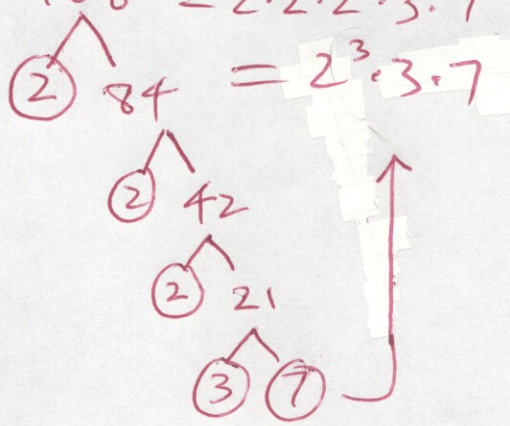
Ch. 5 – Number Theory

5.1 Quick Tests for Divisibility

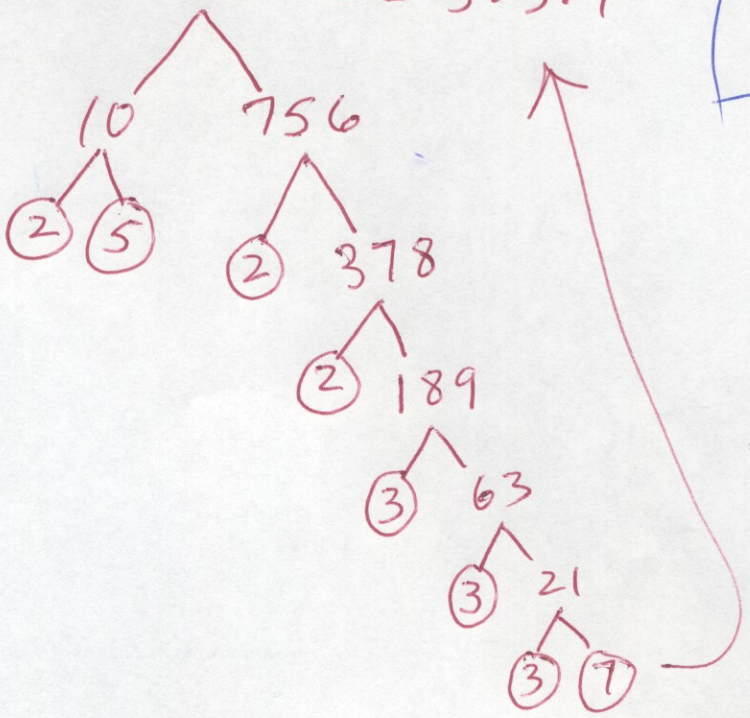
e.g. ① Prime Factor 168

Using a "Factor Tree"



② Prime Factor 7560

$7560 = 2^3 \cdot 3^3 \cdot 5 \cdot 7$



Recall

A prime number is a whole number greater than 1 whose ONLY factors are 1 and itself.

⇒ 2, 3, 5, 7, 11, 13, 17, 19, 23, ...

* with a ~~zero~~ remainder.

n	A number is divisible* by n if
2	if ends w/ 0, 2, 4, 6, or 8 (i.e. even)
3	if the "sum of the digits" is divisible by 3
4	if the last 2 digits (as a 2-digit ##) is divisible by 4.
5	if it ends w/ "0" or "5"
6	it must be divisible by both 2 AND 3.
8	if the last 3-digits (as a 3-digit ##) are divisible 8.
9	if the "sum of the digits" is divisible by 9.
10	if it ends with "0"
11	if the "Alternating Sum of digits" is divisible by 11.
12	it must be divisible by both 3 AND 4.

eg. ① Is 62,173,107 divisible by 9?

Sum of digits = 6+2+1+7+3+1+0+7
= 27 = 3·9 YES!!

② Is 280,022 divisible by 6?

- is Even, so 2 is a factor!
- Sum of Digits = 14 Not Divisible by 3

⇒ No

e.g. (3) Check 55,698,072 for divisibility by 11 & 12.

- For 11

Alternating sum = +5−5+6−9+8−0+7−2
= 10 No!

- For 12:
  - Divisible by 4?
    Yes, since 72 is divisible by 4.
  - Divisible by 3?
    No, since the sum of the digits = 42, which is divisible by 3

⇒ Thus, so is 12 a factor.

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(4) Is 1,083,279,316 divisible by 8 and 9?

- For 8 - No, since 316 isn't.
- For 9 - No since the sum of the digits = 40, which is not divisible by 9.
