Math 129
Mayan Numerals
(200 B.C. to 1500 A.D.)

Mayans based their numeration system on their calendar. Mayan numbers represent Mayan days. Their year was considered to have 360 days, divided into 18 months of 20 days each. They did have a symbol for "zero" and their system was positional. Numbers are written vertically with each place representing days, months, years, 20-years, 20-(20-years), . . . from the bottom up. They wrote all their numbers using only the following three symbols:

Figure 1

(shell) ------- zero

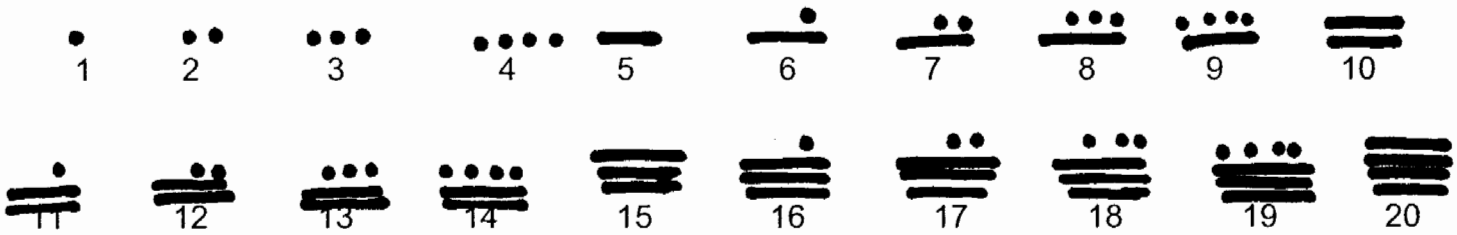
------- one

------- five

Figure 2

20 days	=	1 month
18 months	=	1 year
360 days	=	1 year

The first 20 numbers are written as follows



Numbers greater than 20 will be represented using the days, months, and years "places".

Examples: what Hindu-Arabic number is represented by the following Mayan numerals?

1. 

17 months = 340 days
13 days
} 353 in H-A

2. 

3 years = 360 x 3 = 1,080 days
6 months = 120 days
zero days
} 1,200 in H-A

Notice that the *days, years, 20years- place* never goes above 20 and that the *months- place* never goes above 18.

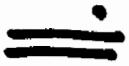
To translate form Hindu-Arabic to Mayan, think of the Hindu-Arabic number as "days" available to distribute among years, months and days using the table in figure 2.

Examples: Convert the following Hindu-Arabic numbers to Mayan.

1. Convert 271

271 days is less than one year, so we don't need any number on the years place. Each month has 20 days, so 271 days is the same as 13 months and 11 days. (271 divided by 20 is 13 with reminder 11). Finally, we write 13 in the months place and 11 in the days place.

months 

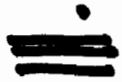
days 

2. Convert 5,915

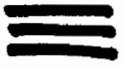
5,915 is more than one year, so find first how many years that makes (remember 1 year=360 days).

- 5,915 divided by 360 is 16 with reminder 155 therefore we have 16 years with 155 days left.
- We now have to decide how many months we can make with 155 days: 155 divided by 20 is 7 with remainder 15, therefore we have 7 months and 15 days.

Altogether we have 16 years, 7 months , and 15 days.

years 

months 

days 

3. Convert 1,084.
   - 1,084 divided by 360 is 3 with reminder 4, we have 3 years with 4 days left.
   - 4 days are not enough for one month so we need a **zero** in the months place.
   - The 4 days left go in the days place

years 

months 

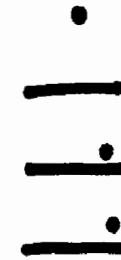
days 

Math 129
Exercises on Mayan Numerals

1. Translate each of the given Mayan numerals to Hindu-Arabic.

a) 

b) 

c) 

d) 

e) 

f) 

2. Rewrite the following Hindu-Arabic numbers in Mayan notation.

a) 43

b) 20

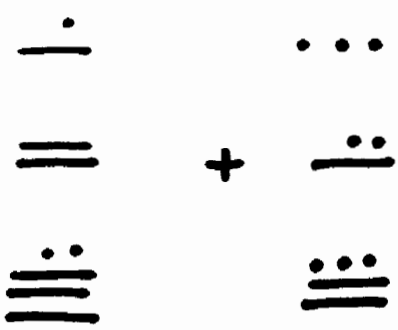
c) 3610

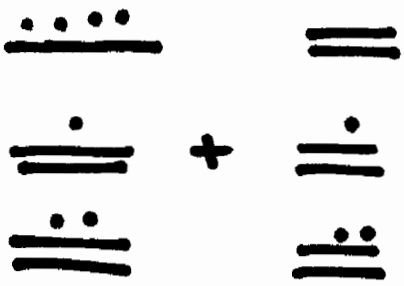
d) 2,417

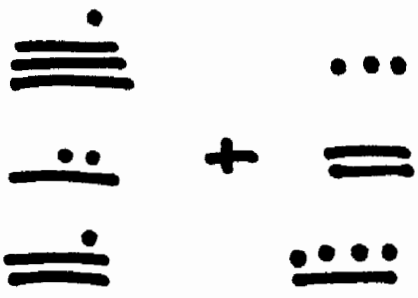
e) 15,162

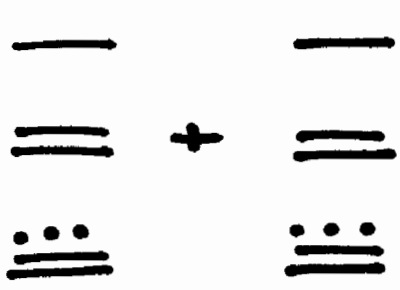
f) 144,001

3. Add the following Mayan Numerals (do not translate to Hindu-Arabic).

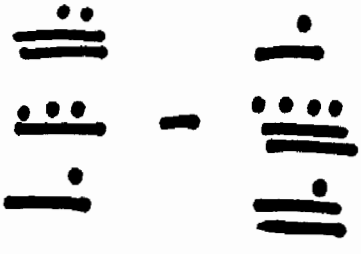
a) 

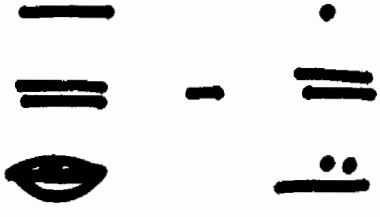
b) 

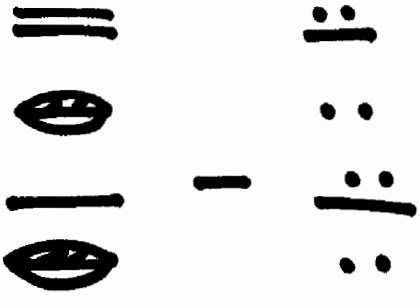
c) 

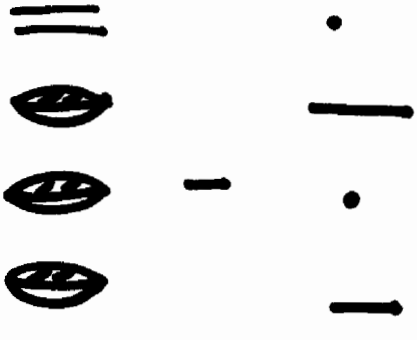
d) 

4. Subtract in Mayan (do not translate to Hindu-Arabic).

a) 

b) 

c) 

d) 

5. Write the largest possible Mayan number using only days, months, and years (3 "digits").

What is that number in Hindu-Arabic