# **Lunar Base Reconstruction - 3 Lesson Series**

*For Y5 students (age 10) using deconstruction/reconstruction approach*

## **Lesson 1: Reconstructing Your Base**

### **Learning Objectives**

Students will be able to:

* Analyze the final base example to understand component relationships
* Reconstruct their own unique base layout using provided starter components
* Position and connect domes, tubes, and airlocks logically
* Add characters and basic equipment from the library
* Create simple character movement using "move on path" blocks

### **Lesson Input**

**Key Concepts:** Spatial reasoning, modular construction, basic animation

**Starter Components Available:**

* **Dome 1 & Dome 2:** Main habitat structures (can be duplicated and recolored)
* **Space\_Hanger:** Large specialized dome
* **Air\_Lock\_Door1 & Air\_Lock\_Door2:** Entry/exit doors
* **ButtonGroup1-4:** Interactive buttons for door control
* **Tube segments:** Connecting corridors (TunnelSegment)
* **Camera:** Pre-positioned viewpoint
* **Characters:** Casual boy, Bear, Regular girl, Casual woman, Regular man

**Easy Win Coding - Character Patrol:**

when program starts

move Regular\_man on path Round\_path in 120 sec forever

set gravity pull to 0.17

**Reconstruction Process:**

1. Study the final base image - notice dome colors, tube connections, character placement
2. Start with one dome as your main habitat
3. Add tube segments to create corridors
4. Connect second dome using logical pathway
5. Position airlock doors at entrance points
6. Place button groups near doors for future interaction
7. Add characters and set one walking on the existing Round\_path
8. Duplicate and recolor domes (green/yellow filters) for variety

**Design Tip:** Your base doesn't need to match the example exactly - create your own layout!

### **Mini Plenary**

* Does your base have clear connections between areas?
* Is your character moving continuously around part of the base?
* Are your airlocks positioned at logical entry/exit points?
* Can you identify the purpose of each dome in your design?

### **Challenge Levels**

**Foundation:** Basic Connected Base

* 2 domes connected by 1-2 tube segments
* 1 airlock door positioned appropriately
* 1 character moving on the provided path
* Clear main entrance to base
* **Success:** Connected structure, moving character

**Intermediate:** Multi-Area Complex

* 3+ domes with different purposes (living, working, storage)
* Multiple tube connections creating logical flow
* 2+ airlock doors for different entrances
* 2-3 characters placed throughout base
* Modified path route or additional paths
* **Success:** Complex layout, purposeful design

**Advanced:** Sophisticated Base Network

* 4+ specialized areas with unique color schemes
* Complex tube network connecting all areas efficiently
* Strategic airlock placement for security/efficiency
* Multiple characters with different roles
* Custom path system visiting multiple base areas
* Additional library objects for base detailing
* **Success:** Professional design, innovative layout solutions

### **Wrap-up Plenary**

You've successfully reconstructed functional lunar bases from the component parts! Your bases show logical design thinking and your characters bring life to the environment. In Lesson 2, we'll make those buttons actually control the doors and add gravity effects to different areas of your base.

**Ready for Coding:** Your positioned buttons and doors are perfectly set up for interactive programming!

## **Lesson 2: Interactive Systems Programming**

### **Learning Objectives**

Students will be able to:

* Program button-door interactions using "when clicked" events
* Apply different gravity settings to simulate various base zones
* Use "push with velocity" to create realistic character movement
* Implement basic physics properties for objects in low-gravity environment
* Create responsive feedback systems for user interactions

### **Lesson Input**

**Key Concepts:** Event-driven programming, physics simulation, user interaction, cause-and-effect relationships

**CoBlocks Focus:**

* when ButtonGroup1 is clicked
* move Air\_Lock\_Door1 to y: -2 in 2 sec
* push Regular\_man with velocity 3 forward
* set gravity pull to 0.17 (lunar gravity)
* wait 5 sec (for timing sequences)

**Building on Your Base:** Your reconstructed base is perfect for adding interactivity! We'll focus on the core systems that make a space base feel alive.

**Door Control System:**

when ButtonGroup1 is clicked

move Air\_Lock\_Door1 to y: -2 in 2 sec

wait 5 sec

move Air\_Lock\_Door1 to y: 0 in 2 sec

**Character Physics Enhancement:**

when Regular\_man is clicked

push Regular\_man with velocity 2 forward

when Casual\_boy is clicked

push Casual\_boy with velocity 1 upward

**Gravity Zone System:**

when program starts

set gravity pull to 0.17

when Dome\_1 is clicked

set gravity pull to 0.1

say "Entering low-gravity lab zone"

### **Mini Plenary**

* Do your doors open and close when buttons are clicked?
* Can you make characters jump or move when clicked?
* Does the low gravity setting make objects behave differently?
* Are your interactive systems responding consistently?

### **Challenge Levels**

**Foundation:** Basic Button-Door System

* 1 button controls 1 door (open/close cycle)
* Characters respond to clicks with simple movement
* Basic lunar gravity applied to whole base
* **Success:** Working door control, responsive characters

**Intermediate:** Multiple Interactive Systems

* 2+ button-door pairs working independently
* Characters with different click responses (jumping, pushing)
* Gravity zones - different areas with different gravity settings
* Basic feedback (doors making sounds or visual changes)
* **Success:** Multiple working systems, varied interactions

**Advanced:** Complex Base Operations

* All 4 button groups controlling different systems
* Advanced character behaviors (patrol routes affected by interactions)
* Multiple gravity zones with smooth transitions
* Emergency systems (all doors open simultaneously)
* Physics-based puzzles (use low gravity to move objects)
* **Success:** Sophisticated interaction design, creative problem-solving

### **Wrap-up Plenary**

Your bases now respond to user input! The button-door systems work like real airlocks, and your characters behave realistically in the low-gravity environment. In Lesson 3, we'll add information systems and educational content to make your bases teaching tools about space exploration.

**Physics Foundation:** Your gravity and movement systems are perfectly set up for adding educational content!

## **Lesson 3: Educational Information Systems**

### **Learning Objectives**

Students will be able to:

* Create information panels triggered by clicking base components
* Design quiz systems that test knowledge about space exploration
* Implement text displays that explain base functions and space science
* Develop educational tours using camera movement and information timing
* Transform their base into a teaching tool for others

### **Lesson Input**

**Key Concepts:** Information design, educational content creation, user experience, knowledge sharing

**CoBlocks Focus:**

* show info panel with title "Life Support" text "This dome processes air and water"
* show quiz panel with question "What is lunar gravity?" correct answer "0.17g"
* when correct: say "Well done!"
* when incorrect: say "Try again - it's much less than Earth!"
* switch to camera Camera for 3 seconds

**Building on Interactive Base:** Your working door systems and character interactions provide perfect opportunities for educational content!

**Information Panel System:**

when Dome\_1 is clicked

show info panel with title "Habitat Dome"

text "Living quarters with life support systems. Gravity set to 0.17g"

when Air\_Lock\_Door1 is clicked

show info panel with title "Airlock System"

text "Pressurized chamber prevents air loss when entering/exiting"

**Educational Quiz Integration:**

when Space\_Hanger is clicked

show quiz panel with question "Why do lunar bases need airlocks?"

correct answer "To prevent air loss"

when correct

say "Correct! Air would escape into the vacuum of space"

when incorrect

say "Think about what happens to air in space..."

**Guided Tour System:**

when Regular\_girl is clicked

say "Welcome to our lunar base tour!"

wait 2 sec

switch to camera Camera for 4 seconds

say "This base supports 6 astronauts in low gravity"

wait 3 sec

say "Click on any dome to learn about its function"

### **Mini Plenary**

* Do your information panels provide useful facts about space exploration?
* Are your quiz questions appropriate for teaching others?
* Can users easily navigate and learn from your base?
* Does your educational content connect to real space science?

### **Challenge Levels**

**Foundation:** Basic Information System

* 2-3 information panels explaining basic base functions
* 1 simple quiz question about lunar gravity or space
* Clear, accurate information appropriate for peers
* **Success:** Working info panels, educational content

**Intermediate:** Comprehensive Learning Experience

* 4+ detailed information panels covering different space topics
* 2-3 quiz questions with helpful feedback
* Guided introduction sequence for new users
* Mix of base-specific and general space science information
* **Success:** Rich educational content, good user guidance

**Advanced:** Interactive Space Education Center

* 6+ information systems covering complex space science topics
* Multi-question quiz system with scoring
* Multiple tour modes (construction, daily life, science, emergency)
* Interactive experiments (gravity comparisons, airlock demonstrations)
* Adaptive content that responds to user choices
* Links between base systems and real space mission challenges
* **Success:** Professional educational quality, innovative teaching methods

### **Wrap-up Plenary**

You have created complete educational experiences that teach others about space exploration! Your bases successfully combine:

* **Construction Skills:** Logical base design using modular components
* **Programming Skills:** Interactive systems with buttons, doors, physics, and movement
* **Educational Design:** Information systems that teach real space science concepts

Your lunar bases demonstrate how engineering, programming, and education work together. You've taken basic building components and created sophisticated learning environments that could actually help train future astronauts!

**Real-World Connections:**

* Your airlock systems work like those on the International Space Station
* Your gravity settings match actual lunar conditions (1/6th Earth gravity)
* Your modular base design reflects real space habitat planning
* Your life support concepts apply to actual space missions

## **Implementation Notes**

**Flexible Pacing:**

* **Week 2 completion:** Focus on Foundation/Intermediate levels
* **Week 3-4 completion:** Target Intermediate/Advanced levels with time for iteration
* **Advanced finishers:** Can help teach others or create connected base networks

**Assessment Focus:**

* **Technical:** Successful use of CoBlocks for intended functionality
* **Design:** Logical base layout and user-friendly interactions
* **Educational:** Accurate space science content and effective teaching methods

**Differentiation:**

* **Struggling students:** Provide step-by-step guides for basic button-door connections
* **Advanced students:** Challenge with multi-system integration and original research
* **All students:** Peer teaching opportunities to share successful solutions