Guidance for tutors

Outcome	P8	**Student can consistently:**	Solve problems involving permutations and combinations.

How the topic is examined	• This topic is not currently examined at GCSE but certain aspects are on GCSE Statistics, AS/A2 mathematics and additional maths qualifications. • It is likely that students would have a calculator to solve problems as the calculations can easily become quite complex.

Prior knowledge	• Students should be confident:
	  ○ Simplifying a fraction.
	• In addition questions involving this topic can have links to:
	  ○ All other probability sections (P1 – P7)
	  ○ Expanding brackets using binomial theorem (AEx11 and AEx12)

Suggested tuition approaches	• A permutation is an ordered combination.
	• For each imagine you have n objects to choose from and you want to choose r objects.
	  ○ Permutations : The number of ways of arranging r objects from n objects is given by ${}_nP_r = \frac{n!}{(n-r)!}$
	  ○ Combinations: The number of ways of choosing r objects from n objects is given by ${}_nC_r = \frac{n!}{r!(n-r)!}$
	• Students should understand how to use the ${}_nP_r$ and ${}_nC_r$ buttons on their calculator
	• The following link provides detailed examples https://www.mathsisfun.com/combinatorics/combinations-permutations.html

Common errors and misconceptions	• Students mix up permutations and combinations. • Students often don't realise a problem is a combinations problems, too often they want to use the permutations formula. They should ask themselves the question. Does the order matter?

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Suggested resources	• Questions
	  ○ http://www.exeter.k12.ca.us/static/uploads/PermutationsCombinationsHW.pdf
	  ○ http://frontenacss.limestone.on.ca/teachers/dcasey/0F7D4056-00870BC8.17/Simple%20Permutations%20and%20Combinations%20Worksheet.pdf
	• Video tutorials
	  ○ https://www.examsolutions.net/tutorials/probability-using-permutations-and-combinations/