Mathematics — Ganita Manjari

Chapter 11 Test 6

The World of Algorithms

Class IX | 2026–27

Time Allowed: 45 Minutes | Maximum Marks: 25

General Instructions

1. All 13 questions are compulsory. Choose one option in A; show working in B–D.
2. No calculators. Give exact answers unless an approximation is requested.
3. Unless stated otherwise, inputs are positive integers. Give precise algorithm steps.

SECTION A

(5 questions × 1 mark = 5 marks)

1. For $m > n > 0$, Euclid's subtraction step changes $gcd(m, n)$ into:

(A) $gcd(m + n, m - n)$ (B) $gcd(n, m - n)$

(C) $m - n$ immediately (D) mn

2. With inputs (14, 35), what must the ordered subtraction algorithm do before its first subtraction?

(A) Swap to (35, 14) (B) Return 14

(C) Subtract 35 from 14 (D) Return 49

3. After one subtraction reduction, the pair (17, 17) becomes:

(A) (0, 0) (B) (34, 17)

(C) (17, 1) (D) (17, 0)

4. After replacing an ordered positive pair (m, n) by $(n, m - n)$, which quantity strictly decreases?

(A) The GCD

(B) The number of common divisors

(C) The sum of the two inputs

(D) Every divisor of the inputs

5. If one positive input is 1, the GCD can be reported immediately as:

(A) The other input (B) 1

(C) 0 (D) Their sum

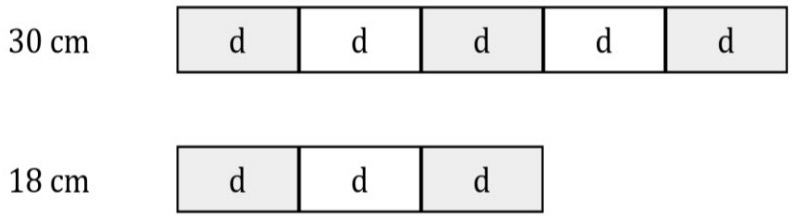
SECTION B

(4 questions × 2 marks = 8 marks)

6. Find $gcd(42,30)$ using subtraction. Show the ordered pair after each subtraction, reordering when necessary; do not count swaps as reductions.

7. A student changes (9, 24) directly into (24, −15). Explain the error and give the correct first reduction in the non-negative subtraction algorithm.

8. In figure, every small block has the same length d. The upper strip is 30 cm and the lower strip is 18 cm. Find d and the length left after removing a lower-strip length from the upper strip.



9. Why must the subtraction routine stop at (11, 0), instead of performing another reduction?

SECTION C

(3 questions × 3 marks = 9 marks)

10. For $m > n > 0$, prove that the common divisors of m, n are exactly those of $n, m - n$.

11. Justify that repeated ordered subtraction on two positive integers eventually reaches a pair containing zero.

12. Starting from $(N, 1)$ with positive integer N, how many subtraction reductions are needed to reach (1, 0)? Count a reduction to zero, but do not count swaps. Explain why digit count alone does not describe this work.

SECTION D

(1 application question × 3 marks = 3 marks)

13. A worker cuts ropes of 42 m and 66 m into equal pieces with no waste and claims that 12 m is the greatest possible piece length. Use subtraction to assess the claim and find the total number of pieces.