

1) (3 points) Write the first 10 counting numbers (starting with 1) in base 4. You do not have to write the subscript:

1, 2, 3, 10, 11, 12, 13, 20, 21, 22

2) (3 points) Count from 63_{seven} to 101_{seven} . You do not have to write the subscript:

63, 64, 65, 66, 100, 101

3) (4 points a, b; 7 points c) Convert the following numbers to the given base:

a) 5322_{eight} to base 10

b) $2,001$ to base 7

$$5 \cdot 8^3 + 3 \cdot 8^2 + 2 \cdot 8^1 + 2 \cdot 8^0$$

2770

$$7^3 = 343$$

$$7^2 = 49$$

$$7^1 = 7$$

$$7^0 = 1$$

$$2001 \div 343 = 5 \text{ R } 286$$

$$286 \div 49 = 5 \text{ R } 41$$

$$41 \div 7 = 5 \text{ R } 6$$

$$6 \div 1 = 6 \text{ R } 0$$

5556_{seven}

c) 11110010_{two} to base 16

$$1 \cdot 2^7 + 1 \cdot 2^6 + 1 \cdot 2^5 + 1 \cdot 2^4 + 1 \cdot 2^1 = 242$$

$$16^1 = 16$$

$$16^0 = 1$$

$$242 \div 16 = 15 \text{ R } 2$$

$$2 \div 1 = 2 \text{ R } 0$$

F2_{sixteen}

4) (3 points) List the first 10 prime numbers starting with 2:

I saw the prime
and it opened up my eyes,
I saw the prime.

5) (3 points each) Write the prime factorization for the following numbers:

a) 228

b) 1075

$$\begin{array}{r} 11 \\ 4 \ 57 \\ 11 \ 11 \\ 2 \ 2 \ 3 \ 19 \end{array}$$

$$\begin{array}{r} 5 \ 215 \\ 5 \ 43 \end{array}$$

5² · 43

2² · 3 · 19

30

6) (3 points each) Label the following as either true or false. Use the word "true" or "false" to mark your answer. If false, explain why or give a counter-example:

a) $16 \mid 4$

False $16 > 4$

b) $4 \mid 16$

True

c) If 3 divides into a number and 4 divides into the same number, then 12 also divides into that number.

True

d) If 2 divides into a number and 4 divides into the same number, then 8 also divides into that number.

False! $2 \mid 4$ $8 \nmid 4$
 $4 \mid 4$

7) (3 points) What is the divisibility test for...

a) 4?

Last Christmas,
I gave you my divisibility test

b) 5?

8) (4 points each) Label the following numbers as perfect, abundant, or deficient. Be sure to show supportive work:

a) 6

proper: 1, 2, 3

$1 + 2 + 3 = 6$ perfect!

b) 17 proper: 1

$17 > 1$
deficient

c) 24

proper: 1, 2, 3, 4, 6, 8, 12

$1 + 2 + 3 + 4 + 6 + 8 + 12 = 36$
 $36 > 24$ abundant

9) (3 points each) A Goldbach number is a positive integer that is the sum of two odd prime numbers. The following numbers are Goldbach numbers. Determine two odd primes that add up to them:

a) 36

many pairs!

$5 + 31, 7 + 29, 13 + 23, 17 + 19$

b) 50

many pairs!

$3 + 47, 7 + 43, 13 + 37, 19 + 31$

c) Why must a Goldbach number be an even number?

whoza?

d) Why isn't 2 a Goldbach number where $1 + 1 = 2$?

whoze whatza?

yr

- 10) (5 points) Sally ordered McChickens from McRutrohs®. She had a total of 96 McChickens total from ordering some 6-packs, 9-packs, and 20-packs. (That is, at least one pack of each was ordered). Determine how many of each pack she ordered.

many answers.

$$\frac{6}{111} \quad \frac{9}{11} \quad \frac{20}{111}$$

3 6's, 2 9's, 3 20's

- 11) (5 points) For the numbers 140 and 550, find the GCF and the LCM using your favorite method. Be sure to label your answers:

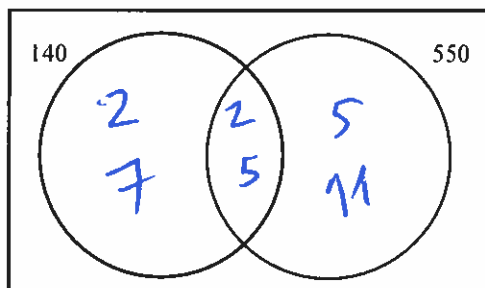
$$140 = 2^2 \cdot 5 \cdot 7$$

$$550 = 2 \cdot 5^2 \cdot 11$$

$$\text{GCF} : 2 \cdot 5 = 10$$

$$\text{LCM} : 2^2 \cdot 5^2 \cdot 7 \cdot 11 = 7700$$

- 12) (3 points) Using your work above, fill in the Venn Diagram for the numbers 140 and 550. The numbers in the 140 circle should multiply to 140. The numbers in the 550 circle should multiply to 550.



- 13) (4 points) Border guards are checking cars as they pass into Mathland, the happiest place on Earth. Border Guard Bell checks every 14th car, Border Guard Biv checks every 10th car, and Border Guard DeVoe checks every 4th car. What will be the first car checked by...

a) Bell and DeVoe?

$$14 = 2 \cdot 7$$

$$4 = 2 \cdot 2 = 2^2$$

$$\text{LCM} = 2^2 \cdot 7 = 28^{\text{th}}$$

b) All three?

$$14 = 2 \cdot 7$$

$$10 = 2 \cdot 5$$

$$4 = 2^2$$

$$\text{LCM} = 2^2 \cdot 5 \cdot 7$$

$$= 140^{\text{th}}$$

- 14) (4 points) Write the first 10 terms of the Fibonacci Sequence:

Rabbits.

- 15) (3 points) List two things you learned about the Golden Ratio while watching *Donald Duck in Mathmagic Land*.

ducks prefer wearing shirts
but not pants.

[Signature]