Guidance for tutors

The table below outlines useful information for tutors as well as some suggested approaches and resources.

Outcome	AG6	Student can consistently:	Represent inequalities using regions.
How the topic is examined		- Examined through test paper questions. - Questions are equally likely to appear on calculator or non-calculator papers. - Students can be asked questions such as: - Draw a graph or set of graphs and shade in a particular region defined by inequalities - Given a set of graphs drawn, shade in a particular region - Describe a particular region given the equations of the graphs.	
Prior knowledge		- Students should be confident with: - Negative numbers - Substitution (AEx5) - Drawing straight line graphs (AG1) - In addition questions involving this topic can have links to: - Inequalities (AEq4) - Finding equation of a line (AG4)	

Suggested tuition approaches	- This topic follows on from inequalities work (AEq4). This time students have to shade in a region defined by a single inequality or a set of inequalities. (e.g. Shade in the region defined by $y > 2x + 1$)
	
	- Here are the steps involved in answering these type of questions:
	    ○ Draw the graph of the function $y = 2x + 1$ (change the inequality to an equals symbol) (See AG1)
	    ○ When you draw the line you should note, if the symbol was < or > then the line should be a dashed line ------------
	    If the symbol is ≤ or ≥ then the line is a solid line ———
	    The dashed line shows that points on this line are not included in the region, whereas a solid line shows that these points are included.
	    ○ Shade in the relevant region. One way students can do this is to pick a random point in the region they think is the right region and see if the (x, y) coordinate satisfies the inequality.
	
	- Sometimes the graphs can already be drawn and students simply have to identify the region.
	- Sometimes a region is defined and students have to work out the inequalities that define the region. Generally the equations of all the lines are given, if they are not you may need to work them out (AG4)
	
	- Common regions defined are
	    ○ $x > 0$ – this is the same as being right of the y – axis
	    ○ $y > 0$ – this is the same as being above the x –axis
	    ○ $x ≤ 4$ – you would draw a solid vertical line at $x = 4$ and then shade in the region to the left.
	    ○ $y > -3$ – you would draw a dashed horizontal line at $y = -3$ and then shade in the region above.
	
	- When students are trying to identify a region that satisfies multiple inequalities, they could shade in the region that does not fit the inequality. You will then be left with the region that does. This is sometimes easier and is acceptable as long as students clearly identify the region.

Common errors and misconceptions	- Students often get simple graphs like $x = 4$ and $y = -3$ etc… incorrect and mix them up. - Students forget to use a dashed line when they have inequalities such as $x < 3$ and $y > 1$ - Many students fail to recognise the equations of the axes $x = 0$ and $y = 0$ - The wrong region ends up being shaded in. Once students think they have identified a region make sure that try several points in that region in all the inequalities and check that they work. Encourage them to check at least one point near the edge of the region.

Suggested resources	• Questions
	    ○ http://www.cimt.plymouth.ac.uk/projects/mepres/allgcse/pr16-es.pdf (pp 80 - 84)
	    ○ https://corbettmaths.files.wordpress.com/2013/02/graphical-inequalities-pdf.pdf
	• Past GCSE Questions
	    ○ https://keshgcsemaths.files.wordpress.com/2013/11/88_inequalities-regions.pdf
	• Video tutorial
	    ○ http://corbettmaths.com/2013/05/27/graphical-inequalities-part-1/
	    ○ http://corbettmaths.com/2013/05/27/graphical-inequalities-part-2/
	    ○ http://corbettmaths.com/2013/05/27/inequalities-and-regions/