

## On the existence of partitioned incomplete Latin squares with five parts

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Let  $a, b, c, d, e$  be positive integers such that  $a \leq b \leq c \leq d \leq e$ . Heinrich showed the existence of a partitioned incomplete Latin square (PILS) of type  $(a, b, c)$  and  $(a, b, c, d)$  if and only if  $a = b = c$  and  $2a \geq d$ . For PILS of type  $(a, b, c, d, e)$ , it is necessary that  $a + b + c \geq e$ , but not sufficient, and no characterization is currently known. In this talk we provide an additional necessary condition, classify the existence of PILS of type  $(a, b, c, d, a + b + c)$  and PILS with three equal parts, and show the existence of a family of PILS in which the parts are nearly the same size.

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