

NAME: \_\_\_\_\_

*P.I. A.N.8: Determine the number of possible arrangements (permutations) of a list of items*

*P.I. A2.S.10: Calculate the number of possible permutations ( ${}_nP_r$ ) of  $n$  items taken  $r$  at a time*

1. Make up a situation for which you can describe a permutation. Compute the permutation that you create.

2. Is  ${}_nP_r$  always, sometimes, or never greater than  $n^r$ ? Explain your answer.

Answers may vary. Sample: I have 5 sea shells to arrange on a shelf. In how many different ways can I  
[1] arrange them? I can arrange them in 120 different ways.

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Answers may vary. Sample: Never; the greatest value that  ${}_nP_r$  could have is  $n(n-1)(n-2)(n-3) \dots$  for  
[2]  $r$  factors. There are  $r$  factors of which all but one factor is less than  $n$ .  $n^r$  means  $r$  factors of  $n$ . Since all  
but one of the factors of  ${}_nP_r$  are less than the factors of  $n^r$ ,  $n^r$  must be greater each time.

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