

# A Book of Abstract Algebra | (2nd Edition)

Chapter AB, Problem 13E

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## Problem

Prove that the following are true for any integers  $a$ ,  $b$ , and  $c$ :

If  $\gcd(a, b) = c$ , then  $\text{lcm}(a, b) = ab/c$ .

## Step-by-step solution

### Step 1 of 2

#### Objective:-

The objective is to prove if  $\gcd(a, b) = c$ , then  $\text{lcm}(a, b) = \frac{ab}{c}$ .

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### Step 2 of 2

Proof:-

Let us consider the theorem.

**Theorem:-**If  $p$  and  $q$  are two integers with greatest common divisor  $\gcd(p, q)$  and least common multiple  $\text{lcm}(p, q)$ , then

$$p \times q = \gcd(p, q) \times \text{lcm}(p, q)$$

Let us suppose  $\gcd(a, c) = c$ . Then by above theorem:-

$$a \times b = c \times \text{lcm}(a, b)$$

$$ab = c \cdot \text{lcm}(a, b)$$

$$\text{lcm}(a, b) = \frac{ab}{c}$$

Proved

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