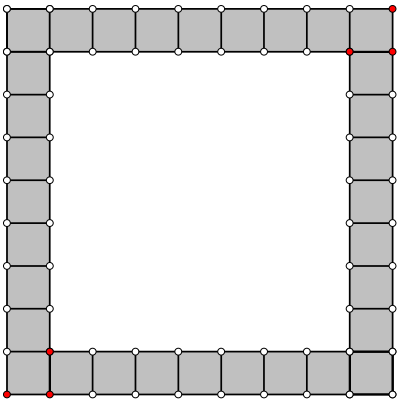
The figure below represents an n x n swimming pool surrounded by a walkway made of 1 x 1 tiles. (The figure shown is the 7 x 7 case.)



Come up with as many *different* expressions as you can for the number of 1x1 tiles it takes to surround an n x n pool.

Ten Things We Learned Teaching Advanced Algebra with the Nspire+CAS

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0. A Few Basics for Those New to CAS & the Nspire (D)

- A Poll: 89 users? Nspire users?
- Documents & Pages & Problems
- The Calculator & CAS: Literals, symbol manipulation, pretty input (templates) as well as pretty output

- Graphs & Geometry: multiple screens (& viewing windows!), sliders
- Spreadsheets: Excel-like; CAS incorporated
- Notes, Data, Split Screens

Quick tips for getting around:

- Ctrl-i Instantly create a new Calculator, Graph, or Spreadsheet
- Ctrl-z Undo
- Ctrl-÷ Template for a rational expression
- Ctrl-x Large group of templates
- Menu>6>2 Point on (point to drag on a graph for tracing, extrema, intercepts)
- Hold down center button Grab a point, graph, text etc. Once grabbed, use arrows to move
- Esc To get out of a mode (for example, Point On)

1. Assessments must change (P)
    - No Calculator Sections (note: should we eliminate?)
    - COBRA Calculator OK, but reconstruct algebra
    - Shorter: Calculator ≠ Faster
    - Most Important: Focus on Writing, not just computing

Examples:
In an application involving rational functions, give a real-world interpretation of the asymptotes

Consider the inequality $\frac{x-2}{x+4} \le -5$.

a. Explain why multiplying both sides by (x + 4) is incorrect. (It is!)

b. Compute the solution set to the original inequality. (COBRA)

No calculator: solve xy + 4x = 6y - 3x for y.

2. Students still don't check answers (D)

- Teachers have to provide frequent exercises to develop number sense. (Our department is now doing a common reading on estimation)

e.g. Find the domain of $f(x) = \frac{1}{x-3}$

$x > 3$ 4, 5, 6, . . .

3. Expect unexpected formats

Examples:

Solve for r: $V = \frac{4}{3}\pi r^3$

Factor $\sqrt{2} \cdot x^2 - 4x + 2\sqrt{2}$ $\sqrt{2}(x^2 - 2\sqrt{2}x + 2)$

$\sqrt{2}(x - \sqrt{2})^2$

(P)

4. Bring back some traditional topics

Examples:

Factor $x^2 + 6x + 2$ over the reals.

If $a_n = \dfrac{7^n}{3^{2n-4}}$, compute $\dfrac{a_{n+1}}{a_n}$.

5.
Use CAS to solve step-by-step

Solve $\begin{cases} \frac{5}{4}x + 7y = 13 \\ 3x - \frac{11}{3}y = 4 \end{cases}$

Step 1: Type the following--

$\frac{5}{4}x + 7y = 13$ ctrl sto▸ var eq1 → $5x + 28y = 52$

$3x - \frac{11}{3}y = 4$ ctrl sto▸ var eq2

6. Warnings generate discussion
Solve $x^2 + 4x = 6x$ for x.

Solve $2x - 2 = \sqrt{x+2}$

Solve $2x - 2 = \sqrt{x+2}$

7. Verify student conjectures (D)

- We can represent mathematical ideas that are beyond students' manipulative powers.
- Generalization is less time consuming, more natural, and included more often.

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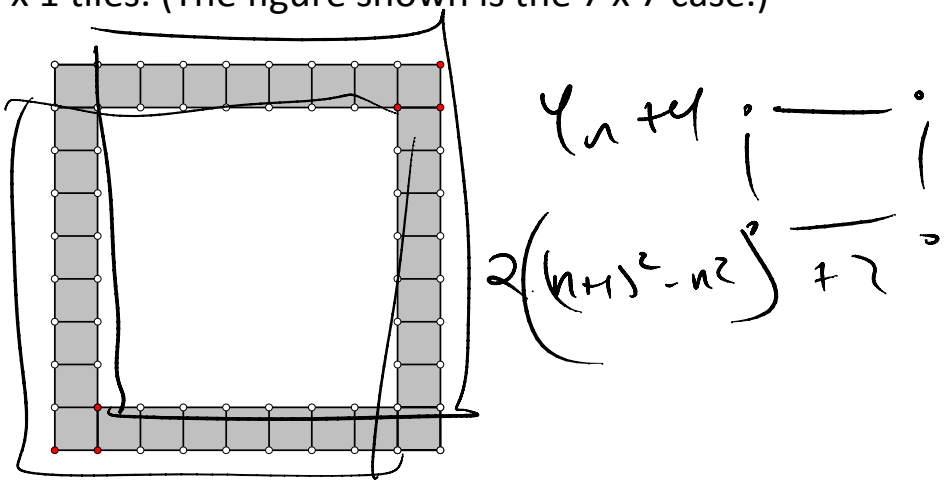
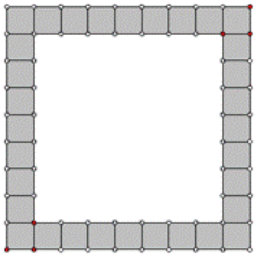
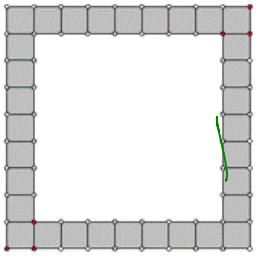
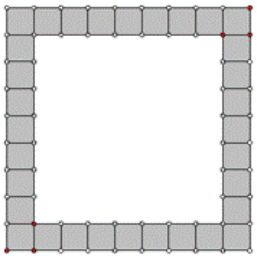
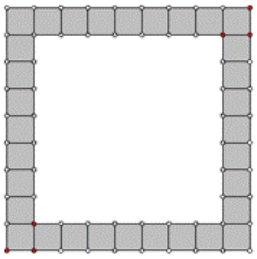


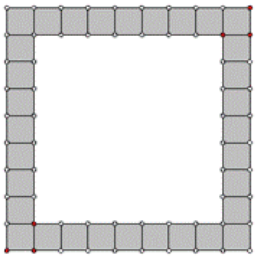
Come up with as many *different* expressions as you can for the number of 1x1 tiles it takes to surround an n x n pool.



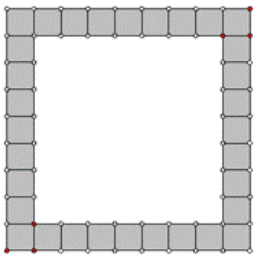


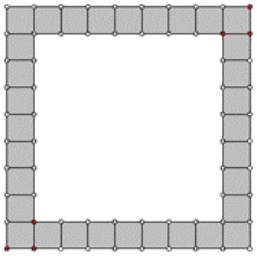


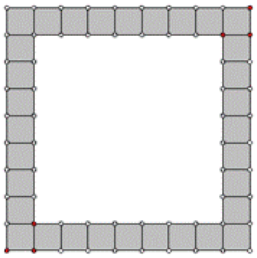




What are some analogous, more general problems?







8. Solve problems in multiple ways.
   - The calculator guarantees a second approach
   - The calculator allows easy comparison of approaches
   - Polya's last phase of problem solving (another approach, a new problem)

Example:
Diagonals of a polygon:
(1) no diagonals to myself or my neighbors; overcounting;

(2) How does n choose 2 over count?

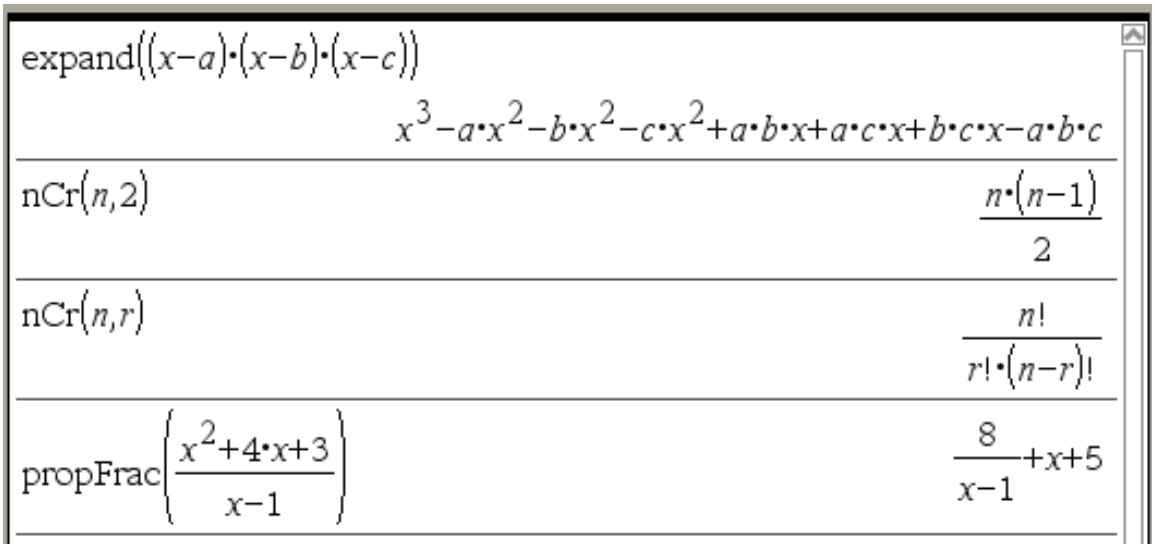
9. Use the "Peterson No" (P)
   - "What would the calculator do if…?"

- "Is this right?"
- The Difference Quotient

10. Top Nspire tips

I	Ctrl-i, Ctrl-x, Ctrl->, Ctrl-<, Ctrl-z
II	Be abstract!

A termn...	B term	C partsum
=seqn(n,2(		
1	a	a
2	a+d	2*a+d
3	a+2*d	3*a+3*d
4	a+3*d	4*a+6*d
5	a+4*d	5*a+10*d
6	a+5*d	6*a+15*d
7	a+6*d	7*a+21*d
8	a+7*d	8*a+28*d
9	a+8*d	9*a+36*d
10	a+9*d	10*a+45*d
11	a+10*d	11*a+55*d



III	How to Delete a Table (D)
IV	Why you don't need to be able to do #III
V	Use fractions, not parentheses
VI	Have students explore parameters (Example: logs and exponentials)
VII	Use Sliders
VIII	Be Prepared (for anything!)