Module 3 - Number Theory & Cryptography
Mr. Foley

Name_____

All questions 4 points unless otherwise noted.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Divisible by	Test	Divisible by	Test
2	The last digit is even	8	Last three digits divisible by 8
3	Sum of digits is divisible by 3	9	Sum of digits divisible by 9
4	Last 2 digits divisible by 4	10	Last digit 0
5	Ends in 0 or 5	12	Divisible by 4 and 4
6	Divisible by 2 and 3		

Determine whether or not the first number is divisible by the second number (1 point each,questions 1-8)

1) 797,886; 3 1) _____

2) 668,858; 5 2) _____

3) 12,341; 3 3) _____

4) 58,012; 4 4) _____

5) 561,897; 9 5) _____

6) 65,570; 10 6) _____

7) 23,313; 6 7) _____

8) 12,728; 8 8) _____

Find the prime factorization of the number.

9) 20 9) _____

10) 154 10) _____

11) 301 11) _____

Find the greatest common divisor (GCD).

12) 12 and 16 12) _____

13) 36, 48, and 84 13) _____

Find the least common multiple (LCM).

14) 120 and 270 14) _____

15) 112 and 96 15) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve.

16) Several different bus routes stop at the corner of Second St. and Lincoln Ave. A Wilkenson bus arrives every 27 minutes and a Harris Road bus arrives every 15 minutes. If both buses arrive at the stop at 5:07 AM, when will they again arrive at the same time? (HINT: find the LCM of 15 min & 27 min, this is the next time they are "the same"). 16) _____

A) 7:22 AM B) 6:42 AM C) 9:12 AM D) 11:52 AM

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

17) Complete the Sieve of Eratosthenes. (8 points)

1	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

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Determine if the item described is designed in accordance with the golden ratio.

18) An oil painting has a width of 38 inches and a height of 61.48 inches. 18) _____

19) A formal garden has a width of 26.00 meters and a length of 48.36 meters. 19) _____

Determine whether the sequence is a Fibonacci-type sequence. If it is, determine the next two terms of the sequence.

20) 3, 2, 5, 7, 9 ... 20) _____

21) 3, 4, 7, 11, 18 ... 21) _____

Provide an appropriate response.

22) List the first seven terms of the Fibonacci sequence. 22) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

23) If June is your starting month, what month will it be 16 months from June? 23) _____

A) July B) February C) November D) October

Perform the modular arithmetic operation.

24) $18 + 26 \pmod 5$ 24) _____

A) 8 B) 3 C) 5 D) 4

25) $114 + 110 \pmod{10}$ 25) _____

A) 3 B) 11 C) 4 D) 22

Find the modulo class to which the number belongs for the given modulo system.

26) 14, mod 4 26) _____

A) 1 B) 0 C) 2 D) 3

27) 54, mod 11 27) _____

A) 3 B) 8 C) 10 D) 4

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

28) 28 is a perfect number. 28) _____

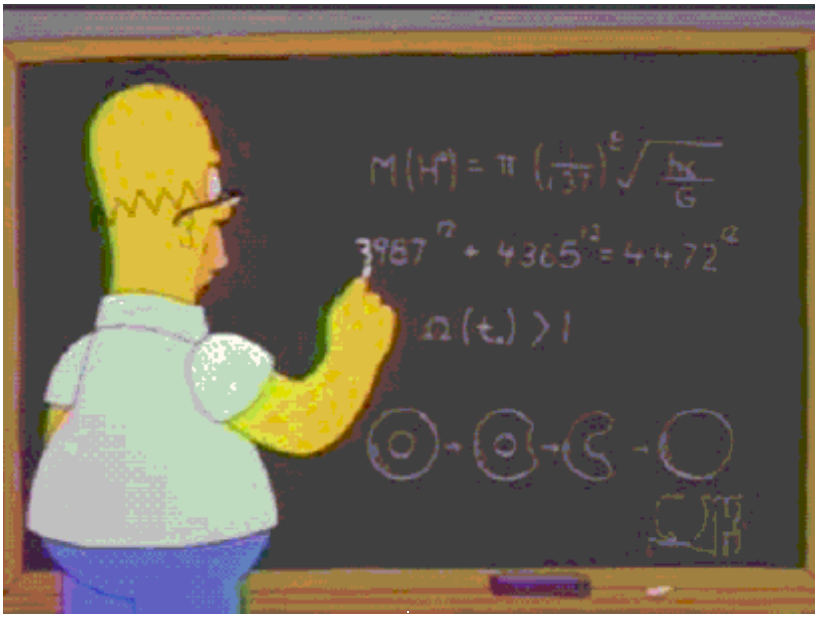
29) We learmed in the text, $2^{n-1}(2^n-1)$ is perfect when (2^n-1) is prime. Find 3 perfect numbers. 29) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

30) One of Fermat's proven theorems is "*Every odd prime can be expressed as the difference of two squares in one and only one way.*" Express 23 as the difference of two squares. 30) _____

31) Fermat near misses. Why is the equation on Homer's board wrong? 31) _____

$3987^{12}+4365^{12}=4472^{12}$



Answer Key
Testname: MODULE3TEST

1) Yes
2) No
3) No
4) Yes
5) Yes
6) Yes
7) No
8) Yes
9) $2^2 \cdot 5$
10) $2 \cdot 7 \cdot 11$
11) $7 \cdot 43$
12) 4
13) 12
14) 1080
15) 672
16) A
17)
18) Yes
19) No
20) No
21) Yes; 29, 47
22) 1, 1, 2, 3, 5, 8, 13
23) D
24) D
25) C
26) C
27) C
28) FALSE
29) FALSE
30)
31)