

Probability & Combinatorics: Permutations & Combinations

Tactile Concrete-Pictorial-Abstract (CPA) Station Guide • CCSS.MATH.HSS.CP.B.9

Student Name: _____

Date: _____

Model: SC-32

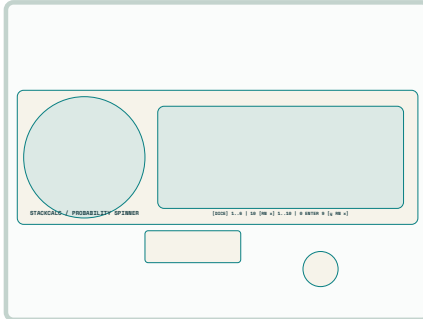
Check Score: ____ / 4

STUDENT SELF-CHECK RULE (NO CHEATING):

Build with blocks and solve on paper first! Use your SC-32 calculator ONLY to verify answers on the 4-line LCD screen.

STATION LAB TUTORIAL: BENCH SCHEMATIC & CPA PROGRESSION

1. 2D Bench Blueprint



Kit: Probability Spinner

2. Desk Setup (Concrete -> Pictorial)

Physical Bench Setup:

Spin the dual probability spinner; roll fair dice pack to record empirical sample spaces.

Sketch Model on Paper:

Draw a tree diagram showing branch choices and outcome paths.

3. Step-by-Step LCD Stack Trace (SC-32)

MODE: 123 Base-10 Arithmetic

1. 10 X: 10 Population n = 10 in

2. ENTER Y: 10 | X: 10 Stack lift

3. 3 Y: 10 | X: 3 Sample size r = 3 in

4. nCr X: 120 Combinations: 10C3 =

EXPECTED LCD X: 120 combinations

1 Calculate 8C2 (choose 2 items from 8).

Manipulative Model & Desk Sketch (Show your work):

Final Math Answer:

☐ Verified on SC-32

2 Calculate 7P3 (permutations: order matters).

Manipulative Model & Desk Sketch (Show your work):

Final Math Answer:

☐ Verified on SC-32

3 Calculate 6! (6 factorial) on SC-32: [6] [x!].

Manipulative Model & Desk Sketch (Show your work):

Final Math Answer:

☐ Verified on SC-32

4 Find probability of rolling snake eyes (two 1s) on 2 dice.

Manipulative Model & Desk Sketch (Show your work):

Final Math Answer:

☐ Verified on SC-32

Station Diagnostic & Solution Key: AP Stats Unit 4

Probability & Combinatorics: Permutations & Combinations • Manipulative Setup, Diagnostic Rubric & Verification Flow

MANIPULATIVE HARDWARE STATION INVENTORY & 3D PRINT PREPARATION

Station Kit: Probability Spinner & Fair Dice Pack

CAD / STL Source File:

Recommended Filaments:

CAD Blueprint: probability_spinner

Education/scad/lib/probability_spinner.scad

Teal Spinner Housing with Yellow Indicator Rotor (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	Calculate 8C2 (choose 2 items from 8). Standard: CCSS.MATH.HSS.CP.B.9	28	[8] [ENTER] [2] [nCr]
2	Calculate 7P3 (permutations: order matters). Standard: CCSS.MATH.HSS.CP.B.9	210	[7] [ENTER] [3] [nPr]
3	Calculate 6! (6 factorial) on SC-32: [6] [x!] Standard: CCSS.MATH.HSS.CP.B.9	720	[6] [x!]
4	Find probability of rolling snake eyes (two) Standard: CCSS.MATH.HSS.CP.B.9	0.0278 (1/36)	[1] [ENTER] [3][6] [+]

TEACHER DIAGNOSTIC GUIDE: COMMON MISCONCEPTIONS & REMEDIATION

Key Misconception to Target During Station Observation:

Order matters in Permutations (nPr); order does NOT matter in Combinations (nCr).

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.