Mathematics and Culture Test 1 Name Kayla

1. Match the items on the left with the appropriate choice on the right to make a true statement that is not *The golden ratio is the golden ratio*. Indicate the match by copying the number for the item on the right in the blank on the left.

a. 7 1+1/(1+1/(1+1/(1+...)))
b. 20 1729
c. 16 2, 3, 5, 7, 11, 13,
d. 15 2, 3, 5, 8, 13, 21
e. 18 3, 4, 5, 7, 11
f. 2 Bar Codes
g. 13 Even numbers
h. 11 Fermat's Little Theorem
i. 3 Irrational numbers
j. 14 Odd numbers
k. 8 One to one coorespondence
l. 10 Pigeonhole Principle
m. 9 Rational numbers
n. 1 RSA codes
o. 19 Telling time
p. 5 The Fibonacci Sequence
q. 6 The golden ratio
r. 17 The product of two large primes
s. 4 The square root of 2
t. 12 Twin primes

1) are used in internet encryption
2) use check digits
3) have decimal expansions that neither terminate nor repeat
4) confounded the Pythagoreans
5) is related to the golden section
6) gives the most aesthetically pleasing rectangle, some believe
7) is the golden ratio
8) is what you set up when you count
9) are no more plentiful than natural numbers, even though it seems like there should be
10) can show us that there are two non-bald people who are equally hairy
11) is why RSA encryption works
12) are odd
13) equal zero mod 2
14) equal 1 mod 2
15) are Fibonacci numbers
16) are prime numbers
17) is hard to factor
18) are relatively prime
19) is like doing mod 12 arithmetic
20) is the first number that can be expressed as the sum of two cubes in two ways

20 pts

20
12
10
10
10
10
72
Essay = 28

2. Compute the following:

a. 145 mod 12 = 1
b. 10 mod 4 = 2
c. $2^2$ mod 3 = 1
d. 7 mod 5 = 2
e. $3^4$ mod 5 = 1
f. if a < p and p is prime, $a^{p-1}$ mod p = 1

12 2 pts each

3. I'm thinking of a number between 1 and 60. When I divide my number by 3 I get a remainder of 1. When I divide my number by 4 I get a remainder of 2. And when I divide my number by 5 I get a remainder of 1. What is my number? 46 10 pts

1 × 40 = 40
2 × 45 = 90
1 × 36 = 36
166
120
46

4. The following was encoded using the affine shift: 3x + 5. Decode it:
CRSR'H YFEFOVW = ZENO'S PARADOX 10 pts
ZENO'S PARADOX

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 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 |
| 5 | 8 | 11 | 14 | 17 | 20 | 23 | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 1 | 4 | 7 | 10 | 13 | 16 | 19 | 22 | 25 | 3 |
| F | I | L | O | R | U | X | A | D | G | J | M | P | S | V | Y | B | E | H | K | N | Q | T | W | Z | C |

5. Using the same code, encode your last name:_____ 10 ~~10~~ 5 pts

On separate paper:

6. What makes RSA codes so valuable? 10 pts Anyone can be told how to encrypt w/out knowing how to decode
7. Write an (approximately half page hand written) essay on something you have learned so far this term.

20 pts