Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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Mersenne Primes, The 49th Mersenne Prime, and GIMPS

Curtis Cooper University of Central Missouri

April 21, 2016

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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 - GIMPS People
 - GIMPS Links

Reasons

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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Primes			



• A **prime number** is an integer, greater than 1, which has exactly two factors, itself and one.

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Primes			



- A **prime number** is an integer, greater than 1, which has exactly two factors, itself and one.
- Prime Numbers Less Than 100:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

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Mersenne Primes ○ ●○○	49th Mersenne Prime o o	GIMPS 00 0	Reasons
Mersenne Primes			

Mersenne Numbers

• A Mersenne number is a number of the form $2^p - 1$, where *p* is a prime number.

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Mersenne Primes			

Mersenne Numbers

- A Mersenne number is a number of the form $2^{p} 1$, where *p* is a prime number.
- Examples of Mersenne numbers are:

$$3 = 2^{2} - 1$$

$$7 = 2^{3} - 1$$

$$31 = 2^{5} - 1$$

$$127 = 2^{7} - 1$$

$$2047 = 2^{11} - 1$$

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Mersenne Primes ○ ○●○	49th Mersenne Prime ○ ○	GIMPS 00 0	Reasons
Mersenne Primes			

• A Mersenne prime is a Mersenne number that is prime.

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Mersenne Primes ○ ○●○	49th Mersenne Prime ○ ○	GIMPS 00 0	Reasons
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Mersenne Primes ○ ○●○	49th Mersenne Prime ○ ○	GIMPS 00 0	Reasons
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$$2047 = 2^{11} - 1 = 23 \times 89$$
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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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Mersenne Primes			

Marin Mersenne

 Mersenne primes are named after a 17th-century French monk and mathematician



Marin Mersenne (1588-1648)

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Mersenne Prime GIMPS Reas	sons

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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- 2⁷⁴²⁰⁷²⁸¹ 1 is prime!
- Largest Known Prime Number

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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M74207281			

- 2⁷⁴²⁰⁷²⁸¹ 1 is prime!
- Largest Known Prime Number
- 22,338,618 decimal digits

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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M74207281			

- 2⁷⁴²⁰⁷²⁸¹ 1 is prime!
- Largest Known Prime Number
- 22,338,618 decimal digits
- Discovered on January 7, 2016

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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M74207281			

- 2⁷⁴²⁰⁷²⁸¹ 1 is prime!
- Largest Known Prime Number
- 22,338,618 decimal digits
- Discovered on January 7, 2016
- Reported prime by Computer Number 5 in Room 143 at the Summit Center on September 17, 2015.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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M74207281			

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- Went undiscovered for almost 4 months. An email was supposed to be sent out to me and GIMPS administrators when the computer reported the prime. This email report was not sent.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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- Went undiscovered for almost 4 months. An email was supposed to be sent out to me and GIMPS administrators when the computer reported the prime. This email report was not sent.
- Discovered by routine data mining.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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News on 49th Mersenne Prime

News About 49th Mersenne Prime

Official Press Release http://www.mersenne.org/M49/74207281.htm

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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News on 49th Mersenne Prime

News About 49th Mersenne Prime

- Official Press Release http://www.mersenne.org/M49/74207281.htm
- New York Times Story http://www.nytimes.com/2016/01/22/science/new-biggestprime-number-mersenne-primes.html?_r=1

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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- New York Times Story http://www.nytimes.com/2016/01/22/science/new-biggestprime-number-mersenne-primes.html?_r=1
- Standupmaths https://www.youtube.com/watch?v=q5ozBnrd5Zc

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- Standupmaths https://www.youtube.com/watch?v=q5ozBnrd5Zc
- Jimmy Fallon https://www.facebook.com/kshbtv/videos/10153315475526190

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The Great Internet Mersenne Prime Search

 GIMPS is a collaborative project of volunteers who are searching for Mersenne prime numbers. The software used by GIMPS volunteers is Prime95. This software can be downloaded from the Internet for free.

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The Great Internet Mersenne Prime Search

- GIMPS is a collaborative project of volunteers who are searching for Mersenne prime numbers. The software used by GIMPS volunteers is Prime95. This software can be downloaded from the Internet for free.
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- Scott Kurowski wrote the PrimeNet server that supports GIMPS. In 1997 he founded Entropia, a distributed computing software company.
- Aaron Blosser is the system administrator of PrimeNet.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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GIMPS			

 Woltman's program uses a special algorithm, discovered in the early 1990's by Richard Crandall. Crandall found ways to double the speed of what are called convolutions – essentially big multiplication operations.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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GIMPS			

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- As of February 9, 2016, the 30-day sustained GIMPS throughput has swollen to a record 380 TFLOPs, with the theoretical 30-day maximum throughput exploding to 1.25 PFLOP/s. This is the first time that the GIMPS distributed supercomputer has (theoretically) breached the petaflop barrier.

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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 UCM has about 800 computers performing LL-tests on Mersenne numbers.

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GIMPS People



Woltman



Kurowski



Crandall

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• The GIMPS home page can be found at: http://www.mersenne.org

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GIMPS Links

- The GIMPS home page can be found at: http://www.mersenne.org
- A Mersenne Prime discussion forum can be found at: http://www.mersenneforum.org

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Mersenne Primes, The 49th Mersenne Prime, and GIMPS

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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1. To help in the discovery of new Mersenne primes.

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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- 1. To help in the discovery of new Mersenne primes.
- 2. To put to good use the idle CPU cycles of hundreds of computers in labs and offices across UCM's campus.

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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1. To help in the discovery of new Mersenne primes.

2. To put to good use the idle CPU cycles of hundreds of computers in labs and offices across UCM's campus.

3. To help detect hardware problems (fan and CPU/bus problems) on individual computers at UCM. The German computing community uncovered a flaw in Intel's latest Skylake CPUs running GIMPS software.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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4. To obtain favorable press for UCM for their support of our efforts to discover new Mersenne primes.

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Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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4. To obtain favorable press for UCM for their support of our efforts to discover new Mersenne primes.

5. To win the \$150,000 offered by the Electronic Frontier Foundation (EFF) for the discovery of the first one-hundred million digit prime number. EFF's motivation is to encourage research in computational number theory related to large primes.

Mersenne Primes	49th Mersenne Prime	GIMPS	Reasons
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Email Address and Talk URL

Curtis Cooper's Email: cooper@ucmo.edu

Talk: http://cs.ucmo.edu/~cnc8851/talks/mersenneholden/mersenneholden

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