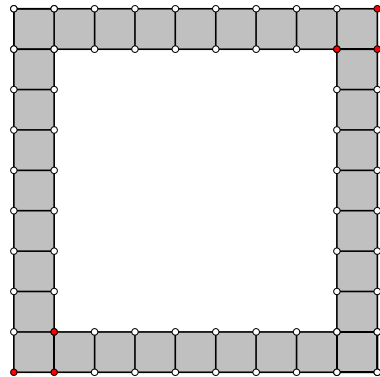


The figure below represents an $n \times n$ swimming pool surrounded by a walkway made of 1×1 tiles. (The figure shown is the 7×7 case.)



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

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

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	89	89	Nspire	+ CAS	Other CAS
Personal		1	1	11	
Class		1	1	1	11

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

- No Calculator Sections
- COBRA
- Shorter: Calculator ≠ Faster
- Most Important: Focus on Writing, not just computing

(P)

Calculator
OK
But
Reconstruct
Algebra

Examples:

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

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

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 .

1. Students still don't check answers

(D)

- Teachers have to provide frequent exercises to develop number sense.

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

$$x > 3$$

$$\sqrt{3-x}$$
$$x \neq 3$$
$$3-x \geq 0$$
$$3 \geq x$$

2. Expect unexpected formats

$$b = 2c^2$$

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)

1. Bring back some traditional topics

Examples:

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

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

5. Solve 3×3 system, standard form, linear = 45 signed number operations

Use CAS to solve step-by-step

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

Step 1: Type the following--

$$\frac{5}{4}x + 7y = 13 \quad \text{ctrl} \rightarrow \text{sto} \rightarrow \text{var} \quad \text{eq1}$$

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

6. Warnings generate discussion

Solve $x^2 + 4x = 6x$ for x .

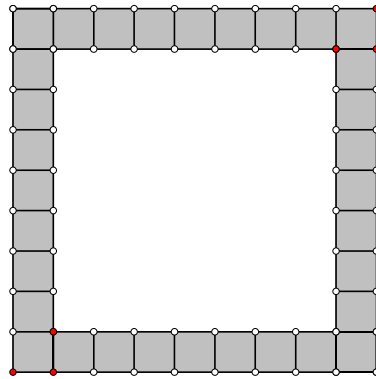
$$\text{Solve } 2x - 2 = \sqrt{x + 2}$$

Verify student conjectures

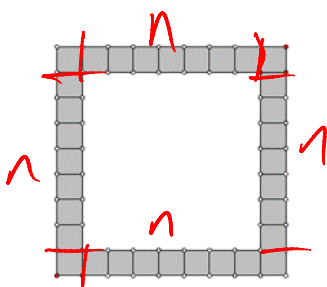
(D)

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

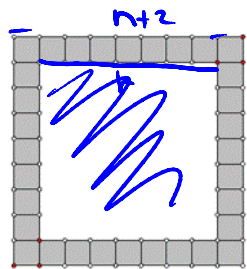
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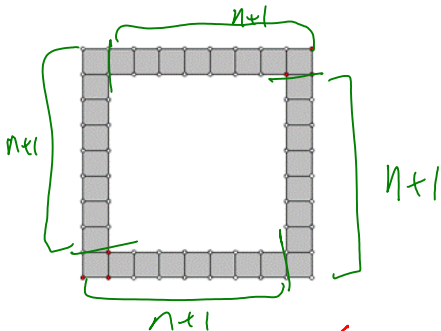


files directly adjacent to pool
 $4n + 4$
 corners

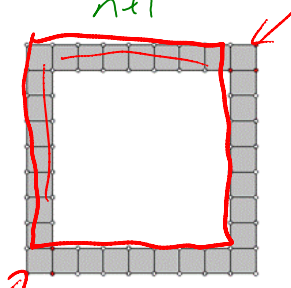


$$(n+2)(n+2) - n \cdot n$$

$$(n+2)^2 - n^2$$

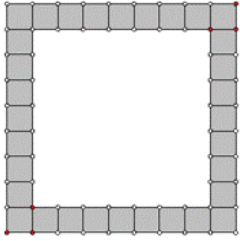


$$4(n+1)$$

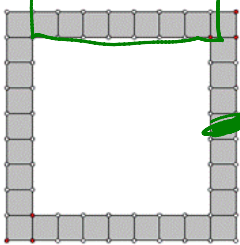


$$2((n+1)^2 - n^2) + 2$$

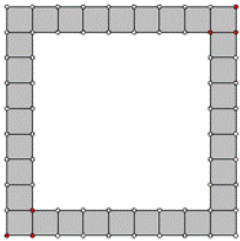
ii



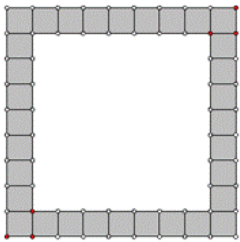
What are some analogous, more general problems? width = m



$$4n + 4 \cdot m^2$$



$$(n + 2m)^2 - n^2$$



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

expand((x-a)*(x-b)*(x-c))	$x^3 - a \cdot x^2 - b \cdot x^2 - c \cdot x^2 + a \cdot b \cdot x + a \cdot c \cdot x + b \cdot c \cdot x - a \cdot b \cdot c$
nCr(n,2)	$\frac{n \cdot (n-1)}{2}$
nCr(n,r)	$\frac{n!}{r! \cdot (n-r)!}$
propFrac($\frac{x^2+4 \cdot x+3}{x-1}$)	$\frac{8}{x-1} + x + 5$

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!)