

DUE _____

Math 32/101

Name _____

NUMBER THEORY: PRIME NUMBERS

A) **Number types** – what types of numbers are you aware of?

B) **Basic definitions** for our study of prime numbers:

1) Prime

2) Twin Prime

3) Composite

4) Unit

5) The Fundamental Theorem of Arithmetic

6) Digital Root

Note: Be careful about the terms *multiple*, *divisor*, *factor*, *divides*, *goes into* – ORDER MATTERS!!! Also know the divisibility symbol.)

C) Factorization

1) All Factors – examples and information:

2) Prime Factorization:

D) Divisibility Tests:

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

E) Types of Numbers: Deficient, Abundant, Perfect

Definition of "Proper Divisors" in THIS context:

Perfect:

Deficient:

Abundant:

F) Goldbach's Conjecture

G) Finding Primes (using our divisibility tests)

H) The Search for Primes in General

1) The Sieve of Eratosthenes:

	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

2) The GREAT INTERNATIONAL MERSENNE PRIME SEARCH

(See video on blog.)

The largest known prime number right now is:

The number of digits in the largest known prime right now is:

Putting this in context, it would take _____ pages in Times 14 font to write this number, which, in context, is as long as:

Is there a pattern in the primes that helps us find them?

I) Context – Large Numbers:

Have you lived a million seconds? A billion seconds? A trillion seconds?

How long does it take one million seconds to pass?

How long does it take one billion seconds to pass?

How long does it take one trillion seconds to pass?

What is the current national debt of the United States?

J) Types of Primes

1) Mersenne Prime (and relationship between Mersenne Primes and Perfect Numbers)

2) Fermat Primes

K) Some of the MANY Applications of Prime Numbers

1) Definition of “co-primes” or “bi-primes” or “semi-primes” –

2) The following numbers are all bi-primes. Try to factor them:

15

29901

299

7597

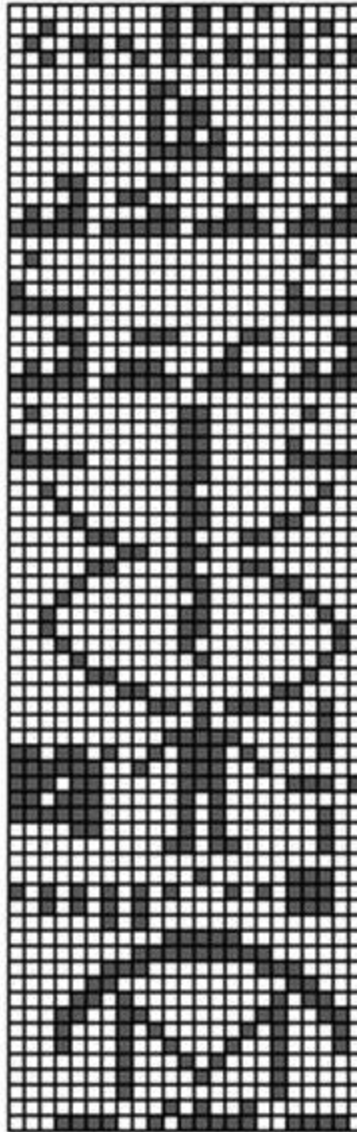
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3) Why are bi-primes important?

Codes/Encryption –

Communication –

L) "E.T. Call Us!!"



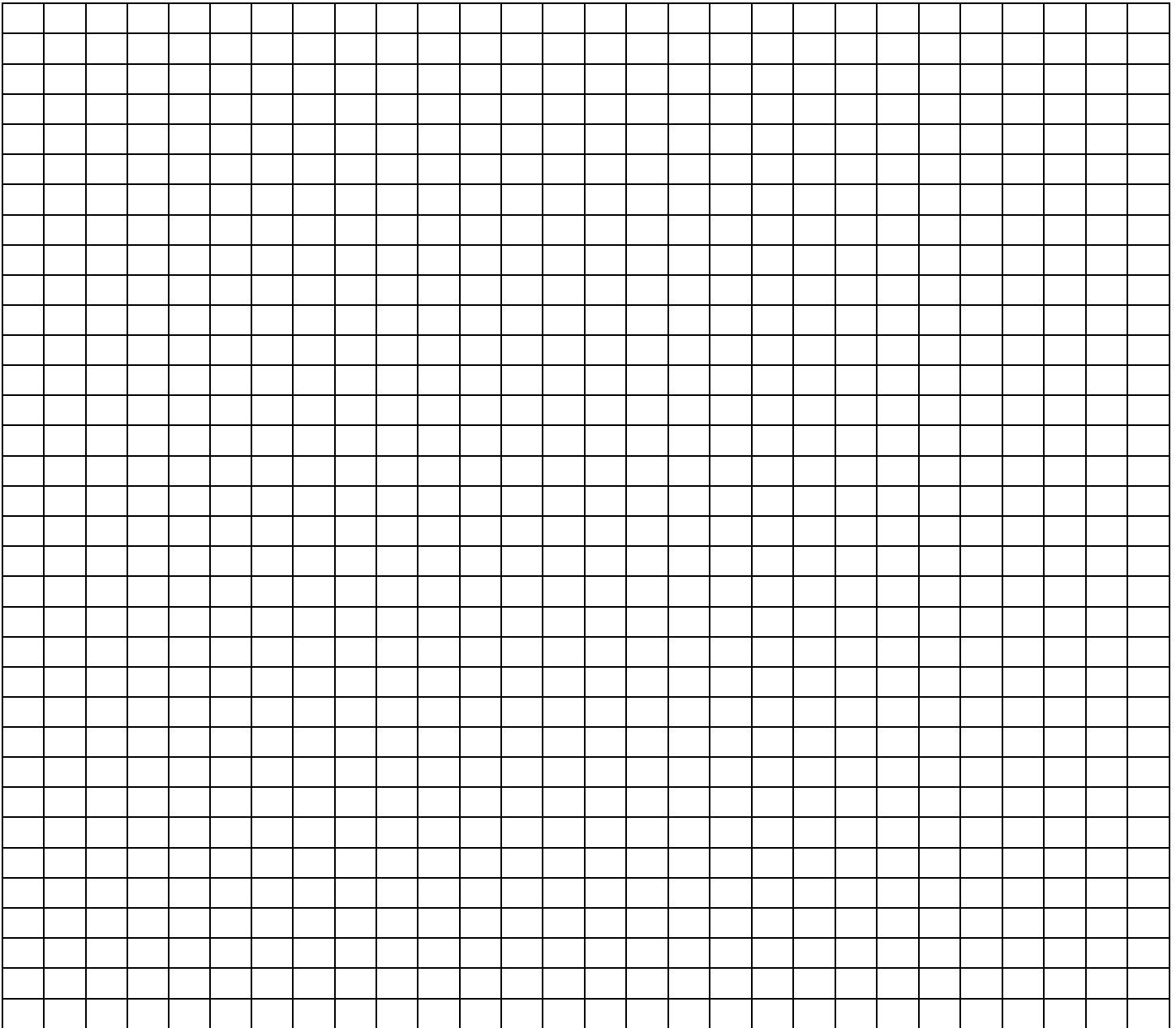
1) This message is 73 rows by 23 columns (note that both 73 and 23 are prime). How is binary used here? How are primes used here?

2) Based on the image above, what information did we send to extra-terrestrials?

M) Your Communication

1) Do you think we were wise or foolish (or neutral) to send out the Arecibo message)? Why?

2) If you were to send out a message, what would you send? (Remember that a completely alien race would not recognize such things as smiley-faces, flowers, faces, doggies, kitties, our numbers, our letters, our words, etc.) Draw your answer using the grid (it does not have to use the full length and width of this grid – remember that an area that is bi-prime is best), and write your answer in binary (i.e. base 2).



What are the dimensions of your graph (the height and width)?

As zeros and ones, your graph above translates into: