

Packing a Powerful Punch with Patterns

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Algebraic Thinking

Algebraic thinking emphasizes these things:

- analyzing change
- generalizing relationships among quantities
- representing these mathematical relationships in various ways (NCTM 2000)



Meaning of Equality

What do elementary students think “equals” = means?

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Students do *not* see equality as expressing the relationship “is the same as.”

Mann, 2004.



Repeating Patterns

- **Core** -- showing 3 repetitions is best to avoid ambiguity.
- **Variations**
 - Size
 - Colour
 - Position
 - Auditory
 - Multi-attribute
 - Multi-dimensional (like patterns on clothes, walls, etc.)
- **Naming with letters** (a multi-attribute pattern can be named differently for each attribute).



Growing/Shrinking Patterns

- Counting sequence.
- Arithmetic sequences -- where each number is a fixed amount greater or less than the preceding one.
 - 3, 5, 7, 9, ... (fixed increase of 2)
 - 20, 17, 14, 11, ... (fixed decrease of 3)
- Geometric sequences (where each number is a fixed multiple of the preceding one).
 - 1, 2, 4, 8, 16, ... (doubling)
- Other number sequences (where the growth is not constant)
 - 3, 4, 6, 9, 13, ... (the increase increases by 1 more each time)



Recursive Patterns

Patterns where each element in the pattern is defined based on a previous element or elements. Some *growing patterns* are also recursive.

- 2, 4, 6, 8, ... (each term is 2 greater than the previous)
- Triangular numbers (build a new row on the bottom)
 - 1, 3, 6, 10, ...
- Fibonacci sequence (beginning with 0 and 1, add two terms to get the next term).
 - 0, 1, 1, 2, 3, 5, 8, 13, ...



Working With Patterns in Open-Ended Questions

- Use 10+ of your pattern blocks and make a pattern. Use 10+ more and make a pattern with an error. Explain to your seat partner the error.
- In a pattern the 6th element is 12 (or a triangle, an arrow pointing up, a red dot). What could the pattern be? What if the 7th element was the triangle? (Note: How does this change the difficulty for young students?)



Open-Ended Pattern Questions

Make these patterns:

- with a core of red, green (AB)
- with a core of triangle, square, square (ABB)
- with a chore of your own choosing

- What shape will the 10th element be? The 20th? The 25th? The 100th? What other tools could students use to figure these out?

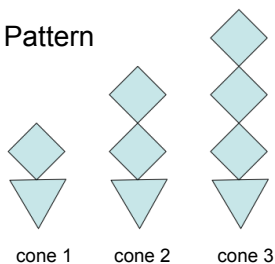
It is always powerful when the answer to a question lies in a pattern.



Ice Cream Cone Pattern

Copy the pattern with your pattern blocks and extend it at least two more elements.

How might students create an accompanying T-chart to go with this pictorial growth pattern?

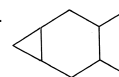


Pictorial Growth Patterns

- Build a subdivision of houses. Record on a t-chart.



- Make fish swimming in the ocean. Record on a t-chart.



Kim Sutton, 1995.



References

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Full handout for this session is available at

focusonmath.wordpress.com
under "NCTM Session"

