

- 1) (3 points) Write the first 12 counting numbers (starting with 1) in base 5. You do not have to write the subscript:

1, 2, 3, 4, 10, 11, 12, 13, 14, 20, 21, 22

- 2) (3 points) Count from $52D_{\text{sixteen}}$ to 532_{sixteen} . You do not have to write the *sixteen* each time:

52D, 52E, 52F, 530, 531, 532

- 3) (5 points a, b; 10 points c) Convert the following numbers to the given base:

- 8) Convert the following numbers to the given base:

- a) 514_{seven} to base 10

- b) 2,330 to base 8

$$5 \cdot 7^2 + 1 \cdot 7^1 + 4 \cdot 7^0 = \boxed{256}$$

$$\begin{aligned} 8^3 &= 512 & 2330 \div 512 &= 4 \text{ R } 282 \\ 8^2 &= 64 & 282 \div 64 &= 4 \text{ R } 26 \\ 8^1 &= 8 & 26 \div 8 &= 3 \text{ R } 2 \\ 8^0 &= 1 & 2 \div 1 &= 2 \text{ R } 0 \end{aligned}$$

4432eight

- c) 1412_{six} to base 9

$$1 \cdot 6^3 + 4 \cdot 6^2 + 1 \cdot 6^1 + 2 \cdot 6^0 = 368$$

$$\begin{aligned} 9^2 &= 81 & 368 \div 81 &= 4 \text{ R } 44 \\ 9^1 &= 9 & 44 \div 9 &= 4 \text{ R } 8 \\ 9^0 &= 1 & 8 \div 1 &= 8 \text{ R } 0 \end{aligned}$$

448nine

- 4) (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) $7 \mid 14$ _____

true

- b) $8 \mid 4$ _____

False $8 > 4$

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

False $2 \mid 6, 6 \mid 6$
 $6 \nmid 12 \times 6$

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

true

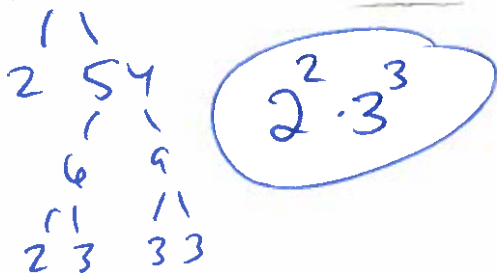
$\frac{2}{38}$

5) (3 points) List the first 10 prime numbers:

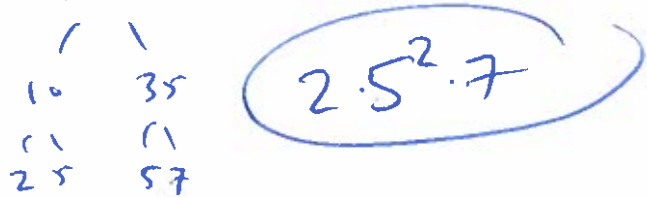
2, 3, 5, 7, 11, 13, 17, 19, 23, 29

6) (3 points each) Write the prime factorization for the following numbers:

a) 108



b) 350



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

a) 6?

words

b) 9?

moar words

8) (5 points each) Label the following numbers as perfect, abundant, or deficient. Be sure to show supportive work:

a) 6

1, 2, 3 - proper factors
 $1 + 2 + 3 = 6$ perfect

b) 17

1 - proper factor
 $17 > 1$
deficient

c) 24

1, 2, 3, 4, 6, 8, 12 - proper
 $1 + 2 + 3 + 4 + 6 + 8 + 12 = 36$
 $24 < 36$
abundant

9) (4 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 $9 \mid 18$. Determine if the following numbers are Harshad Numbers. Be sure to show supportive work:

a) 24

$2 + 4 = 6$
 $6 \mid 24$ ✓
 yes!

b) 37

$3 + 7 = 10$
 $10 \nmid 37$
 no

36

- 10) (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?

many
Answers

$\begin{array}{l} 5 \text{ packs of } 7 \\ 1 \text{ pack of } 11 \end{array}$	$\begin{array}{l} 6 \text{ packs of } 3 \\ 2 \text{ packs of } 11 \end{array}$	$\begin{array}{l} 2 \text{ packs of } 7 \\ 1 \text{ pack of } 7 \\ 3 \text{ packs of } 11 \end{array}$
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- 11) (6 points) For the numbers 126 and 140, find the GCF and the LCM using your favorite method. Be sure to label your answers:

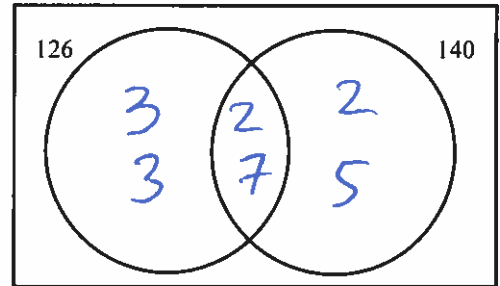
$$126 = 2 \cdot 3^2 \cdot 7$$

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

$$\text{GCF} = 2 \cdot 7 = 14$$

$$\text{LCM} = 2^2 \cdot 3^2 \cdot 5 \cdot 7 = 1260$$

- 12) (4 points) Using your work above, fill in the Venn Diagram for the numbers 126 and 140:



- 13) (4 points) SpongeBob, Patrick, and Sandy work at the Krusty Krab to check Krabby Patties for freshness. SpongeBob checks every 12th patty, Patrick checks every 8th patty, and Sandy checks every 21st patty. What will be the first patty checked by all three?

SB $12 = 2^2 \cdot 3$

Pat $8 = 2^3$

Sandy $21 = 3 \cdot 7$

$$\text{LCM} = 2^3 \cdot 3 \cdot 7 = 168^{\text{th}} \text{ patty}$$

- 14) (4 points) Given that the first two terms of the Fibonacci Sequence are 1 and 1, write the next 6 terms and also explain how you find them (i.e. explain the process of getting the next terms):

words + numbers

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

bees are wonderful

all hail the bees