Outcome	NR3	Student can consistently:	Calculate with simple percentages, including percentage increase and decrease.
How the topic is examined	• Examined through test paper questions. • Questions are equally likely to appear on calculator or non-calculator papers. Therefore, students should be exposed to problems that require not using a calculator. • Questions involving VAT at 20% are common on non-calculator papers. • Questions involving percentages can often be mixed in with problems involving fractions and decimals.		

Prior knowledge	• Students should be confident:
	  o Multiplying and dividing without a calculator.
	  o Converting from percentages to decimals.
	  o Using a calculator.
	• In addition questions involving percentages can have links to:
	  o Fractions (NF1, NF2).		

Suggested tuition approaches	• It is important for students to understand that a percentage means parts out of 100.
	• It is vital that students show all their working out.
	• For non-calculator questions a common method is for students to build up the percentage.
	  o For example to find 35% of 80 students would find 25% and 10% or do 3 x 10% + 5%.
	  o Or work out 1% (by diving by 100) and then multiplying by the percentage)
	• Students should be prepared to find any percentage on a non-calculator test using long multiplication; however the majority of questions are all multiples of 5%.
	• For calculator paper questions:
	  o Ensure students use their calculator – many still like to do it in their head.
	  o The most preferred option is to divide by 100 and multiply by the percentage.
	  o Another method is to use a multiplicative relationship and change the percentage to a decimal first and then multiply by the amount (e.g. 78% of £18 = 0.78 x 18). This is essentially the same method as above, but students often cannot see the connection.
	• For percentage increase and decrease questions:
	  o Students can work out the percentage and then add it on or subtract it from the original amount.		

	○ If they use the decimal notation they can incorporate the 100% straight away (e.g. increase £250 by 12% = 1.12 x 250 or decrease by 12% = 0.88 x 250). ○ The decimal method is the preferred one as students move towards finding repeated percentage increase. It makes questions in NR4 much less time consuming to calculate. ● It is important that students are exposed to word problems involving percentages and also ones that have mixed fraction and ratio problems too.
Common errors and misconceptions	● Students want to use non-calculator methods (build up method) for all percentage questions, even when they have a calculator to use. It is not always the most efficient. (e.g. find 27% of 85kg – many students will find 10%, 10%, 5% etc…) when it is easier and more efficient to find 1% or use the decimal method. ● Students should always check their calculations and check if they are reasonable. ● For percentage increase and decrease questions many students forget to add on or subtract the original amount. ● Students struggle to understand the word 'left' as in 'remaining' when solving word problems. (e.g. Jan earns £1200 a month. She gives 30% to her mum. How much does she have left?)
Suggested resources	● Questions ○ http://www.cimt.org.uk/projects/mepres/allgcse/bkb11.pdf (pp 236-247) ○ https://www.tes.co.uk/teaching-resource/percentage-worksheets-6260217 (free account required) ○ https://www.tes.co.uk/teaching-resource/gcse-grade-d-to-grade-b-objective-based-percentage-questions-3009785 (free account required) ● Past GCSE Questions ○ https://keshgcsemaths.files.wordpress.com/2013/11/51_percentages.pdf ● Khan Academy Percentage videos ○ https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic