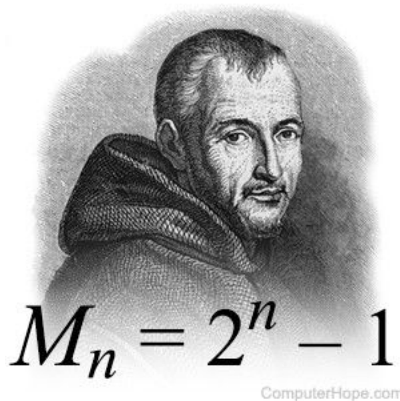
Mersenne Prime



$$2^n - 1 = \text{Prime \#}$$

“What do you see” “What looks familiar and what looks unfamiliar”
Have student write on individual white boards what they see.
Discussion will come out that n represents exponent - review meaning of exponent

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Math String

2^2

2^3

2^4

3^2

3^3

3^4

4^2

4^3

4^4

Practice with a couple exponents using this Flow Sequence aka Math String

$$2^n - 1 = \text{Prime \#}$$

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What are Prime #s

Have students list a few prime #s

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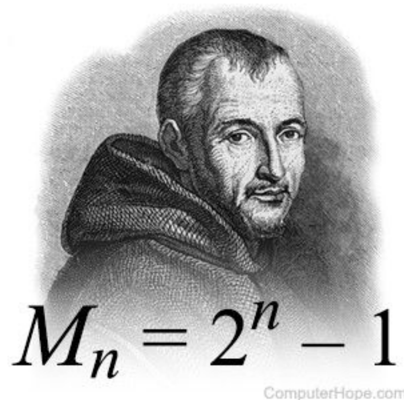
Have student write on individual white boards what they see.
Discussion will come out that n represents exponent - review meaning of exponent

$$2^n - 1 = \text{Prime \#}$$

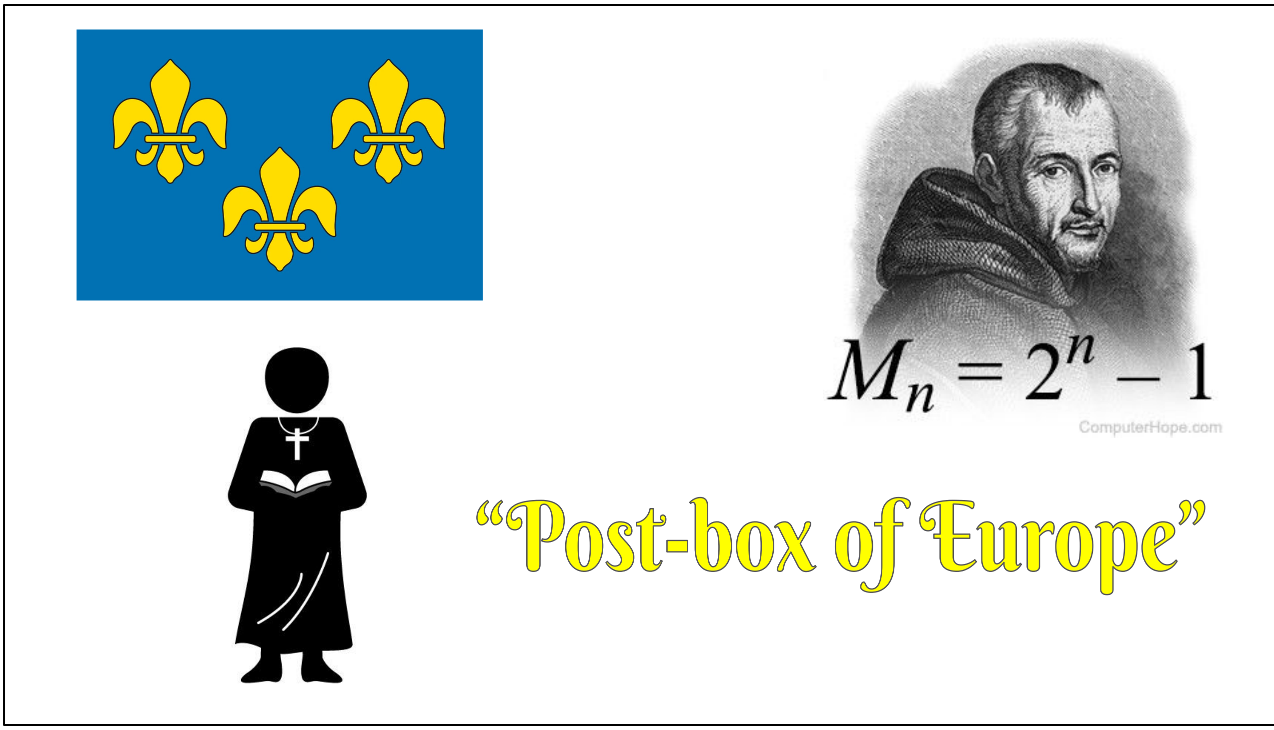
$$2^2 - 1 = 3$$

Have students work in groups to try to figure out as many exponential numbers that create a # 9. Show one example.

Mersenne Prime

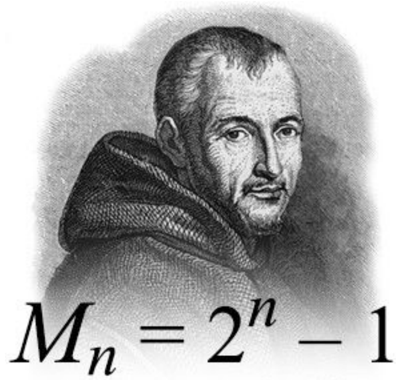


Share with students that Mersenne was an



Marin Mersenne (1588 – 1648) was a French mathematician and priest. Because of the frequent exchanges with his contacts in the scientific world during the 17th century, he has been called the “the post-box of Europe”.

Today we mostly remember him for the *Mersenne primes*, prime numbers that can be written as 2_n-1. Most of the largest known primes are of this type. He also studied acoustics and the harmonics of a vibrating string, and wrote about theology and philosophy.



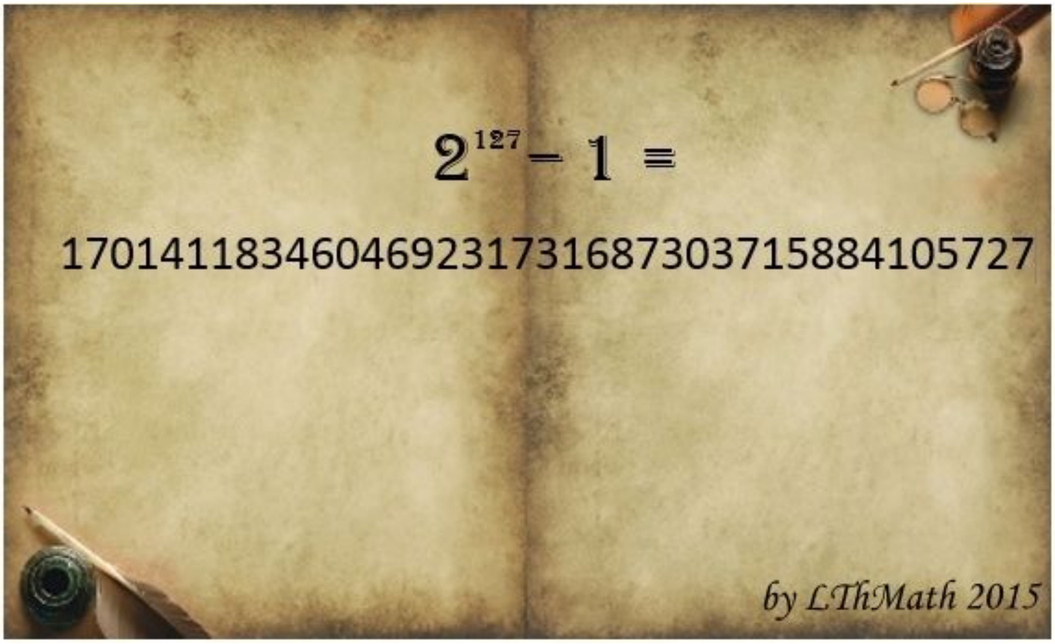
When 2*n*-1 is prime it is said to be a Mersenne prime.

$$M_n = 2^n - 1$$

n = 2, 3, 5, 7, 13, 17, 19, 31, 61, 89, 107 and 127.

Tell students that Mesenne identified the follow numbers as Meseene Prime
However, that he made a mistake,
Share more history about the new revelations of which were Prime.

It was obvious to Mersenne's peers that he could not have tested all of these numbers (in fact he admitted as much), but they could not test them either. It was not until over 100 years later, in 1750, that Euler verified the next number on Mersenne's and Regius' lists, $2^{31}-1$, was prime. After another century, in 1876, Lucas verified $2^{127}-1$ was also prime. Seven years later Pervouchine showed $2^{61}-1$ was prime, so Mersenne had missed this one. In the early 1900's Powers showed that Mersenne had also missed the primes $2^{89}-1$ and $2^{107}-1$. Finally, by 1947 Mersenne's range, $n \leq 258$, had been completely checked and it was determined that the correct list is:


$2^{127} - 1 =$
170141183460469231731687303715884105727
by LThMath 2015

$$2^{2}-1 = 3$$
$$2^{3}-1 = 7$$
$$2^{5}-1 = 31$$
$$2^{7}-1 = 127$$
$$2^{13}-1 = 8{,}191$$
$$2^{17}-1 = 131{,}071$$
$$2^{19}-1 = 524{,}287$$

This is the first Mesenne Prime equations. The current record of of Mesenne prime has n as 82,589,933 which was discovered in 2018. How many consecutive primes would that be

$2^{2}-1 = 3$

$2^{3}-1 = 7$

$2^{5}-1 = 31$

$2^{7}-1 = 127$

$2^{13}-1 = 8,191$

$2^{17}-1 = 131,071$

$2^{19}-1 = 524,287$

? $2^{82,589,933} - 1$

“This is the first 7” What consecutive number would the current discovery be”

52

$$2^{2}-1 = 3$$
$$2^{3}-1 = 7$$
$$2^{5}-1 = 31$$
$$2^{7}-1 = 127$$
$$2^{13}-1 = 8{,}191$$
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$$2^{19}-1 = 524{,}287$$

52 $2^{82{,}589{,}933} - 1$

Teacher Resources

https://primes.utm.edu/mersenne/

PrimePages 5000 Largest FAQ Curios! Glossary Search

Home / Mersennes

Mersenne Primes: History, Theorems and Lists

Contents:

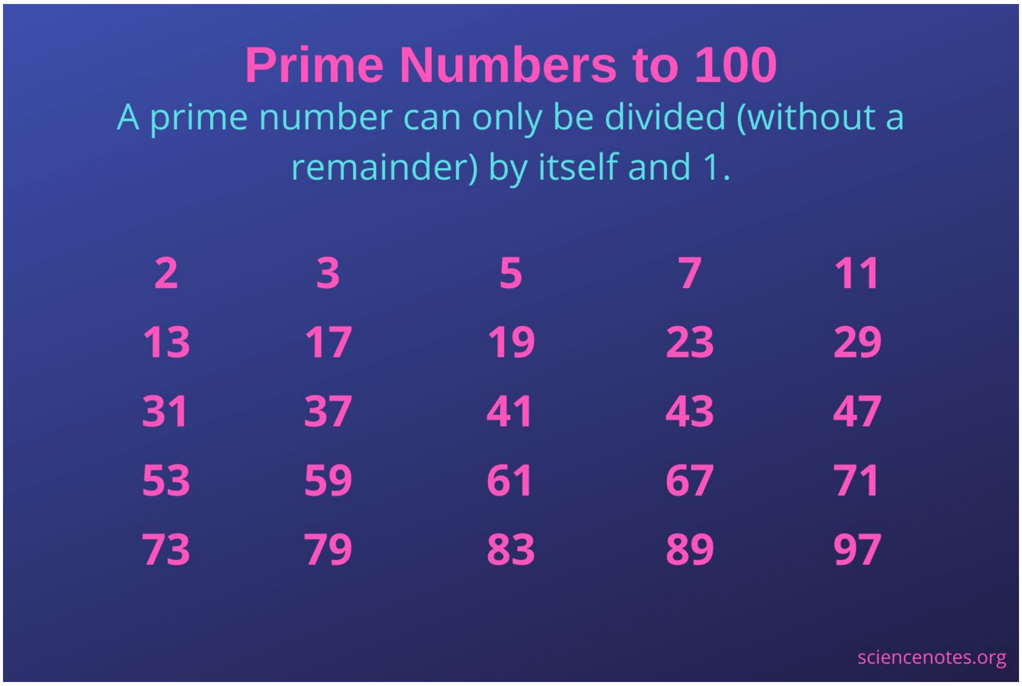
1. Early History
2. Perfect Numbers and a Few Theorems
3. Table of Known Mersenne Primes
4. The Lucas-Lehmer Test and Recent History
5. Conjectures and Unsolved Problems
6. See also Where is the next larger Mersenne prime? and Mersenne heuristics

1. Early History

Many early writers felt that the numbers of the form 2^n-1 were prime for *all* primes n, but in 1536 Hudalricus Regius showed that $2^{11}-1 = 2047$ was not prime (it is $23\cdot89$). By 1603 Pietro Cataldi had correctly verified that $2^{17}-1$ and $2^{19}-1$ were both prime, but then incorrectly stated 2^n-1 was also prime for 23, 29, 31 and 37. In 1640 Fermat showed Cataldi was wrong about 23 and 37; then Euler in 1738 showed Cataldi was also wrong about 29. Sometime later Euler showed Cataldi's assertion about 31 was correct.

Enter French monk Marin Mersenne (1588-1648). Mersenne stated in the preface to his *Cogitata Physica-Mathematica* (1644) that the numbers 2^n-1 were prime for

> n = 2, 3, 5, 7, 13, 17, 19, **31, 67, 127 and 257**



Review with students Prime #s