C if U can

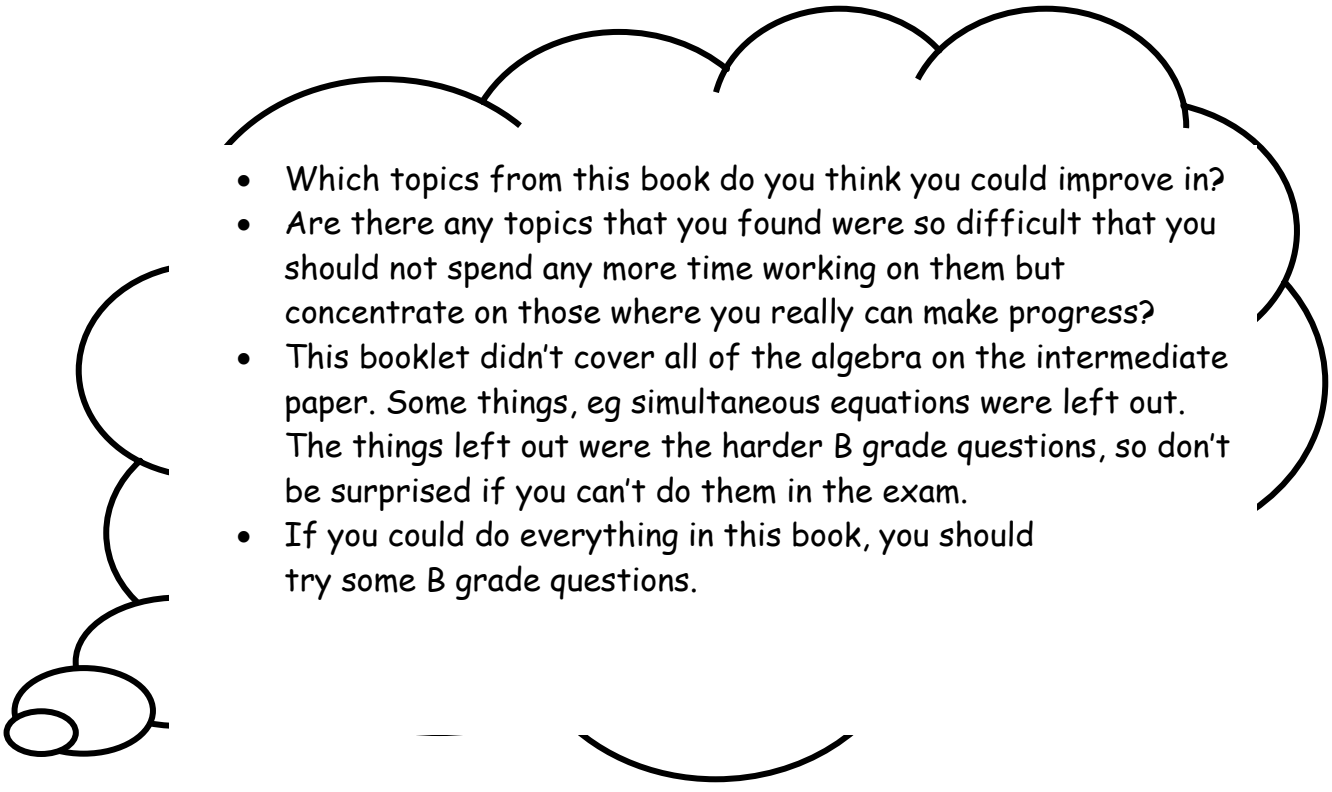
Algebra

Name .....

Birmingham City Council
Learning and Culture

How will this booklet help you to move from a D to a C grade?

- The topic of algebra is split into six units – substitution, expressions, factorising, equations, trial and improvement and inequalities and graphs.
- For each unit, you start by thinking about which types of question you are confident with, which types you're not sure about and which types cause you a real problem and assess yourself using the grid
- You then try some questions similar to those you have seen before – usually D grade questions so you can see whether your self assessment is accurate
- You then have some questions to try which are harder – these are C grade questions. There are hints to help you if you don't know where to start
- There are also some C grade questions with even bigger hints available from your teacher if you need them and there are also some C grade questions with no help (also available from your teacher) for when you feel brave enough!



- Which topics from this book do you think you could improve in?
- Are there any topics that you found were so difficult that you should not spend any more time working on them but concentrate on those where you really can make progress?
- This booklet didn't cover all of the algebra on the intermediate paper. Some things, eg simultaneous equations were left out. The things left out were the harder B grade questions, so don't be surprised if you can't do them in the exam.
- If you could do everything in this book, you should try some B grade questions.

Factorise completely

$$3x^2 + 6xy$$

CLUE:-
Completely is the key word! Are you sure there's nothing else to do?

*Are you **confident, close** or **clueless**? Assess how good you think you are before you start.*

C if U can Equations

	Confident	Close	Clueless
Solve simple equations including those with a letter on both sides.			
Solve problems where you have to use inverse operations. (Working something backwards)			
Write equations from information.			
Solve equations that have brackets.			
Solve equations with fractions in them.			

At the end of the section, go back and think about your self assessment. Was it a good judgement? Make any notes you need to here.

Simple ones first

C een it B4

Solve the equation:-

8x – 3 = 21

Solve the equation:-

4(3n + 7) = 18

Solve the equation:-

4(x + 2) = 6x + 4

.

Expand and simplify

(3x + 2)(4x + 1)

CLUE:-
Don't forget to simplify at the end

Sometimes, the questions worth more marks just have several parts

C if U can do these……

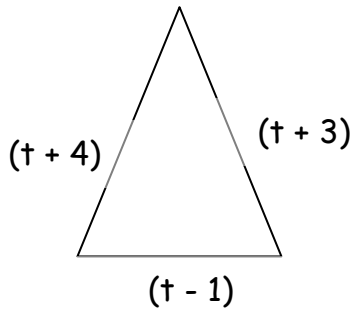
Factorise

1. $9x + 12$

2. $x^2 + x$

CLUE:-
In part 2, x is 1x. You are looking for what is common in both values.

Perimeter = 39 cm



Find the value of t.

Solve the following equations:-

$$\frac{(12 + x)}{3} = 5$$

$$\frac{x}{3} - 5 = 3$$

These just have more steps than the ones you just did.

Now C if U can do these……

Solve this equation

$5 - 3x = 2(x + 1)$

CLUE:-
Brackets first.

Remember, 2 brackets with 2 values inside gives 4 values before you simplify them.

Expand these brackets:-

- **$(x + 1)(x + 3)$**
- **$(x - 6)(x + 2)$**
- **$(x - 4)(x + 7)$**

Factorise:-

- **$x^2 + 3x + 2$**
- **$x^2 + 7x + 12$**
- **$x^2 + 2x - 15$**
- **$x^2 - 2x - 35$**

Make certain you can do these easy ones first.

C een it B4

Factorise

$8xy + 12x$

Factorise

$6x^2 - 3xy$

1. Multiply out each of these
   8(2x – 3)
   3(4x + 1)

2. Now simplify this expression and factorise

8(2x – 3) + 3(4x + 1)

Solve this equation

$$\frac{40 - x}{3} = 4 + x$$

CLUE:-
Deal with the 3 first.

Solve this equation

$$7(x + 2) = \frac{5x + 1}{2}$$

CLUE:-
Brackets first, then the 2

*Can U crack these? Are you **confident, close** or **clueless**? Assess how good you think you are before you start*

C if U can Factorising

	Confident	Close	Clueless
Factorise simple expressions. (factorise means put back into brackets!)			
Simplify and factorise expressions.			
Remove a single pair of brackets.			
Expand and simplify two pairs of brackets.			
Factorise quadratics (involving squares).			

Could you do them? Write any notes you need to remember.

A shop sells doughnuts and muffins. Doughnuts cost d pence each.
Muffins cost m pence each.
Daniel buys 4 doughnuts and 3 muffins.
The total cost is C pence.

Write down a formula for C in terms of d and m

CLUE:-
So C will be the **subject** of the formula. If it helps, write it in words first.

If you don't know what these statements mean, turn the page.

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Trial and improvement and inequalities

	Confident	Close	Clueless
Solve simple inequalities (greater or less than)			
Solve harder inequalities			
Solve problems where you have to work backwards (inverse)			
Write inequalities from information			
Use trial and improvement to solve equations			

Could you do them? Do you need to make any notes?

These shouldn't be too challenging.

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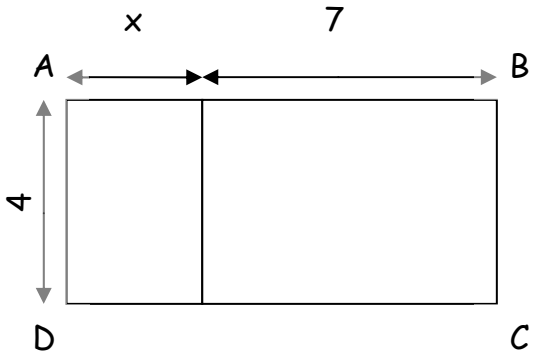
Solve the inequality	Solve the inequality	Solve the inequality
$3n < 6$	$5n > -15$	$6n \leq -3$

The diagram shows a rectangle ABCD. The measurements are in centimetres.
Write an expression, in terms of x, for the area of the rectangle ABCD.



CLUE :-
The question doesn't ask what the area is, just for an expression (or formula) which will help find the area. Write an expression in each part of the rectangle.

Can't think why algebra isn't considered fun!

Now C if U can do these……

Here are some expressions. Two of the expressions always have the same value as **4y**.

Circle the ones always equal to 4y

- 2(y + y)
- 2y + y
- 2y x 2y
- 2y + 2y
- 2 + 2y

CLUE:-

Some of these expressions will **sometimes** be equal to 4y. The questions says **always**

Use trial and improvement to solve

$x^3 + 2x = 50$

where x lies between 3 and 4

Use trial and improvement to solve

$\frac{1}{2} x^3 - x = 90$

where x lies between 5 and 6

These are very similar, just a bit harder!

Now C if U can do these…….

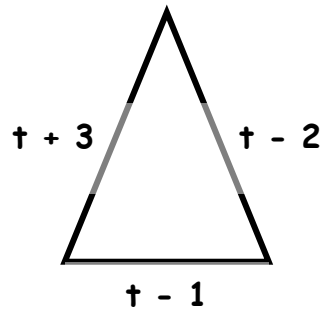
Solve the inequality

$$4x - 3 < 7$$

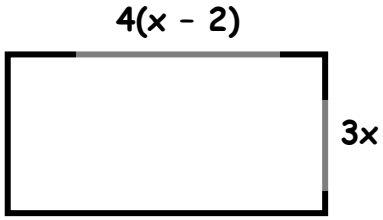
CLUE:-
Start by adding 3 to both sides

In these two questions, you are finding expressions and trying to simplify them.

Find the perimeter of this shape:-



Find the perimeter of this shape:-



Couldn't be easier – but it's going to get harder soon!

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Simplify the expression:-	Simplify the expression:-	Multiply out
$4p + 9q + 5p - 3q$	$5p^2 + 3q - p^2 + 2q$	$6(4x - 3)$

X is an integer, such that

$-3 < x \leq 2$

list all the possible values of x

CLUE:-

Don't forget the difference between the two signs here. Integers are whole numbers

The equation

$X^3 - 15x = 31$

Has a solution between 4 and 5.

Use a trial and improvement method to find this solution.

Give your answer to 1 decimal place.

You must show all your working.

CLUE:-

Make sure you go through enough steps.

Can you do these? Decide how good you think you are before you look at the examples – are you confident, close or clueless?

C if U can Expressions

	Confident	Close	Clueless
Simplify expressions – (make them easier!)			
Expand and simplify expressions with brackets			
Write expressions from information			
Turn expressions into formulae			
Solve problems involving expressions and formulae			

How did you do with the examples? Write any notes you need to remember.

The number of diagonals, D, of a polygon with n sides is given by the formula

$$D = \frac{n^2 - 3}{2}$$

A polygon has 20 sides.
Work out the number of diagonals of this polygon

CLUE:-
Where do you substitute the 20? Work out the top first!

Can you cope with these questions? Decide how good you think you are before you look at the examples – are you confident, close or clueless?

C if U can Graphs

	Confident	Close	Clueless
Complete a table of values.			
Plot co-ordinates from a set of values and draw a straight line.			
Recognise that an equation like y = 3x + 2 is a straight line on a graph.			
Use a line on a graph to find the value on one axis when you are given the value on the other axis.			
Plot co-ordinates and draw a curve on a graph.			

Were they easier or harder than you had thought? What do you need to remember?

Remember substitution? That's how to find the missing values in the tables.

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Complete this table of values for the function
y = 3x + 1

x	-3	-2	-1	0	1	2	3
y			-2			7	

Complete this table of values for the function
y = 2x – 5

x	-3	-2	-1	0	1	2	3
y		-9			-3		

Use the table of values you have completed in the previous question to plot and draw the graph of

y = 2x - 5

$P = x^2 - 7x$

Work out the value of P when x = -5

CLUE:-
Remember x has a negative value – what happens when you square it?

Check out the clues!

Now C if U can do these……

P = 3a + 5b

a = 5·8

b = -3·4

Work out the value of P

CLUE:-

Remember b has a negative value

Complete the table of values for the function

$y = \frac{1}{2}x + 7$

Plot the function

$y = \frac{1}{2}x + 7$

on the grid

Very similar, just harder numbers!

Now C if U can do these……

Complete the table of values for

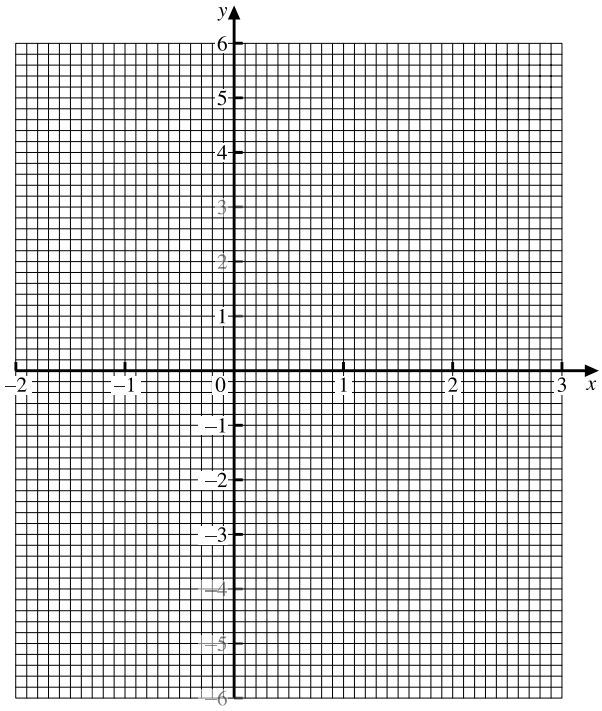
y = 2x - 1

x	-2	-1	0	1	2	3
y						

Then draw the graph and use the graph to find

1. **the value of y when x = -1·4**
2. **the value of x when y = 3·8**

CLUE:-
This graph may be a bit small. If so, re-draw it



Careful – these questions don't use the word 'substitute' – but that's what you're doing!

Evaluate A = 3(2b – 4) when

1. b = -2
2. b = -5

Given that

$P = Q^2 - 2Q$

Find the value of P when Q = -3

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If a = 3 and b = 5, find the value of:-

1. 2a + b
2. 2ab

When n = 8, evaluate the expression

3(2n – 2)

T = 3x + 4y

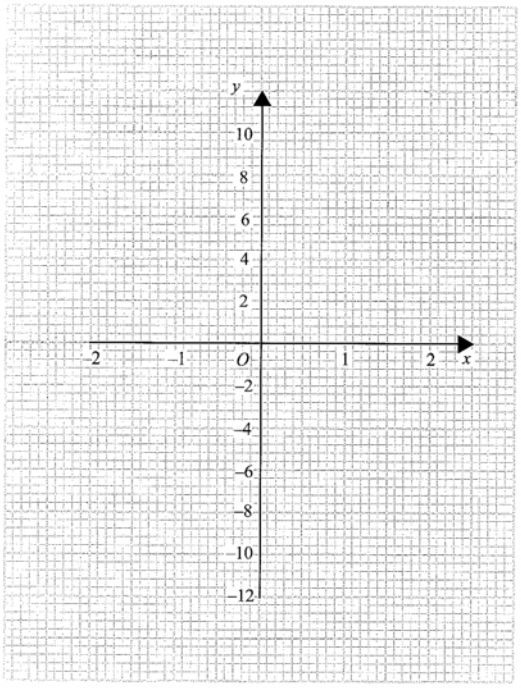
Find the value of T
When x = -5 and y = 3

Complete the table of values for

$y = x^3 + x - 2$

then draw the graph on the grid

x	–2	–1	0	1	2
y	–12			0	



CLUE:-
Take care with the negative numbers. This will make a curve because of the x^3.

CLUE:-
Think about the numbers in the table of values.
Look at the graph for a hint.

Can you cope with these questions? Decide how good you think you are before you look at the examples – are you confident, close or clueless?

C if U can Substitution

	Confident	Close	Clueless
Substitute positive and negative numbers into expressions.			
Substitute positive and negative numbers into equations and formulae.			
Substitute where you may have to square a number.			
Simplify by collecting like terms and then use substitution			
Write equations and formulae from information and then substitute numbers into them.			

At the end of the section, think about your self assessment. Would you make the same judgement now? Make any notes you need to here