Example: Finding GCD (最大公因數)

- Basic steps
  - Factor each number
  - Find the factors that are common between both numbers
  - Multiply the common factors together to get the greatest common divisor

Finding 最大公因數

- Ex: two numbers 40, 48
- Basic steps
  - Factor each number
    - 40 = 2 * 2 * 2 * 5
    - 48 = 2 * 2 * 2 * 2 * 3
  - Find the common factors
    - 2 * 2 * 2
  - Multiply the common factors to get the greatest common divisor
    - GCD = 2 * 2 * 2 = 8

It will take a long time

Euclid's Algorithm for GCD (1)

- Basic steps
  - Larger number = larger number – smaller number
  - If the numbers are the same, it is the greatest common divisor, otherwise go to step 1

Euclid's Algorithm for GCD (2)

- Two numbers 48, 40
- Basic steps
  - 48, 40 → 48 – 40 = 8 40
  - 8 != 40, so repeat step 1
  - 8, 40 → 40 – 8 = 32 8
  - 8 != 32, so repeat step 1
  - 8, 32 → 32 – 8 = 24 8
  - 8 != 24, so repeat step 1
  - 8, 24 → 24 – 8 = 16 8
  - 8 != 16, so repeat step 1
  - 8, 16 → 16 – 8 = 8 8
  - 8 = 8, so 8 is the GCD

Euclid's Algorithm for GCD (3)

```
int find_gcf(int a, int b)
{
  /* assumes both a and b are greater than 0 */
  while (a!=b) {
   if (a > b)
      a = a - b;
   else
      b = b - a;
  }
   return a;
}
```