,7) and (-2,9) lie on the circle
- A circle has centre (0,0) and passes through the point (5,12).
Find the equation of the circle and state its radius

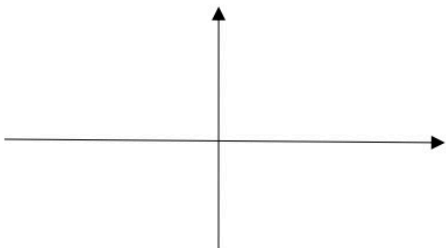
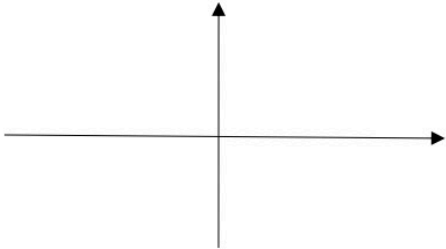
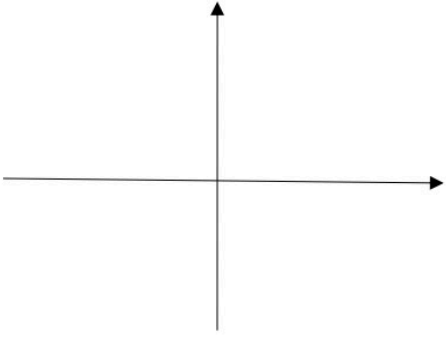
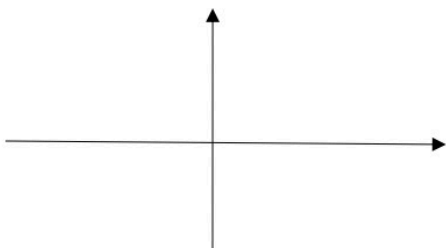


A LEVEL MATHEMATICS

Sketching graphs

Quadratic Expressions (factorise)	Quadratic Equations (solve)	Quadratic graphs (sketch)
$x^2 + 6x + 8$	$x^2 + 6x + 8 = 0$	$y = x^2 + 6x + 8$ 
$x^2 - x - 6$	$x^2 - x - 6 = 0$	$y = x^2 - x - 6$ 
$x^2 - 4x + 3$	$x^2 - 4x + 3 = 0$	$y = x^2 - 4x + 3$ 
$x^2 - 9$	$x^2 - 9 = 0$	$y = x^2 - 9$ 

A LEVEL MATHEMATICS

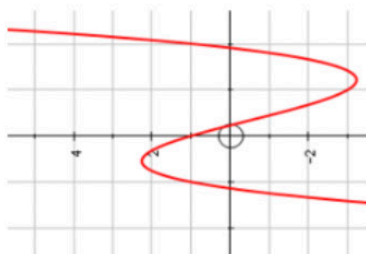
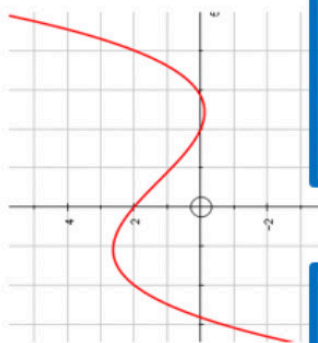
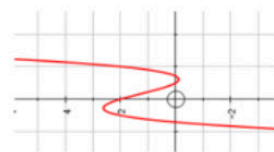
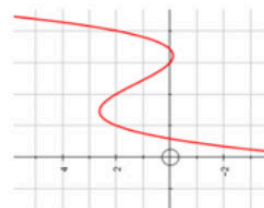
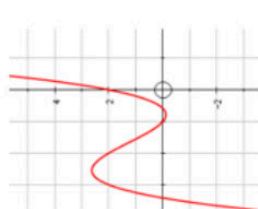
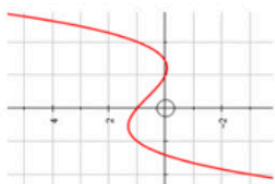
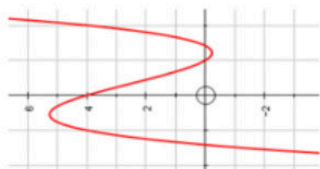
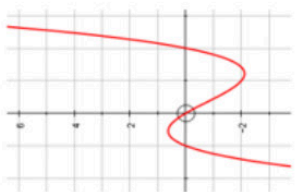
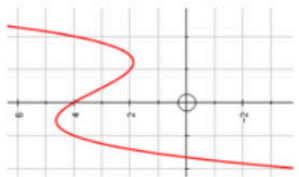
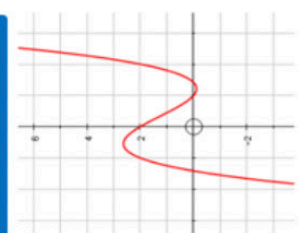
Curves	Points of intersection with the x- axis.	Points of intersection with the y- axis.	Graphs (sketch)
$y = (x - 5)(x - 2)(x - 1)$			
$y = (x + 5)(x - 1)(x + 1)$			
$y = x(x + 3)(x - 2)$			
$y = x(3 - x)(x - 1)$			

A LEVEL MATHEMATICS

Transformations of Graphs

Using your knowledge of transformations of graphs match up the transformations of the function with the graph. The first one is done for you.

$$Y = f(x)$$



$$Y = f(x) + 2$$

$$Y = 2f(x)$$

$$Y = f(x+2)$$

$$Y = f(2x)$$

$$Y = f(x) - 2$$

$$Y = \frac{1}{2} f(x)$$

$$Y = f(x-2)$$

$$Y = f(\frac{1}{2} x)$$

$$Y = 2f(x) - 3$$

This doubles in size
and then moves down
3

Extension: The original graph has a peak at $(-0.5, 2.5)$. Write the new location of this peak after the transformations for each graph. How has the peak moved and why has this happened?

Transformation of graphs