

Station Diagnostic & Solution Key: AP CSP Big Idea 2

Digital Information: Base Conversions & Two's Complement • Manipulative Setup, Diagnostic Rubric & Verification Flow

MANIPULATIVE HARDWARE STATION INVENTORY & 3D PRINT PREPARATION

Station Kit: 4x4 Expression Tree Case & Logic Bit Tokens CAD / STL Source File:

Recommended Filaments:

CAD Blueprint: tree_board

Education/build/scad/tree_board.scad

Oceanic Teal Expression Tray & White Tokens (PLA)

Target Device: SC-32 Scientific

Standard: Gridfinity 42mm Pitch / 0.6mm Inset Markings

#	Math Problem Prompt	Expected Math Answer	Self-Check Keystrokes & RPN Stack
1	Convert decimal 42 to hex: [42] [HEX]. Standard: CSTA.3A-DA-09	0x2A	[4][2] [HEX]
2	Convert hex 1A to decimal: [1][A] [DEC]. Standard: CSTA.3A-DA-09	26	[1][A] [DEC]
3	Perform bitwise AND on SC-32: 0x0F AND 0x2A. Standard: CSTA.3A-DA-09	0x0A (10 DEC)	[0][F] [ENTER] [2][A] [AND]
4	Find Two's complement negation of 5 in 8-bit Standard: CSTA.3A-DA-09	1111 1011 (-5)	[5] [+/-] [BIN]

TEACHER DIAGNOSTIC GUIDE: COMMON MISCONCEPTIONS & REMEDIATION

Key Misconception to Target During Station Observation:

Remember hex digits A through F represent values 10 through 15 in base 16.

How the Manipulatives & Calculator Foster Self-Correction:

Students solve with pencil and physical blocks first. When they self-check on the SC-32, any discrepancy between their written answer and the calculator's 4-line LCD immediately prompts them to re-inspect their physical bench model or regrouping, turning errors into productive struggle without teacher intervention.

Station Facilitation & Pacing Tip:

Keep 3D printed trays docked on standard Gridfinity baseplates to prevent loose parts on student desks. Encourage students to articulate their CPA steps: name the block representation (Concrete), point to their drawn tape/bond model (Pictorial), and verify register values (Abstract).

CLASSROOM SCORING & STATION MASTERY RUBRIC

Exemplary (18–20 pts):	Complete, accurate manipulative sketches; exact math answers; independently verified self-check on LCD stack.
Proficient (14–17 pts):	Correct math answers; minor sketch omissions; verified on calculator with minimal teacher prompting.
Developing (10–13 pts):	Understands problem concept but made computational slips; successfully self-corrected using calculator LCD.
Intervention (<10 pts):	Relied on calculator before solving on paper, or struggled with underlying physical manipulative models.