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Direct Proof & Counterexample: Divisibility

Notes

- **Divisibility**. ($d|n$ reads "d divides n")

$$d|n \leftrightarrow \exists \text{ an integer } k \text{ such that } n = dk.$$

- Division is transitive.
- **Unique Factorization of Integers Theorem.** Given any integer $n > 1$, there exists a positive integer k, distinct prime numers $p_1, p_2, ..., p_k$, and positive integers $e_1, e_2, ..., e_k$ such that

$$n = p_1^{e_1} p_2^{e_2} p_3^{e_3} ... p_k^{e_k}$$

Test Yourself

1. there exists k such that $n = kd$.
2. n; d.
3. a; b.
4. $\frac{n}{d}$ is not an integer.
5. a divides b; a divided by b.
6. $a|b$ and $b|c$; $a|c$.
7. divisble by at least one prime.
8. prime; a product of primes; order.