Lemma: If p is prime and $p \mid ab$, for $a, b \in \mathbb{Z}$, then either $p \mid a$ or $p \mid b$.

Proof. Case 1. Let $p \nmid a$.
RTP: $p \mid b$.

Since $p \nmid a$, $\gcd(p, a) = 1$.

Lemma: If $g = \gcd(a, b)$, then $g = a \cdot x + b \cdot y$ for some integers x and y.

$$\left.\begin{aligned} a &= 2 \\ b &= 7 \end{aligned}\right\}$$

$7 = 3 \times 2 + 1 \longrightarrow$ (1)

$2 = 2 \times 1 + \boxed{0} \longrightarrow$ (2)

$$\therefore\ 1 = \gcd(2, 7) = 7 - 3 \times 2$$
$$= (-3) \times 2 + 1 \times 7$$
$$= a \cdot x + b \cdot y, \quad x = -3,\ y = 1$$

Since $1 = \gcd(p, a)$, $p \cdot x + a \cdot y = 1 \cdots$ (3)

for some integers x and y.

Given: $p \mid ab \Rightarrow ab = p \cdot z$ for some integer z. $\cdots$ (4)

Now, $b = b \cdot 1 = b(px + ay)$
$$= (bp)x + (ab)y$$
$$= (bp)x + pz \cdot y$$
$$= (bx + yz) \cdot p$$
$$= l \cdot p, \quad l = bx + yz \in \mathbb{Z}.$$

$\Rightarrow \boxed{p \mid b.}$

Case 2. Let $p \nmid b$.
RTP: $p \mid a$.
Similar to Case 1.

$5 \mid \overset{a}{3}(\overset{b}{2b + 3a})$
$5 \leftarrow$ prime
$p \mid ab$
$p \mid a$ or $p \mid b$
$5 \nmid 3$
$5 \mid (2b + 3a)$
$\Rightarrow$ b Pa holds