



Boost Your Borderline Students

A guide to using Pearson Publishing's
mathematics resources

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Introduction

Mathematics is a rich and stimulating subject, which can be taught through engaging programmes of study. However, there comes a point when mathematics teachers have to focus on helping students to achieve the best possible result in their GCSE mathematics examination.

In theory, all GCSE grades from G upwards are counted as a pass. However, a grade C or above in mathematics is often an entry requirement for further study or employment. Hence, the grade a student achieves at GCSE can have important repercussions. From the school's point of view, GCSE grades of C or above are to be encouraged, because they reflect well upon the school as a whole. Teachers of GCSE subjects therefore are under pressure to get as many students as possible to achieve a grade C or above.

This pressure is particularly strong in mathematics. Students who achieve a GCSE grade C or above in mathematics help to boost the school's statistics for the Department for Education and Skills' RAISEonline, and so show the school in a better light for Ofsted and for league tables. This has recently become a particular concern with the performance measure changing from the straightforward 'five A*-C grades' to 'five A* to C including mathematics and English'. Students who may fail to reach a GCSE grade C in mathematics, or whose work wavers between a grade D and a grade C (collectively hereafter called 'D/C borderline students') are now an important focus for all teachers of GCSE mathematics.

Boost Your Borderline Students is designed to help mathematics teachers provide extra practice in the areas of the GCSE mathematics examination which students often find challenging. It identifies some key topics that need reinforcing when trying to help D/C borderline students achieve that all-important C grade.

Boost Your Borderline Students is not intended as a scheme of work in a classroom. Rather, it is designed as a reference guide to using Pearson Publishing's mathematics resources effectively. The material recommended in ***Boost Your Borderline Students*** might be used, for example:

- in revision lessons in the run-up to the examination, possibly interspersed with work on past papers (see page 2)
- at an after-school booster course for an identified group of students
- for self-study by particular students during study leave.

Syllabus

Under the three-tier system, D/C borderline students would usually sit Intermediate tier papers, as illustrated in the diagram below.

Tier	G	F	E	D	C	B	A	A*
Higher								
Intermediate								
Foundation								

The three-tier system, highlighting the range of marks awarded in each tier

In the two-tier system, it is feasible for D/C borderline students to sit either Foundation or Higher tier papers, as illustrated in the diagram below.

Tier	G	F	E	D	C	B	A	A*
Higher								
Foundation								

The two-tier system, highlighting the range of marks awarded in each tier

Boost Your Borderline Students has been written with the two-tier syllabus in mind, and assumes that students who may benefit from the recommended activities are taking only the Foundation tier. This means that certain topics which may have featured in the three-tier GCSE mathematics Intermediate examination (for example algebraic solutions for simultaneous equations or trigonometry) have not been included.

Using past papers

Over and above the work presented here, there is a great deal to be learnt from past papers, including:

- identifying what does and does not come up regularly in the GCSE maths examination
- noting which topics tend to occur in 'easy' questions — get those marks in the bag!
- noticing which topics tend to occur in 'hard' questions — is it even worth revising these if there are plenty of easier marks that students can be prepared for?

Pearson Publishing's resources

The activities suggested in **Boost Your Borderline Students** are selected from a number of Pearson Publishing's mathematics publications. Some of these publications were originally written for the KS4/GCSE age and ability level; others were aimed at the top levels of KS3 or the lower end of Higher tier GCSE. You need to make a judgement about how your students may react to this. If you think that they will object to any materials that do not say 'GCSE' or 'Foundation tier' on them, simply copy and paste the relevant parts of the worksheet from the PDF (portable document format) file into a word processor document and print that.

The following mathematics resources available from Pearson Publishing are mentioned:

- *Avoiding Common Errors Pack 2: Levels 6 to 8*
- *GCSE Success - Mathematics*
- *KS3 Mathematics Homework Pack E: Level 7*
- *KS3 Mathematics Homework Pack F: Level 8*
- *Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier*
- *Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier*

These titles are all available to order from Pearson Publishing through its Web site at www.pearsonpublishing.co.uk, or by calling 01223 350555. These titles are just a selection of Pearson Publishing's full mathematics catalogue (which is provided at www.pearsonpublishing.co.uk, and listed on page 13).

Note that the *Avoiding Common Errors* series includes guidance on teaching students to avoid common errors, and references to this guidance are given next to each activity in the *Avoiding Common Errors* publications. These references are also provided where appropriate in ***Boost Your Borderline Students***.

When the Pearson Publishing titles are purchased on disc (eg as 'ePacks'), usually two PDFs are available for each title: one for the teacher, which contains the introduction, contents and answers; and one for the student, which contains the activities. In ***Boost Your Borderline Students***, worksheet page references are to the student PDF and answer page references are to the teacher PDF unless otherwise stated.

Page numbers

Two sets of page numbers are provided in ***Boost Your Borderline Students***. This is because Pearson Publishing resources can be accessed in more than one format:

- **Printed** – If you have a printed copy of the publication, or if you choose to print out the publication from the PDF on the disc that you have purchased, refer to the page numbers marked 'printed'.
- **Onscreen** – If you are looking at the publication on a computer screen, it will be presented through Adobe Reader. Refer to the page numbers marked 'onscreen' which correspond with the page numbers given at the bottom of the Adobe Reader screen (for example as '4 of 32').

How the material was selected

Boost Your Borderline Students lists the areas and the activities in Pearson Publishing's titles which would be most suitable to use with D/C borderline students. The areas have been selected for one or more of the following reasons:

- it is an area where common, unnecessary mistakes are often made
- it is an area that often separates C candidates from D candidates
- the area can be tackled through a simple, step-by-step process, and so can be 'drilled' ready for examination.

The recommended resources should bolster an existing revision plan, but should not be treated as a substitute for that plan. Students who complete the recommended activities cannot be guaranteed an improved grade. It is assumed that the activities would be attempted in addition to normal revision.

Compiling the list of areas was not a trivial task; it was particularly difficult to discriminate between areas that could tip the balance between a D and a C grade, and those that would form part of general revision anyway. For example, most students (no matter which tier) would benefit from practice of the four rules of decimals and fractions. Topics that might be useful, but which are not mentioned in *Boost Your Borderline Students* include:

- solving simple linear inequalities and representing them on the number line
- enlargements
- compound measures.

Activities on each of these can be found in Pearson Publishing's mathematics resources (see page 13).

The following topics are covered in *Boost Your Borderline Students*:

- Calculators
- Pythagoras' theorem
- Graphs and their interpretation
- Pie charts
- Estimating the mean for grouped data
- Algebraic manipulation
- Solving linear equations/transposing formulae.

Calculators

The issue of calculators may seem a trivial one — students will have been using calculators for years and may think they know how to use them. This is not a good time for them to face the challenge of transferring to a different or more powerful calculator. However, the calculators that students have when they start Year 11 may well not be suitable for a GCSE mathematics examination. It is worth checking that your students' calculators are sufficient well before the day of the examination.

Although trigonometry has been moved to the Higher tier, and so true scientific functions are not required on a calculator, given the poor BIDMAS (brackets, indices, division, multiplication, addition and subtraction) support offered on most desktop calculators, it is still important to use a scientific calculator.

Key points

It is recommended that you check whether students:

- know how to use their calculator
- can check that it is working reliably
- know how to reset their calculator (for example, if it has been placed into radian mode or if some degree of accuracy has been set, can they return the functions to 'normal?')
- have a spare calculator and spare batteries just in case (perhaps they know someone who is not in Year 11 who could lend them an identical spare calculator on the day of the examination?).

It is important to emphasise to students that they should **not** transfer to a different calculator just before the examination. If their calculator breaks or is lost, they should try to borrow exactly the same model if at all possible.

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>Avoiding Common Errors Pack 2: Levels 6 to 8</i>	Calculator skills - 1	24	3
	Calculator skills - 2	25	4
	Answers to Calculator skills - 1 and 2 worksheets	42	23
	These worksheets cover:		
	- Common errors 4 and 5	7	7
	- Common errors 6 to 10	8	8
	- Common error 11	9	9

<i>GCSE Success - Mathematics</i>	Do you know how to use your calculator keys?	28	28
	Do you know how to use your calculator keys?: Answers (in student PDF)	29-30	29-30
<i>KS3 Mathematics Homework Pack E: Level 7</i>	6 Using a calculator (brackets and memory) - 1	8	7
	7 Using a calculator (using the memory) - 2	9	8
	Answers to worksheets 6 and 7	34	4
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	18 Using a calculator: Brackets and memory	20	19
	19 Using a calculator: Powers, roots, memory	21	20
	20 Standard form	22	21
	Answers to worksheets 18, 19 and 20	149	6

Pythagoras' theorem

One of the consequences of mathematics GCSE becoming 'two-tier' is that trigonometry is only required for the Higher tier, but Pythagoras' theorem is required for Foundation tier.

Pythagoras' theorem is a topic that students tend to find difficult, yet it actually lends itself well to step-by-step solutions. It is therefore a good topic to focus on with D/C borderline students. However, along with algebra, 'Pythagoras' theorem' is one of those phrases that people are used to 'hearing and fearing' in the media. You may therefore wish to just call this topic 'right-angled triangles' to avoid any students' preconceptions about how hard it is. After all, when did you last see a GCSE question that said 'Use Pythagoras' theorem to solve ...?').

Key points

It is important to emphasise the following steps:

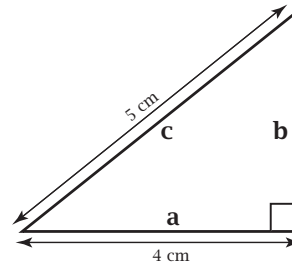
- 1 Identify the right angle, and therefore side c .
- 2 Write down the formula: $c^2 = a^2 + b^2$
- 3 Put in the values you know: $5^2 = 4^2 + b^2$

$$25 = 16 + b^2$$

- 4 Solve the equation: $b^2 = 25 - 16$
 $= 9$

$$b = \sqrt{9}$$

$$= 3 \text{ cm}$$



Remind students that not all exam questions will give whole number answers. They should round their answers off to a suitable degree of accuracy (normally three significant figures).

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>GCSE Success - Mathematics</i>	Revision notes: Pythagoras' theorem	41	41
<i>KS3 Mathematics Homework Pack E: Level 7</i>	22 Pythagoras' theorem - 1	24	23
	23 Pythagoras' theorem - 2	25	24
	Answers to worksheets 22 and 23	37	7
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	108 Pythagoras' theorem	110	109
	Answers to worksheet 108	168	25
<i>Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier</i>	71 Pythagoras' theorem	73	72
	Answers to worksheet 71	125	18

Graphs and their interpretation

In the two-tier syllabus, Foundation tier candidates are not expected to solve simultaneous or quadratic equations algebraically. However, they are expected to be able to plot a graph of the functions involved and solve them graphically. This means that there should be some easy marks to be gained from generating and plotting points, plus some higher-level marks (even in a question that looks hard) for interpreting and reading the solution. Students are also expected to plot points for quadratic curves. This is a source of easy marks if students are competent in calculating values and understand that they can check the curve by ensuring it is symmetrical.

Key points

The key points to emphasise to students are:

- Don't be put off by a hard question — aim at getting the easy marks for calculating and plotting points. Once you have done that, the rest of the question may seem easier.
- Remember that the horizontal axis is 'x', and the vertical axis is 'y' (students may wish to remember this by the phrase 'x is a cross (across)').
- If two lines cross, **both** equations are true at that point — these are called **simultaneous equations**.

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>KS3 Mathematics Homework Pack E: Level 7</i>	13 Solving simultaneous equations by drawing graphs	15	14
	Answers to worksheet 13	35	5
<i>Two-Tier GCSE Mathematics Homework Pack 1: Higher Tier</i>	30 Simultaneous equations: Solving by drawing a graph - 1	32	31
	31 Simultaneous equations: Solving by drawing a graph - 2	33	32
	Answers to worksheets 30 and 31	116	9

Pie charts

Calculating the angles to draw in a pie chart is a straightforward task. Students should check (and show that they have checked) that all the angles add up to 360° , even if they have rounded them up or down. If all the angles do not add up, then students obviously need to check for errors or deliberately round some of the angles the other way (ie down instead of up, or vice versa).

Key points

The key points to emphasise to students are:

- Calculating angles to draw in a pie chart is just like calculating fractions. For example, in a pie chart about the colour of cars, ask yourself what fraction of the cars are green in the pie chart. Then find that fraction of 360° .
- **Always** add up all the angles and check they come to 360° .
- If you had to round up your angles, then you may find your total is very close to, but not exactly, 360° (eg 361°). If this is the case, then round one of your angles the other way.

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>Avoiding Common Errors Pack 2: Levels 6 to 8</i>	Pie charts (covering error 60)	41	20
	Answers to Pie charts worksheet	48	29
	Common error 60	22	22
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	133 Drawing pie charts - 1	135	134
	134 Drawing pie charts - 2	136	135
	Answers to worksheets 133 and 134	176	33

Estimating the mean for grouped data

This is a very straightforward topic, providing that students are asked to estimate the mean, and are not required to work back from the estimate! (They would be very unlucky at this level to get such a question.) It is recommended that students concentrate on the technique of using frequencies and midpoints to estimate the mean.

Students will probably need to be told several times why only an estimate is required (ie because we are 'guessing' that all the values lie at the midpoint). Hopefully, knowing this will cut down the risk of panic or a visual 'guess' when they see the words in an examination.

Key points

The key points to emphasise to students are:

- Multiply **midpoints** by **frequencies**. Add them together and divide by the **total** frequency, not the number of groups.
- Remember that this is only an **estimate** of the mean, as you do not know all the exact values.

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>KS3 Mathematics Homework Pack E: Level 7</i>	28 Grouped data	30	29
	Answers to worksheet 28	38	8
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	127 Grouped data	129	128
	Answers to worksheet 127	173	30
<i>Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier</i>	94 Grouped data	96	95
	Answers to worksheet 94	130	23

Algebraic manipulation

This area lends itself to extended practice. In the two-tier syllabus, Foundation tier students do not have to factorise a quadratic into two linear terms. For example, students have to do:

- $x^2+6x = x(x+6)$
- $(x+2)(x+4) = x^2+6x+8$

But students do not have to do: $x^2+6x+8 = (x+2)(x+4)$

This provides a useful benchmark for how complex a set of algebraic skills they require.

Encourage students to evaluate the expression before and after with one (or preferably more) simple values of x , just to check it has worked correctly (eg when $x=0$ or when $x=1$).

Key points

The key points to emphasise to students are:

- Check your answers (substitute values like 0 and 1 into your answer and into the original question, to check that they both give the same result).
- Make sure you have simplified fully, eg:

$$(x+2)(x+4) = x^2+6x+8$$

$$\text{not } (x+2)(x+4) = x^2+4x+2x+8$$

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>Avoiding Common Errors Pack 2: Levels 6 to 8</i>	Brackets and equations	28	7
	Answers to Brackets and equations worksheet	43	24
	This worksheet covers:		
	- Common error 19	10	10
	- Common errors 20 to 25	11	11
<i>KS3 Mathematics Homework Pack F: Level 8</i>	17 Factorisation - 1	19	18
	Answers to worksheet 17	36	6
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	54 Expansion of brackets	56	55
	55 Factorisation	57	56
	Answers to worksheets 54 and 55	156	13
<i>Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier</i>	18 Expansion of brackets	20	19
	19 Factorisation - 1	21	20
	Answers to worksheets 18 and 19	113	6

Solving linear equations/ transposing formulae

Solving linear equations and transposing formulae effectively come down a single task: doing the same thing to both sides until you have isolated the target variable.

Key points

The key points to emphasise to students are:

- Write down what you have done to both sides of the equation at each step.
- Check your answers by **one** of the following methods:
 - Substitute your answer into the original equation.
 - In the case of formulae, use sample values to get an answer in the original equation and then feed these values into the rearranged form to see if you get back to where you started.

Activities in Pearson Publishing's resources

You could look at the following for your students:

Publication	Activity title	Page numbers	
		Printed	Onscreen
<i>KS3 Mathematics Homework Pack F: Level 8</i>	9 Re-writing formulae - 1	11	10
	10 Re-writing formulae - 2	12	11
	11 Equations - 1	13	12
	12 Equations - 2	14	13
	Answers to worksheets 9 and 10	34	4
	Answers to worksheets 11 and 12	35	5
<i>Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier</i>	45 Rules: Equations - 1	47	46
	46 Rules: Equations - 2	48	47
	47 Writing equations - 1	49	48
	48 Writing equations - 2	50	49
	51 Harder equations	53	52
	52 Rewriting formulae	54	53
	Answers to worksheet 45	154	11
	Answers to worksheets 46 to 48	155	12
	Answers to worksheets 51 and 52	156	13
<i>Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier</i>	13 Rewriting formulae	15	14
	Answers to worksheet 13	112	5

Further information

The following titles are available from Pearson Publishing. For more information or to place an order, call 01223 350555, email info@pearson.co.uk or visit www.pearsonpublishing.co.uk:

- *Avoiding Common Errors Pack 1: Levels 3 to 5*
- *Avoiding Common Errors Pack 2: Levels 6 to 8*
- *GCSE Mathematics Homework Pack 1: Foundation Tier*
- *GCSE Mathematics Homework Pack 2: Intermediate Tier*
- *GCSE Mathematics Homework Pack 3: Higher Tier*
- *GCSE Success – Mathematics*
- *ICT in Mathematics*
- *Key Skills: Application of Number*
- *KS3 Mathematics Homework Pack A: Level 3*
- *KS3 Mathematics Homework Pack B: Level 4*
- *KS3 Mathematics Homework Pack C: Level 5*
- *KS3 Mathematics Homework Pack D: Level 6*
- *KS3 Mathematics Homework Pack E: Level 7*
- *KS3 Mathematics Homework Pack F: Level 8*
- *KS3 Mathematics Level-by-level Pack A: Level 4*
- *KS3 Mathematics Level-by-level Pack B: Level 5*
- *KS3 Mathematics Level-by-level Pack C: Level 6*
- *KS3 Mathematics Level-by-level Pack D: Level 7*
- *KS3 Mathematics Level-by-level Pack E: Level 8*
- *KS3 Mathematics Level-by-level Pack F: Level 3 for low attainers*
- *Mathematics eRevision Guides (including Foundation, Intermediate and Higher Tiers)*
- *Mental Arithmetic Pack 1: KS3*
- *Mental Arithmetic Pack 2: KS4/GCSE*
- *Non-Calculator Mathematics Pack 1: KS3*
- *Non-Calculator Mathematics Pack 2: KS4/GCSE*
- *Preparing for Ofsted: Maths*
- *Running a Maths Department*
- *Two-Tier GCSE Mathematics Homework Pack 1: Foundation Tier*
- *Two-Tier GCSE Mathematics Homework Pack 2: Higher Tier*
- *Using the Internet – Mathematics*

Some of the above titles are also available in the following compilation CD-ROMs:

- *KS3 Mathematics Network Resources*
- *GCSE Mathematics Network Resources*

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