

1) (4 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) 7|14 _____

true since
 $7 \cdot 2 = 14$

b) 8|4 _____

False. $\exists k \in \mathbb{Z}^+$
 $\Rightarrow 8 \cdot k = 4$

c) If 2 divides into a number and 6 divides into the same number, then 12 also divides into that number.

False 2|6, 6|6,
 But 12 \nmid 6.

d) If 12 divides into a number, then both 2 and 6 must also divide into that number.

True!

2) (4 points) List the first 15 prime numbers starting with 2:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31,
 37, 41, 43, 47

3) (4 points each) Write the prime factorization for the following numbers:

a) 108

$$\begin{array}{r} / \quad / \\ 2 \quad 54 \\ / \quad / \\ 2 \quad 27 \\ / \quad / \\ 3 \quad 9 \\ / \quad / \\ 3 \quad 3 \end{array}$$

 $2^2 \cdot 3^3$

b) 350

$$\begin{array}{r} / \quad / \\ 10 \quad 35 \\ / \quad / \quad / \quad / \\ 2 \quad 5 \quad 5 \quad 7 \end{array}$$

 $2 \cdot 5^2 \cdot 7$

4) (3 points) What is the divisibility test for...

a) 6?



YAY Fibon &
 Golden Ratio!

b) 9?



5) (5 points each) Label the following numbers as perfect, abundant, or deficient. Be sure to show supportive work:

a) 6
 \downarrow
 $1, 2, 3$
 $\underbrace{\hspace{2cm}}$
 sum is 6 = perfect!

b) 17
 \downarrow
 $1 < 17$
deficient

c) 24
 \downarrow
 $1, 2, 3, 4, 6, 8, 12$
 $\underbrace{\hspace{2cm}}$
 sum is 36 > 24
Abundant

6) (5 points each) A Harshad Number is a positive integer which is divisible by the sum of its digits. For example, the number 18 has digits 1 and 8 whose sum is 9. Note that $9|18$. Determine if the following numbers are Harshad Numbers. Be sure to show supportive work:

a) 24
 $2 + 4 = 6$
 $6 | 24 \checkmark$
 $\therefore 24$ is a Harshad Number

b) 37
 $3 + 7 = 10$
 $10 \nmid 37$
 Nope!

c) 190
 $1 + 9 + 0 = 10$
 $10 | 190 \checkmark$
 $\therefore 190$ is a Harshad Number

7) (5 points) Patrick needs to order a total of 46 SpongeBob hats for his math class. The hats are only sold in packs of 3, 7, and 11. How many of each pack would he need to get a total of 46 hats?

$3 \cdot 0 + 7 \cdot 5 + 11 \cdot 1$ many answers!
 $3 \cdot 8 + 7 \cdot 0 + 11 \cdot 2$ may be more!
 $3 \cdot 2 + 7 \cdot 1 + 11 \cdot 3$

8) (6 points) For the numbers 126 and 140, find the GCF and the LCM using your favorite method. Be sure to label your answers:

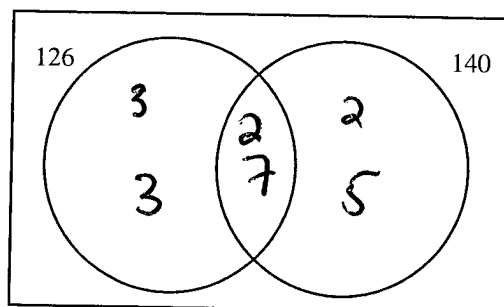
$126 = 2 \cdot 3^2 \cdot 7$

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

GCF: $2 \cdot 7 = 14$

LCM: $2^2 \cdot 3^2 \cdot 5 \cdot 7 = 1260$

9) (4 points) Using your work above, fill in the Venn Diagram for the numbers 126 and 140:



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