

ART OF PROBLEM SOLVING

Show your reasoning. Use graph paper for models and additional work.

1. Rewrite each subtraction as addition of a negation, then evaluate: $14 - 23$, $-8 - 17$, and $12 - (-9)$.
2. Evaluate $18 - 7 - 18 + 7$ from left to right. Then regroup it by first rewriting every subtraction as addition. Why is regrouping now valid?
3. Find the missing integer: $-13 - x = 21$. Check your answer in the original equation.
4. Compute both $a - b$ and $b - a$ when $a = -7$ and $b = 12$. What relationship do you notice? State the relationship for any integers a and b .
5. Give an example showing that subtraction is not associative; that is, show that $(a - b) - c$ need not equal $a - (b - c)$.

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6. The temperature rises from -16°F to 11°F . Write a subtraction expression for the change and evaluate it.
7. Find all integer pairs (a, b) such that $a - b = 8$, $|a| \leq 5$, and $|b| \leq 5$.
8. Simplify $-(a-b)-(b-a)$ without substituting numbers. Explain each use of negation or subtraction.
9. Integers $x < y < z$ satisfy $y - x = 7$ and $z - y = 4$. Find $z - x$ without choosing values for x , y , and z . Explain why your answer must always be the same.