Title of Document

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1 Terminology

1.1 T1

a divides b, or $a|b$, means $a \equiv 0(\mod b)$. a/b has a remainder of 0

1.2 T2

a is congruent to b modulo m, or $a \equiv b(\mod m)$, means when a is divided by m there is a remainder of b.

2 Exploration

2.1 E1

- a. The base seven equivalent of 97 is 166.The base seven equivalent of 512 is 1331.
- b. $(365 + 104 = 502)_7$
- c. The integer is divisible by 7 if a_0 is 0. The integer is divisible by 6 if the sum of the base-7 digits, $a_n + a_{(n-1)} + ...a_1 + 1_0$ is divisible by 6. This is because $7^n - 1$ is always divisible by 6.

  The integer is divisible by 8 if alternating adding and subtracting the digits, $a_n - a_{(n-1)} + a_{(n-2)}...a_0$, is divisible by 8.

2.2 E2

1, 2, 4, 8, 16, 31... kinda 2^n regions?

3 Numerical Problems

3.1 N1

- a. $519 = 163 \times 3 + 30$
  $163 = 30 \times 5 + 13$
  1

- b. x=121 y=-38

3.2 N2

$221 = 65 \times 3 + 26$
$65 = 26 \times 2 + 13$
$26 = 13 \times 2$
$gcd(221, 65) = 13$
13=65-26*2
26=221-65*3
13=65-(221-65*3)*2=65-221*2+65*6=65*7+221*(-2)

this means all multiples of 13 can be expressed this way

3.3 N3

x=1016 y=-3081, 4388

4 Additional Topics

4.1 A1

1+3(5+1 $\frac{}{2+\frac{1}{3+\frac{1}{4}})5+\frac{1}{2+\frac{1}{3+\frac{1}{4}}}}$