

James Madison University  
Mathematics Colloquium

**Trioperate Fields – Mersenne Primes  
A Creaking Back Door**

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Monday, October 10  
4:45 pm  
(Refreshments served at 4:35)

Room 033, Burruss Hall

**Abstract**

Whenever it is possible to define a third operation,  $\#$ , on a field  $(F, +, \times)$  to get  $(F, +, \times, \#)$  so that  $(F^*, \times, \#)$  is a field the structure  $(F, +, \times, \#)$  is called a Trioperate field. In this context  $F^* = F \setminus \{0\}$ . In this talk all finite trioperate fields will be characterized and the progress that has been made on the infinite case will be discussed. No example of an infinite trioperate field is known to date. There is a connection to the failure of such structures to exist and the famous unsolved question of the cardinality of the Mersenne Primes. This is the creaking back door. An undergraduate abstract algebra student, Brett Enge, doing independent research here at JMU a few years ago developed most of the results in this talk.