Extending Patterns

Key idea

First find **how it grows**:

Linear: same 1st difference.
Quadratic: same 2nd difference.
Exponential: same ratio.

Linear (add)

$4,\ 7,\ 10,\ 13, \ldots$ adds 3 each time.

Next: $16,\ 19,\ 22$.

Exponential (multiply)

$3,\ 6,\ 12,\ 24, \ldots$ multiplies by 2 each time.

Next: $48,\ 96$.

Common mistake

A large answer does **not** prove a pattern is exponential.

Always check the difference or the ratio first.

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Quadratic Patterns

Key idea

A quadratic pattern has a constant **second** difference: the first differences rise by the same amount.

Example

$2,\ 5,\ 10,\ 17, \ldots$

Differences $+3, +5, +7$.

Next $+9, +11$, so $26,\ 37$.

Example

$3,\ 8,\ 15,\ 24,\ 35, \ldots$

Differences $+5, +7, +9, +11$.

Next $+13, +15$, so $48,\ 63$.

Common mistake

Do not switch rules halfway.

If the differences rise by 2, keep that same second-difference rule to the end.

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