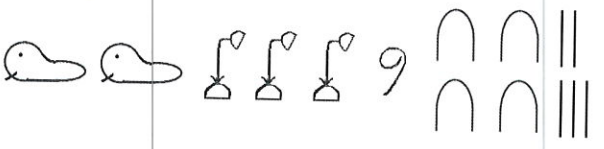
MTH 151, Exam #2, Fall 2017 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

1. Write the following numerals in historical counting systems in the Hindu-Arabic system. (4 points each)

a. 

23,527

b. 

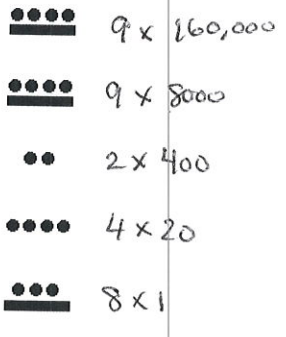
203,145

c. $\overline{MMCLVI}DCXXXIX$

2,156,639

d. 六千七百

6,700

e. 

1,572,888

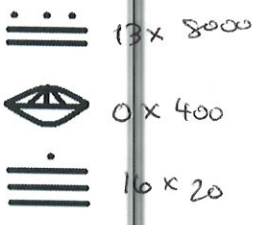
f. $\overset{\varepsilon}{M}\theta\omega\xi\eta$

59,868

g. 

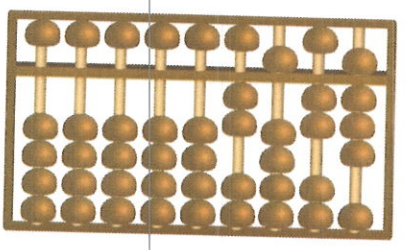
22 × 3600 + 11 × 60 + 23 =

79,883

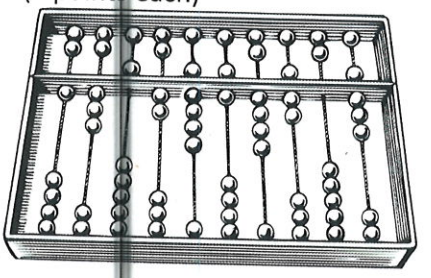
h. 

104,329

2. Write the number that is displayed on each abacus. (3 points each)

a. 

2,528

b. 

1,352,964,708

3. Write the number 9,324 in the following numeral systems: (4 points each)
   a. Greek

,θτκδ

   b. Babylonian

   c. Mayan

   d. Chinese

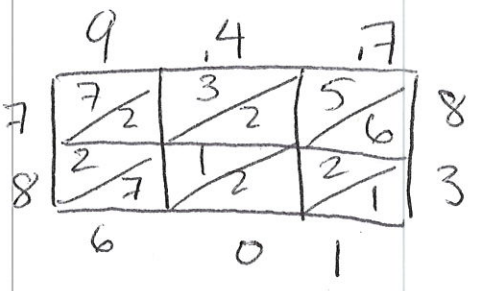
九千三百二十四

4. Write number 2,506,341 in the following numeral systems: (5 points each)
   a. Roman

$\overline{\text{MM}}\text{DVI}$ CCC XLI

   b. Egyptian

5. Use the lattice method to calculate 947×83. (5 points)



78,601

6. Write the number 592 in the following bases: (4 points each)
   a. Base-2 (binary)

1001010000

   b. Base-16 (Hexadecimal)

250

   c. Base-7

1504

7. Convert the follow numbers in the given bases into base-10. (4 points each)
   a. 6813_9

$6 \times 729 + 8 \times 81 + 1 \times 9 + 3 = 5034$

   b. 31211_4

$3 \times 256 + 1 \times 64 + 2 \times 16 + 1 \times 4 + 1 = 869$

   c. $89t1e_{12}$

$8 \times 20736 + 9 \times 1728 + 10 \times 144 + 1 \times 12 + 11 =$

182,903

8. Add the following pairs of numbers in the given bases or numeral systems. (4 points each)

a. $7341_8 + 776_8$

$10,337_8$

b. $122101_3 + 20212_3$

220020_3

c. 三千四百六十五 + 七百九十八

四千二百六十三

9. Evaluate the following expressions. (2 points each)

a. 15 mod 4

3

b. 91 mod 12

7

10. Write all the natural number factors of 180. (5 points)

1, 180
2, 90
3, 60
4, 45
5, 36
6, 30
9, 20
10, 18
12, 15

{1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, 180}

11. Write the prime factorization of 360. (4 points)

$2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 2^3 3^2 5$

12. Find the 7th Mersenne number $M_n = 2^n - 1$. Determine if this number is a prime. Explain your reasoning. (5 points)

$2^7 - 1 = 127$ prime

using calculator, divide by all integer/prime # up to $\sqrt{127}$.

13. Use the shortened Binet formula $F_N = \left[\left[\left(\frac{1+\sqrt{5}}{2}\right)^N / \sqrt{5}\right]\right]$ to find F_{11}. (4 points)

$F_{11} = 89$

14. The Lucas sequence is similar to the Fibonacci sequence. It start 1, 3, 4, ..., and each term in the sequence is determined using the same recursive formula as Fibonacci (adding the two preceding values in the sequence). Find the next five terms of the Lucas sequence. (5 points)

1, 3, 4, 7, 11, 18, 29, 47, . . .