

1. [9 pts - 3 each] Circle the larger Roman numeral in each pair:

(a)

*CDXLIII*

*CDXCIV*

(b)

*LVIII*

*XCVIII*

(c)

*CMI*

*DCCI*

2. [6 pts] Create the smallest possible Roman numeral from these digits: *C, C, D, I, M, X, X*.

3. (a) [8 pts] Find all values of the digit  $d$  in the number  $152d2$  that make this number divisible by 4. Briefly explain your reasoning in a sentence.

(b) [5 pts] Demonstrate the test for divisibility by 11 on the number 31526. State your conclusion.

4. [8 pts] Use the definition of divides to decide whether this statement is true or false: “30 divides 15.” Show clear work and thorough explanation.
5. [6 pts] Show work in using the Divisibility-of-a-Sum Theorem to determine whether 20,999,999,979 is divisible by 21.
6. [5 pts] In a 1-600 Sieve of Eratosthenes, what is the largest number that will produce any “crossing out”?
7. [8 pts] True or false: If a number is divisible by 12 and 15, then it must be divisible by  $12 + 15$ . Justify your answer.

8. (a) *[8 pts]* How many different factors does the number  $3^5 \cdot 5^2 \cdot 11^4 \cdot 17^9$  have in all?
- (b) *[12 pts]* Find four of them that are between 30 and 200.
9. *[8 pts]* Use any technique to find the LCM (only!) of the numbers  $10^3 \cdot 7^2$  and  $14^2 \cdot 3$ .
10. *[8 pts]* Use listing to find the GCD of 40 and 108.
11. *[8 pts]* The LCM of  $a$  and 960 is 4800 and their GCD is 32. Find  $a$ . Show clear work.