Instructor Manual: The Division Algorithm

Example 1 Solution: 101 divided by 11.

We want integers q and r such that 101 = 11q + r with $0 \leq r < 11$.

11 * 9 = 99, so r = 101 - 99 = 2. Thus q = 9, r = 2.

Example 2 Solution: -11 divided by 3.

We want -11 = 3q + r with $0 \leq r < 3$.

Try q = -4: 3(-4) = -12, so r = -11 - (-12) = 1. Thus q = -4, r = 1.

Practice Problems:

1. 123 divided by 7: 7*17 = 119, remainder 4. Answer: q = 17, r = 4.

2. -25 divided by 4: q = -7, r = 3 (since -25 = 4(-7) + 3).

3. 250 divided by 13: 13*19 = 247, remainder 3. Answer: q = 19, r = 3.

Python Modulo Discussion:

Python's % operator always returns a remainder r such that $0 \leq r < divisor$. This matches the Division Algorithm requirement. For example, -11 % 3 = 1, not -2, because Python ensures non-negative remainders.