GCD

gcd(a, b)

$\frac{1}{0}$ Not defined

$\frac{0}{20}$?

$0 \times 20 = 0$

$0 = \frac{0}{20}$ =

$-3 \times -1 = 5$

⇒ 5, 15 → 5

12, 8 → 4

20, 0 → 20

(20)

gcd(A, 0) → A

⇒ -5, -10 → 5

-5

1

6, 1 → 1

gcd(A, 1) → 1

GCD(A, B, C) = GCD(GCD(A, B), C)

= GCD(GCD(A, C), B)

= GCD(GCD(B, C), A)

(4) (16, 24)

4 ← 8

GCD(A, B) = GCD(B, A)

(A, B) → min-gcd = b

max-gcd = min(A, B)

```
gcd = 1;
for (i = min(A,B) ; i > 1 ; i--) {
    if (A % i == 0
        &&
        B % i == 0)
        return i;
}
gcd
```

O(n)

A , B

B > A

B - A = C

gcd(A, B) = g

gcd(A, A+C) = g

A + C

A % g = 0

(A+C) % g = 0

C % g = 0

A % g = 0

gcd(A, B-A) = g

gcd(A, B) = gcd(A, B-A)

gcd(a, b) {

10, 8

min max

8 10

=> => min = Min(a, b);

max = Max(a, b);

-> if (min == 0) return max

8 2

2 8

2 6

2 4

2 2

0 2

⇒ if (min == 0 || max == min) return 1;

else gcd(min, max - min).

3 % 10 = 0

g | A, B

B > A

B - A = C

⇒ A % g = 0

B % g = 0

(A + C) % g = 0

C % g = 0 g' ?

B → (A + C) % g' = 0

A % g' = 0

B > A

B = A + C

⇒ B = C1 A + C2

gcd(A, B) = gcd(A, (C1 A + C2))

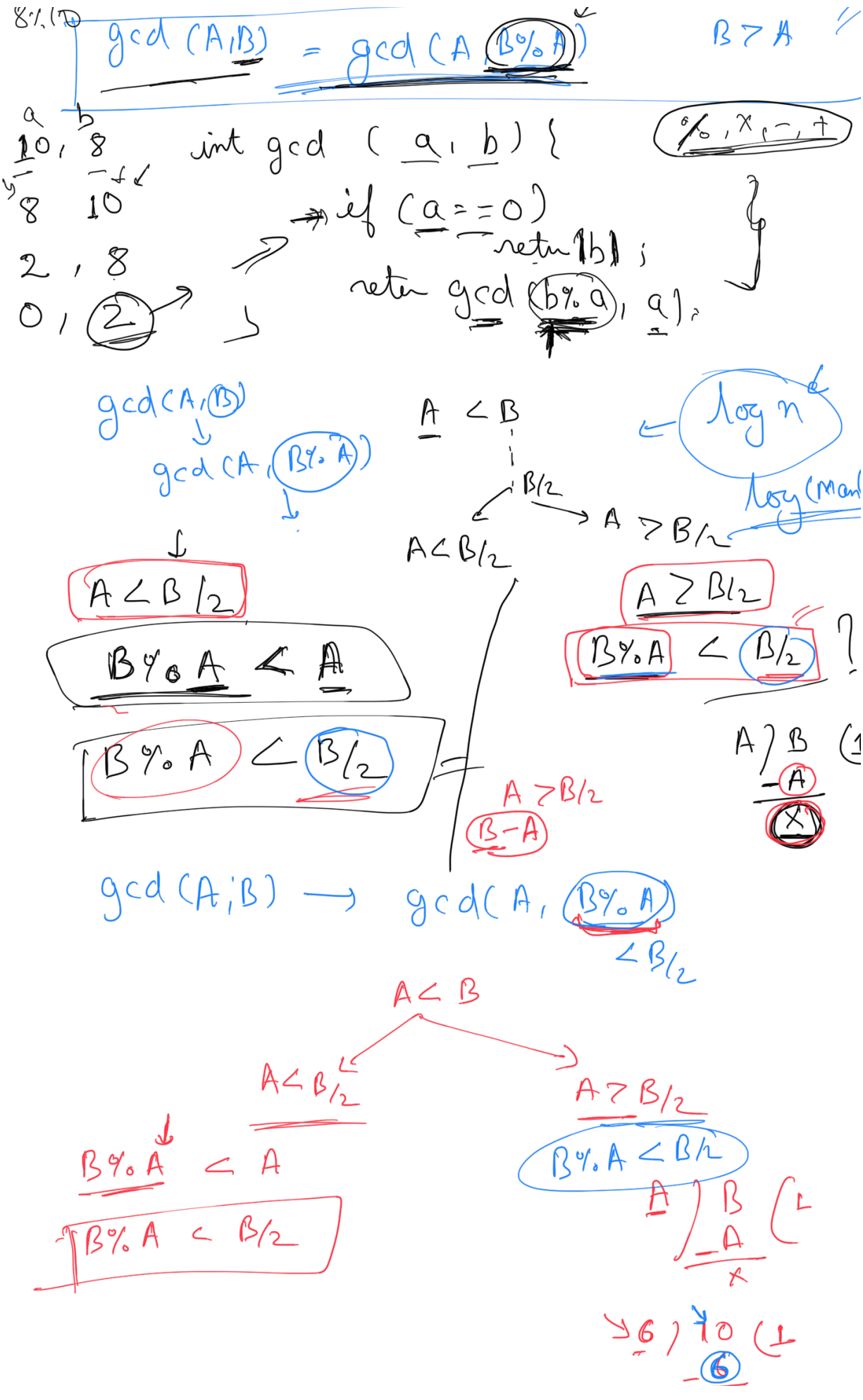
g = gcd(A, B)

⇒ A % g = 0

⇒ (C1 A + C2) % g = 0

C2 % g = 0 C2 = 0

g = gcd(A, B % A)


gcd(A,B) = gcd(A, B%A)
B > A
a b
10, 8
8 10
2, 8
0, 2
int gcd (a, b) {
if (a==0)
return b;
return gcd(b%a, a);
}
%, x, -, +
gcd(A,B)
gcd(A, B%A)
A < B
B/2
A > B/2
log n
log(max
A<B/2
A≥B/2
B%A < A
B%A < B/2
B%A < B/2
A > B/2
B-A
A) B (1
A
X
gcd(A;B) → gcd(A, B%A)
< B/2
A < B
A<B/2
A>B/2
B%A < A
B%A < B/2
B%A < B/2
A) B (1
A
X
6) 10 (1
6

4

[3, 4, 6] → 9

[3, 4, 8, 6] → 3!, 4!, 8!, 6! → 6

13, 24, 8, 5 → ⇒ 120

6, 12, 18

2 × 3
2 × 2 × 3
2 × 3 × 3

2 × 3

3, 4, 8, 6

3! = 1 × 2 × 3
4! = 1 × 2 × 3 × 4
8! = 1 × 2 × 3 × 4 × 5 ×
6! = 1 × 2 × 3 × 4 ...

1 × 2 × 3

3! × 4
3! × 4 ×
3! × 4 × 5

→ 2, 4, 8, 10 ⇒ F

4, 6, 3, 10

↳ (4, 3) → 1

gcd(SubSq) = 1 ?

T

14, 9, 26 → F

↳ gcd(14, 9) = 1

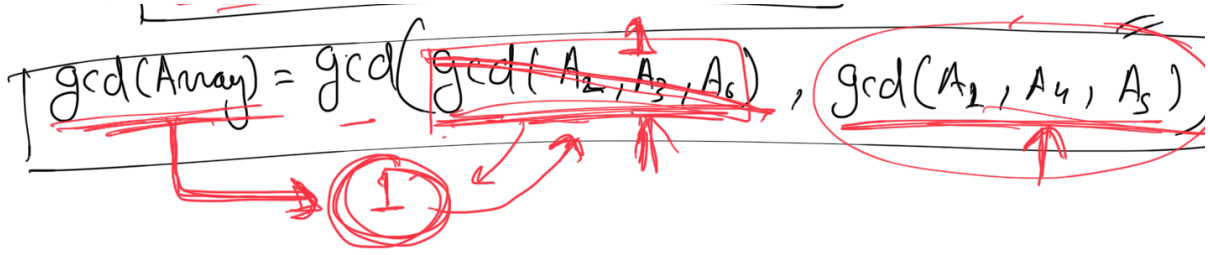
2^N

⇒ [A1, A2, A3, A4, A5, A6]

⇒ gcd(A2, A3, A6) = 1

$n \log M$

(a, b) → log M



1, 4, 5 → 1

gcd(any) = 1

2, 10, 8 → -1

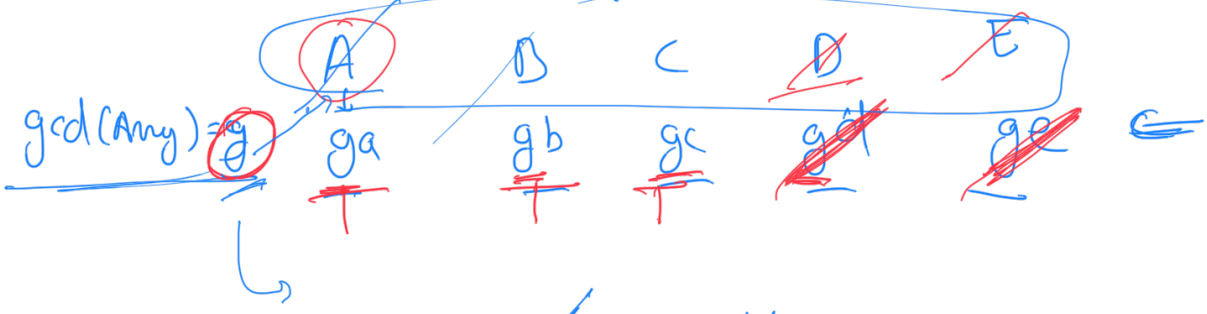
2, 3, 4 → 0

4, 5, 20 → 0

5, 10, 3, 9 → 0

4, 10, 20 → -1

↳ 2 → 10



2, 8, 16 → 2

↳ 8

⇒ 15, 12, 18

12, 18 → 6

15, 18 → 3

12, 15 → 3

13, 2, 4, 8 → 1

↳ 2

2, 4, 6, 8 ... 131

15, 12, 18

(N-1)

$A_1, A_2, A_3, A_4, A_5, A_6$

15, 12, 18

P-gcd	15	3	3
S-gcd →	3	6	18

gcd(15, 18)

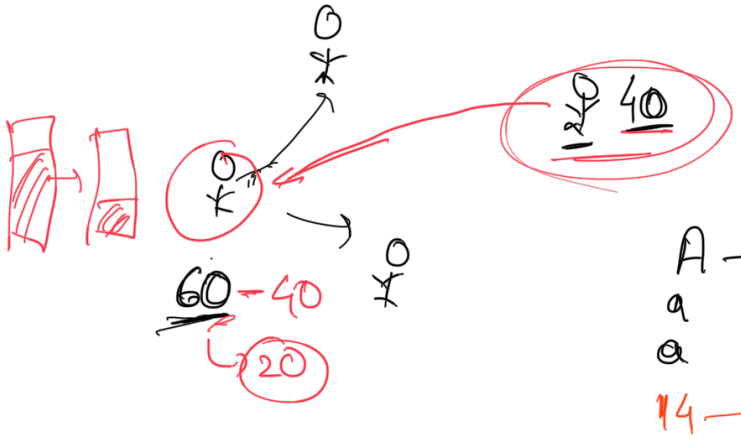
for each i

$g = gcd(P\text{-}gcd(i-1), S\text{-}gcd(i+1))$

3, 6, 12, 1, 18, 21

P-gcd	3	3	3	1	1	1
S-gcd	1	1	1	1	3	21

3



14, 28, 56

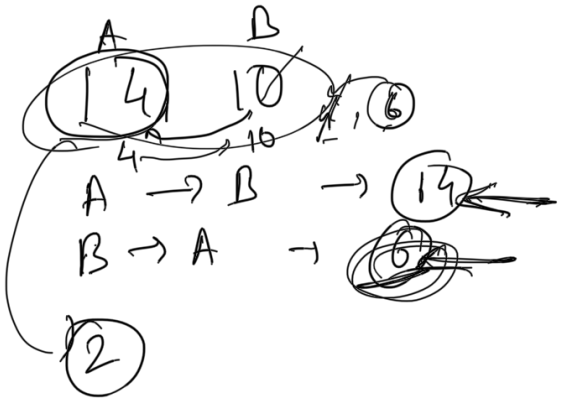
A	B
a	b
a	(b-a)
14	14
2	14 12

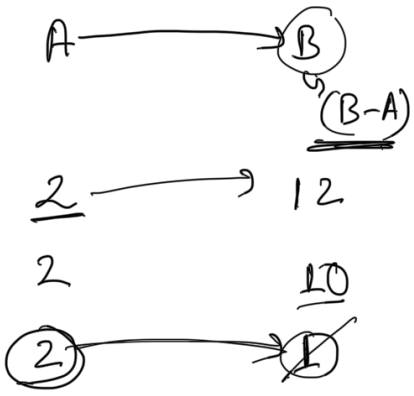
→ 2

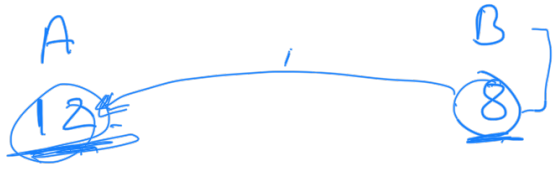
14, 2, 26, 56

14, 2, 26, 30

14, 2, 28, 56







4, 8

4, 4

A → B ⇒ 12

B → A

gcd (gcd(14,2)

gcd(28,56)

14, 2

28, 56

12, 2

10, 2

2, 0

(28, 28)

28, 0

(2, 2)

(2, 0)

---

① B % A =

② Sub Sy -

GCD (A, B) → g

40%

B > A

$B = qA + r$

$GCD(A, B) = GCD(A, (qA + r)) =$

A

5

x –

$\Rightarrow A \% g = 0$ –

$(qA + r) \% g = 0$ –

$x > g$

$A \% x = 0$

$r \% x = 0$

$(qA + r) \% x = 0$

$\rightarrow r \% g = 0$

$GCD(A, r) = g$

$GCD(A, B \% A) = g$

B

$GCD(A, B) = x$

$GCD(A, B) = GCD(A, B \% A)$

6, 3, 10, 4, 2

2^N

A_1, A_2, A_3, A_4, A_5

$\Rightarrow gcd(A_2, A_4, A_5) = 1$

$gcd(array) = gcd(gcd(A_2, A_4, A_5), gcd(A_1, A_3))$

1 1

$gcd(1, x)$

$= 1$

$gcd(A, B)$

$B \% A$

B_2

$gcd(A, A)$

$gcd(y)$

$man(B \% A)$

$A < B/2$

$B \% A < A$

$B \% A < B/2$

B A

10, 6

$A > B/2$

$B \% A$

$A > B/2$

A) B (1

A

x

$B - A < B/2$

$B - B/2 = B/2$

$B \% A < B/2$