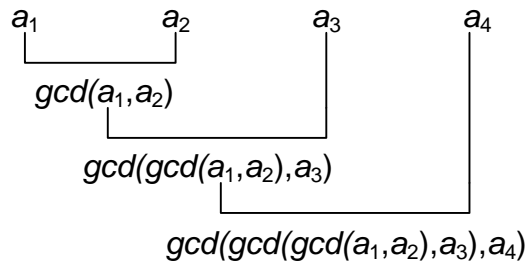# Greatest common divisor
Least common multiple

E-OLYMP 137. GCD Find the Greatest Common Divisor of n numbers.

► It is known that
$$\text{GCD}(a_1, a_2, \ldots, a_i) = \text{GCD}(\text{GCD}(a_1, a_2, \ldots, a_{i-1}), a_i)$$
We shall sequentially calculate the greatest common divisor of two, three,…, n numbers. For example, for four numbers holds an equality:
$$\text{GCD}(a_1, a_2, a_3, a_4) = \text{GCD}(\text{GCD}(\text{GCD}(\text{GCD}(0, a_1), a_2), a_3), a_4)$$

Ler *res* be the Greatest Common Divisor of n numbers. Initialize it with 0. Read the input data and sequentially find GCD of n numbers.

```
res = 0;
scanf("%d", &n);
while (n--)
{
  scanf("%d", &b);
  res = gcd(res, b);
}
```

E-OLYMP 7363. GCD Find the sum of two proper fractions a / b and c / d. Give the result in the form of irreducible fraction. If the result is an integer, print this one integer.

► It's obvious that $\dfrac{a}{b} + \dfrac{c}{d} = \dfrac{ad + bc}{bd}$. It remains to simplify the resulting fraction by their greatest common divisor.

E-OLYMP 136. The segment The segment's end points have integer coordinates. Find the number of points on a segment with integer coordinates.
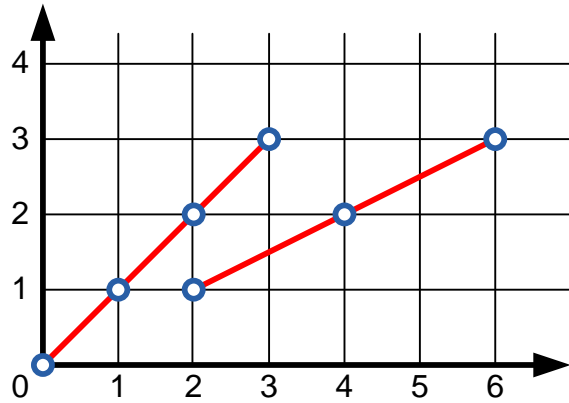
► If (x_1, y_1) and (x_2, y_2) are ends of a segment with integer coordinates, then it contains $1 + \text{GCD} (|x_2 - x_1|, |y_2 - y_1|)$ points with integer coordinates.

For the first sample input the answer is
$$1 + \text{GCD} (|3 - 0|, |3 - 0|) = 1 + \text{GCD} (3, 3) = 1 + 3 = 4$$
For the second sample input the answer is
$$1 + \text{GCD} (|6 - 2|, |3 - 1|) = 1 + \text{GCD} (4, 2) = 1 + 2 = 3$$

E-OLYMP 6941. Sum of GCD Given n positive integers, you have to find the summation of GCD (greatest common divisor) of every possible pair of these integers.

► For each test case, put the input numbers into mas array. Next, for each pair (i, j) $(0 \le i < j < m)$ calculate the GCD (mas[i], mas[j]) and add it to the overall sum.

```
s = 0;
for (i = 0; i < m; i++)
for (j = i + 1; j < m; j++)
  s += gcd(mas[i], mas[j]);
```