

Recover the Starting Value

An observed total is not necessarily the start

A supplied linear model on $0 \leq t \leq 8$ has points (2, 11) and (5, 17), in minutes and liters. Rate = $(17 - 11) \div (5 - 2) = 2$ liters per minute. At two minutes, 4 liters come from change after the start, so $b = 11 - 4 = 7$ liters. The rule $V = 2t + 7$ matches both observations. Calling 11 the start would count the two-minute change twice.

For a decrease, subtract the signed changing part: on $0 \leq t \leq 6$, if $m = -2$ liters per minute and $V = 9$ liters at $t = 3$, then $b = 9 - (-2 \times 3) = 15$ liters. The expression $15 - 2t$ returns 9 at minute 3. Subtracting a negative change adds its magnitude.

Your new practice

A supplied linear model of water remaining, valid from 0 to 6 minutes, has rate -1.5 liters per minute and 16 liters at minute 2. Find its total at zero, write a rule and check the two-minute value. Predict the amount at minute 5. Explain what the negative sign belongs to.

Your calculation, rule and interpretation

Use $b = \text{observed output} - m \times \text{observed input}$. If zero is outside the stated domain, the expression's value there need not be a modeled starting amount.