ARRAY ENGINE
UI SPEC TEMPLATE v1.3

PEARSON COMMON CORE SYSTEM OF COURSES

TWO BIT CIRCUS

March 27, 2013

/ INTERACTION MATRIX

ARRAY ENGINE Interaction Matrix

Interactions	Array Classes							
	c1	c2	c3	c4	c5	c6	c7	Alternate
Array Space								
Create Array	Y		Y	Y		Y	Y	
Delete Array	Y		Y	Y		Y		
Manipulate Array	Y	Y	Y	Y	Y	Y	Y	
Cut Array	Y	Y	Y				Y	
Label Array	Y	Y	Y	Y	Y	Y	Y	
Change Object	Y	Y	Y	Y	Y	Y	Y	
Equations Frame								
Add Expression	Y	Y						Y
Delete Expression	Y	Y						
Edit Numbers	Y	Y	Y	Y	Y			Y
Edit Equation	Y	Y	Y	Y	Y			Y

ARRAY OVERVIEW
Array interactions are divided into two main interactive spaces:

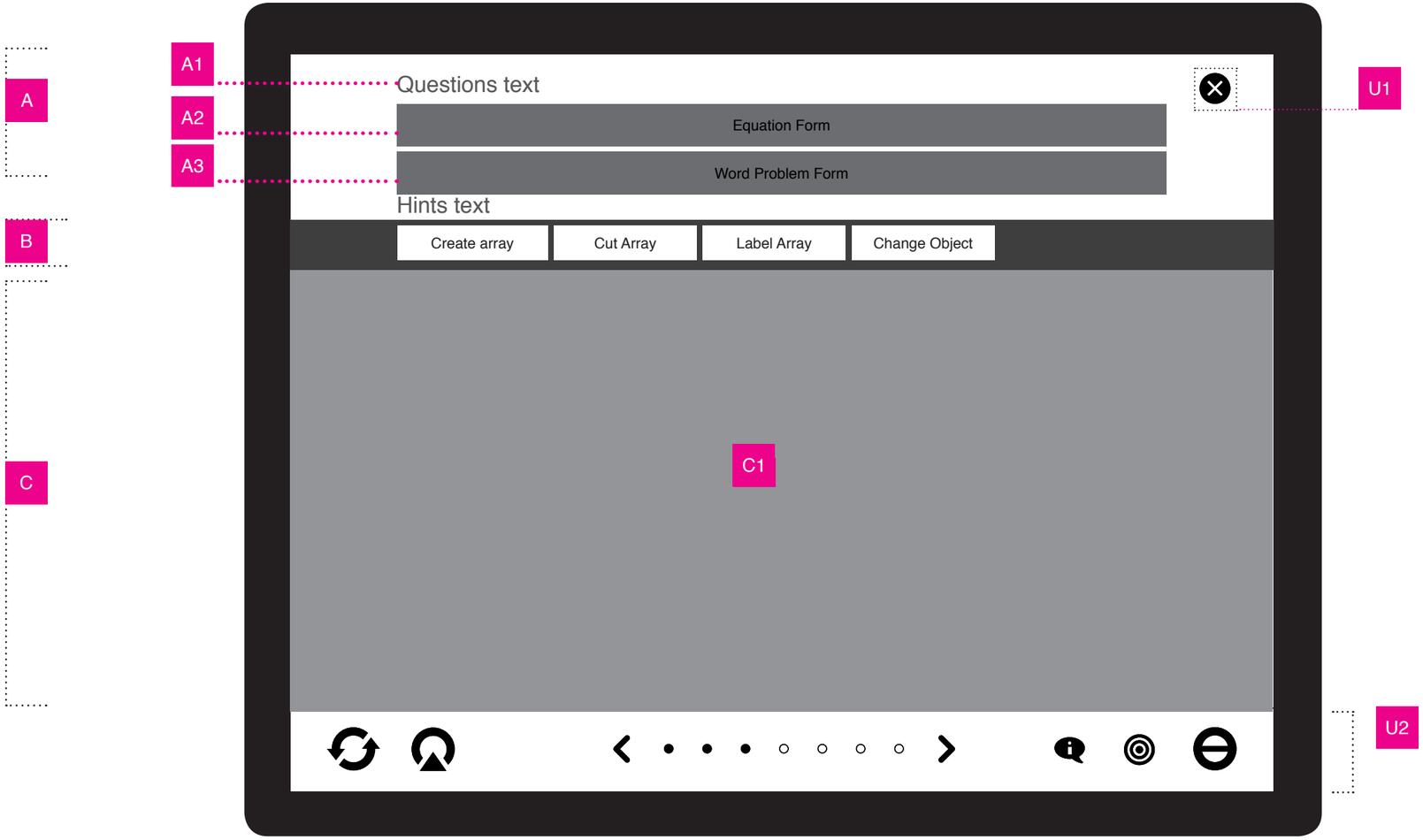
1. Array Space
An interactive area where students may use a set of tools to visually explore and manipulate arrays.
2a. Equation Frame
A form (sometimes this will be pre-filled) which students may fill using the expression writer in order to respond to a given prompt. The goal is to allow student full freedom to keep track of the number of arays they are building in the array space and mirror by filling complete expressions in the equation frame.
2b. Expression Writer Functionality (FBO)
Expression writer will be populated by symbols necessary to fill equation frame as defined by the given problem, and may include “(“, “)”, “x”, #’s “0”-”9”, “+”, “-”.

Array Classes
C1: Class 1
Empty Array Space / Empty Equation Frame
• Student may create an array
ex: (_ x _)
C2: Class 2
Pre-filled Array Space / Empty Equation Frame
ex: (_x_)
C3: Class 3
Pre-filled Array Space / Pre-filled Equation Frame
ex: (_x_) + (_x_) = (9x9)
C4. Class 4
Empty Array space / Pre-filled Equation Frame
ex: (4x9) + (5x9) = (9x9)
C5. Class 5
Pre-filled Array Space / Pre-filled Equation Frame
ex: (4x9) + (5x9) = (9x9)
C6. Class 6
Empty Array Space / No Equation Frame
ex: (4x9) + (5x9) = (9x9)
C7: Class 7
Pre-filled Array space / No Equation Frame
ex: (4x9) + (5x9) = (9x9)

Alternate
Image in Array Space : Pre-filled / Empty Equation Frame

/ STRUCTURE & LAYOUT

ARRAY ENGINE Overview: General Grid Margins



ARRAY OVERVIEW
Two main spaces present the ability to visualize arrays. The array engine is built with flexibility to support various use cases, each providing varying levels of pre-filled information, and prompting manipulation to create specific array patterns.

U. General Grid Margins
U1. Close Button
• [FPO: 00px x 00px]
U2. General Interactive UI
• [FPO: 00px x 00px]

A. Array Problem Space
• [FPO: 00px x 00px]
A1. Prompt
A2. Equation Form
A3. Word Problem Form

B. Tools
• Create Array
• Cut Array
• Label Array
• Change Object

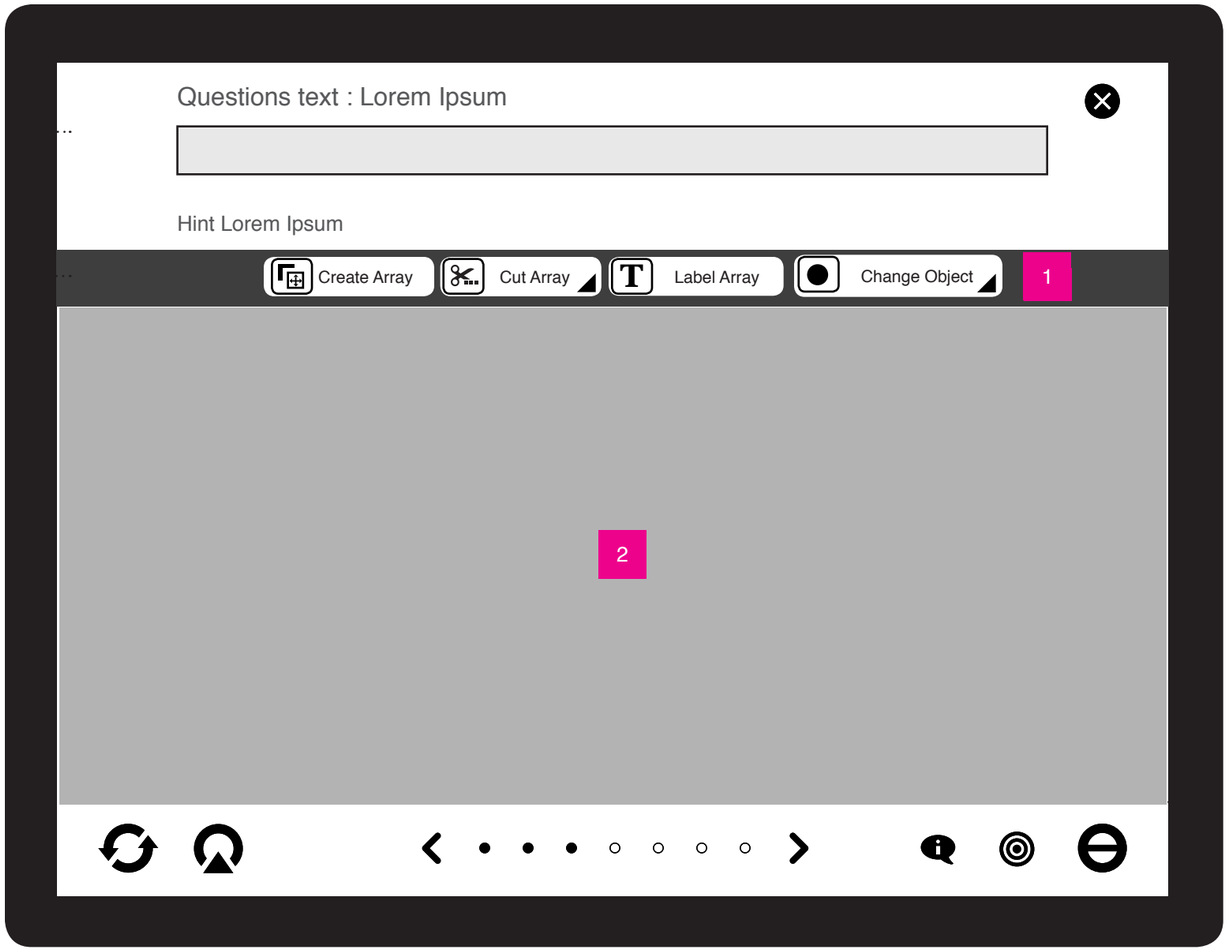
C. Array Equation Space
• [FPO: 00px x 00px]
• 1 equation space

! The interactive workspace has been designed for standard iPad screen resolution (1024 x 768px). Apply 2x scale for retina display (2048 x 1536px)

/ INTERACTION :

Tool / Button States

ARRAY ENGINE Overview: Tool buttons



1 A

Create Array

Active
All tools are available and stay unselected until a student selects a tool and interacts with the array space.

1 B

Create Array

Selected
When student selects a tool, buttons should stay active until intereaction is completed or another tool is selected.

1 C

In Use
Students get an in use button state that allows them to understand when they are interacting with a tool which will also be affecting an array.

1 D

Create Array

Cut Array

Disabled
After student has added an array the create array tools become disabled. Tool is visible but unslectable.

1

Button States
Student can select from a set of tools. Tool buttons may appear in one of 4 states (see 1A-1D above).

2

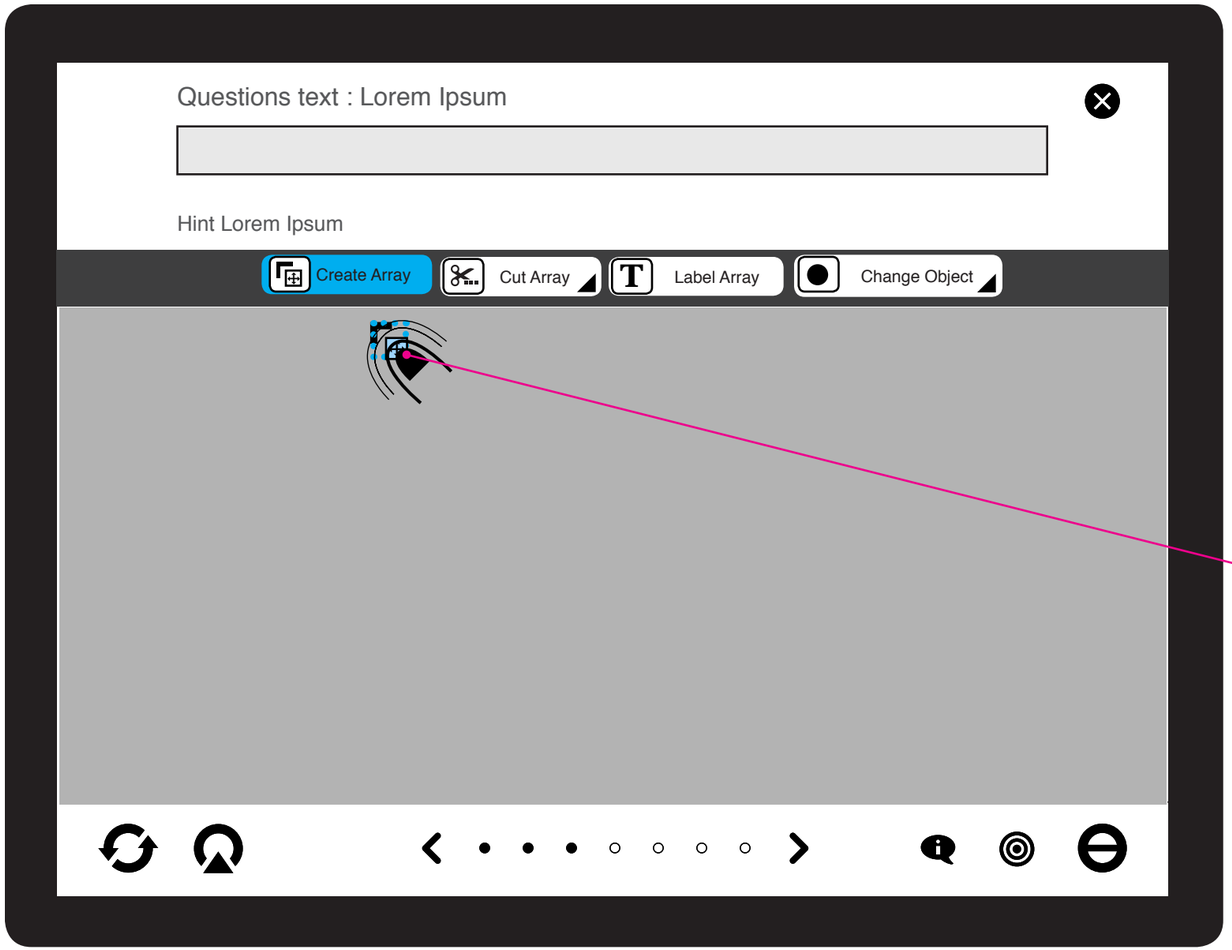
Array Space
Tool button states mirror tool states as they are used in the Array Space.

Example: Upon selecting “create array” tool, a create array icon appears in the Array Space. Students may then drag the array icon to build an array.

/ SCREEN FLOWS :

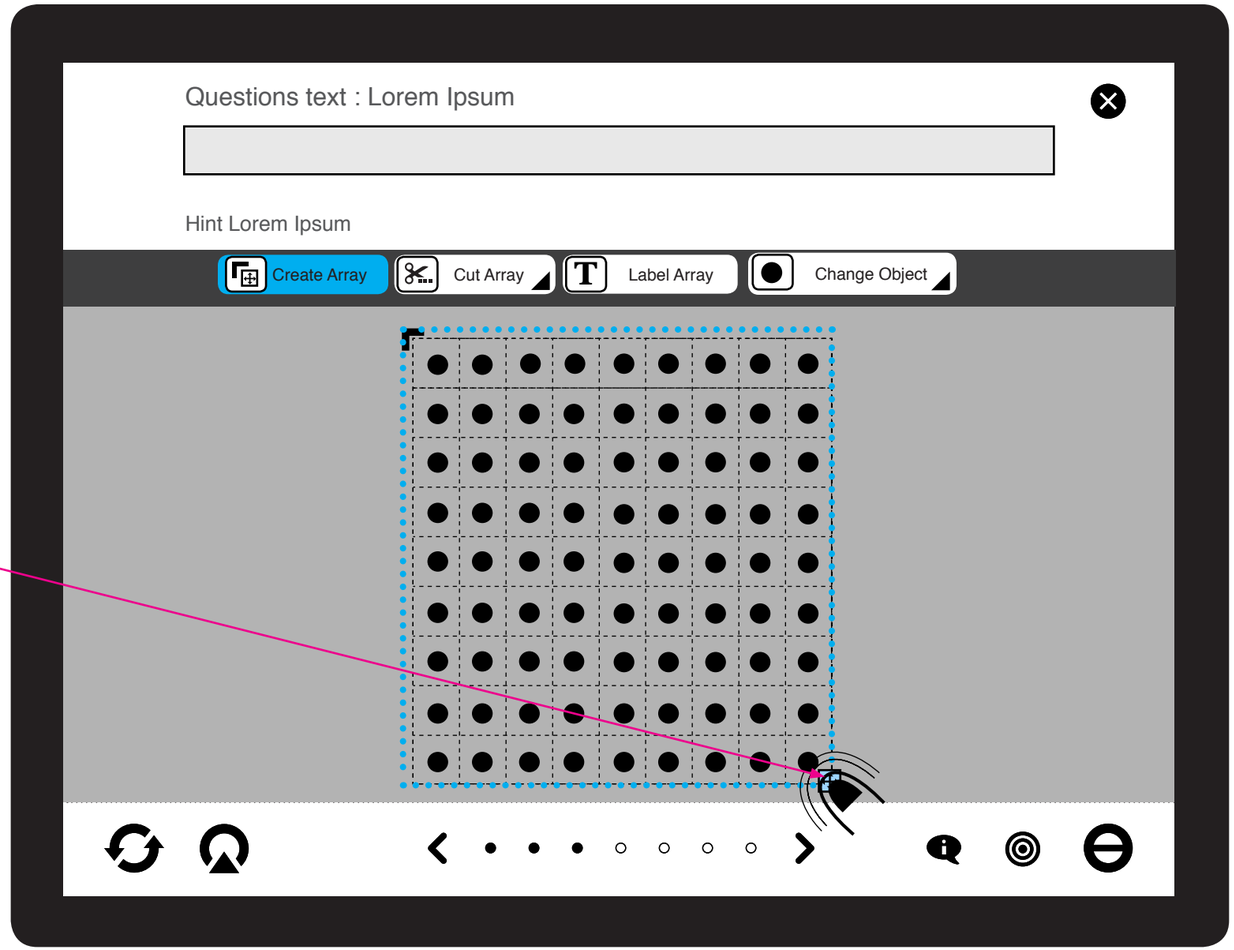
Add / Manipulate an Array

ARRAY ENGINE Create an Array



1

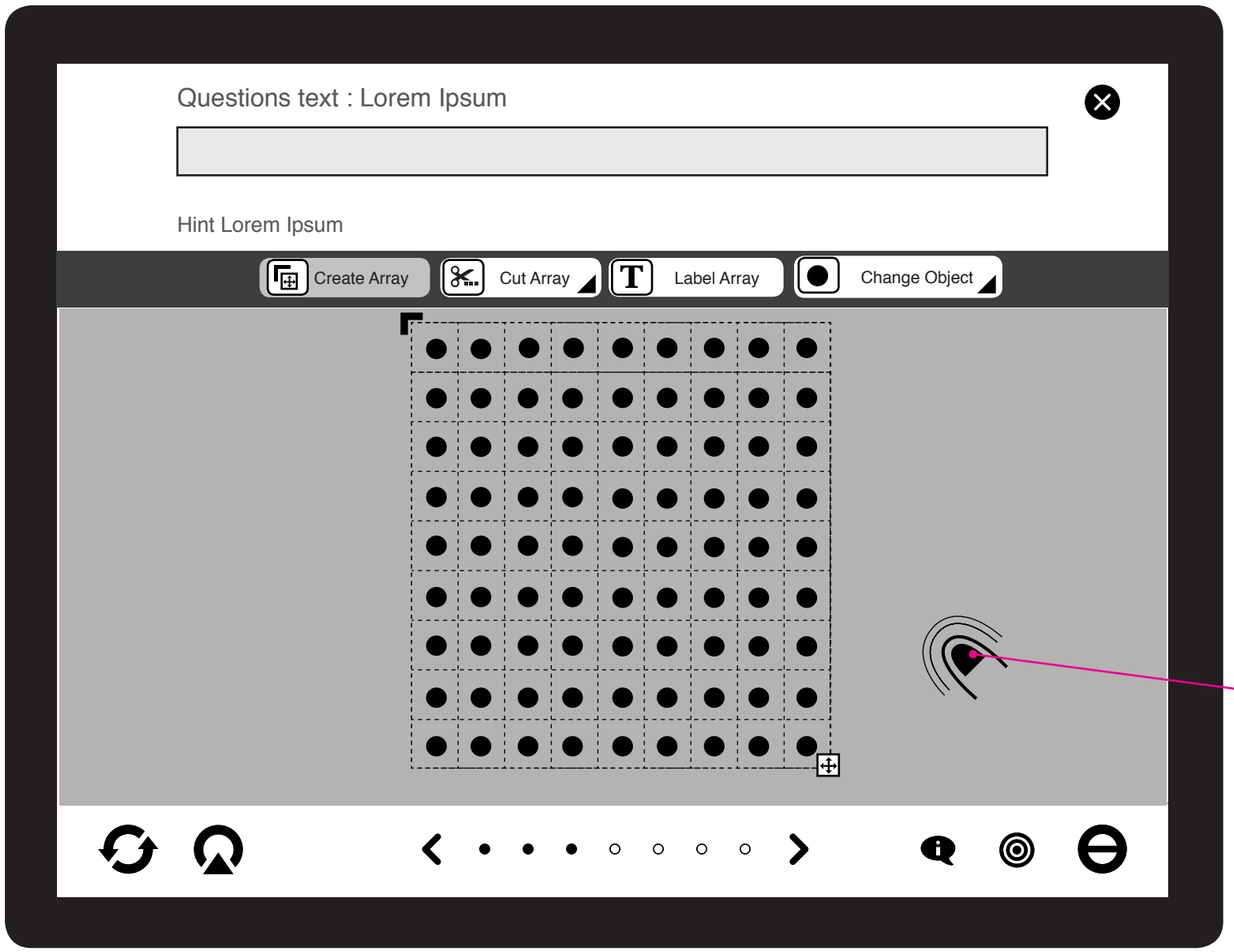
Add Array / Step 1: Select Create Array tool
Students select “create array” tool. Upon selecting tool, a create array icon appears in the Array Space.



2

Add Array / Step 2 : Drag to Create Array in Array Space (Max 9 X 9 array)
Students may then tap and drag to build an array in the array space. Students can drag horizontally, vertically or at a diagonal to create an array.

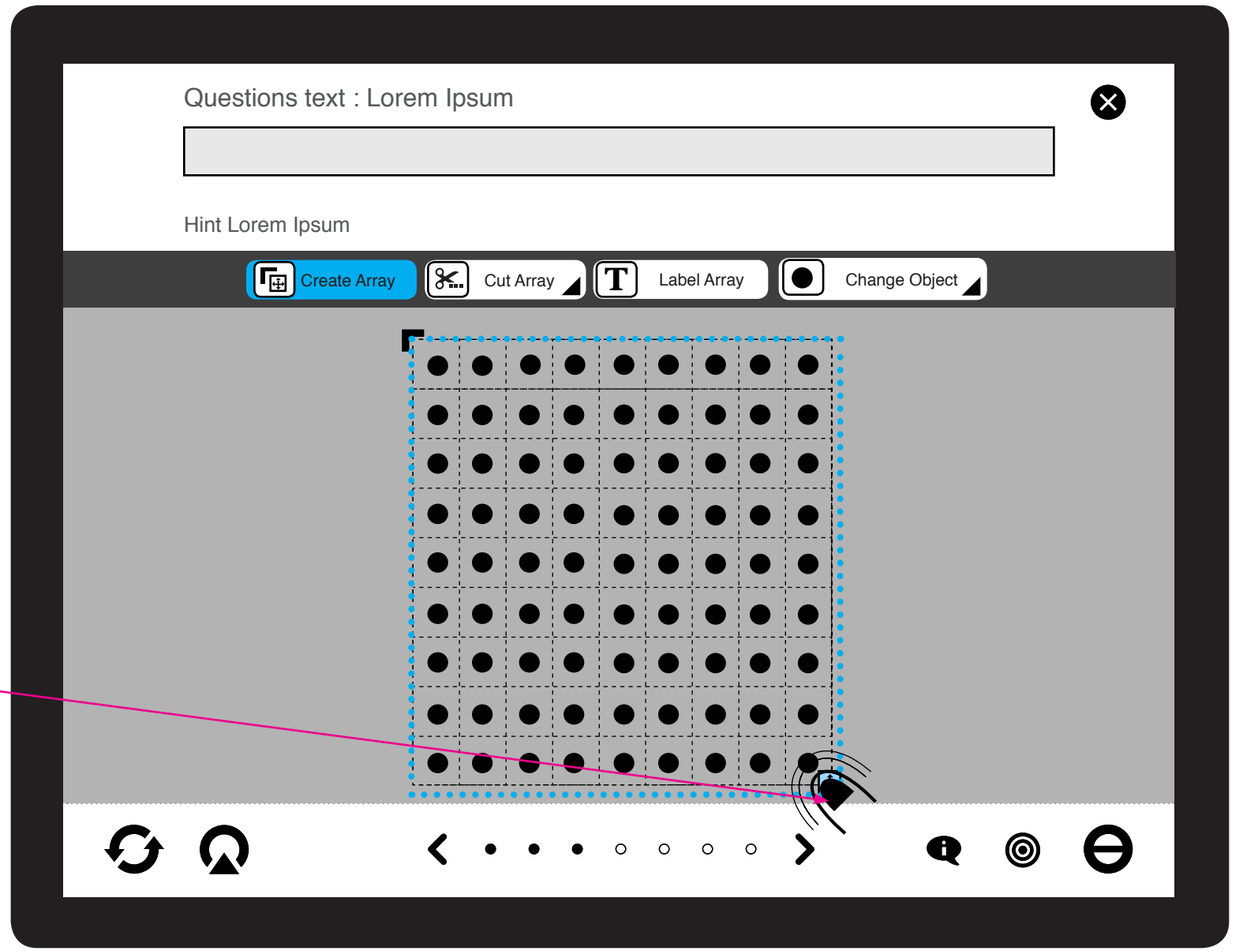
ARRAY ENGINE Select/Change an Array



1

Selecting an Array / Step 1 - Select Array
Student can select an array by tapping anywhere inside of an array or array section. Student can only create 1 Array on the stage. Upon creating an array, the Array tool becomes disabled until array is deleted.

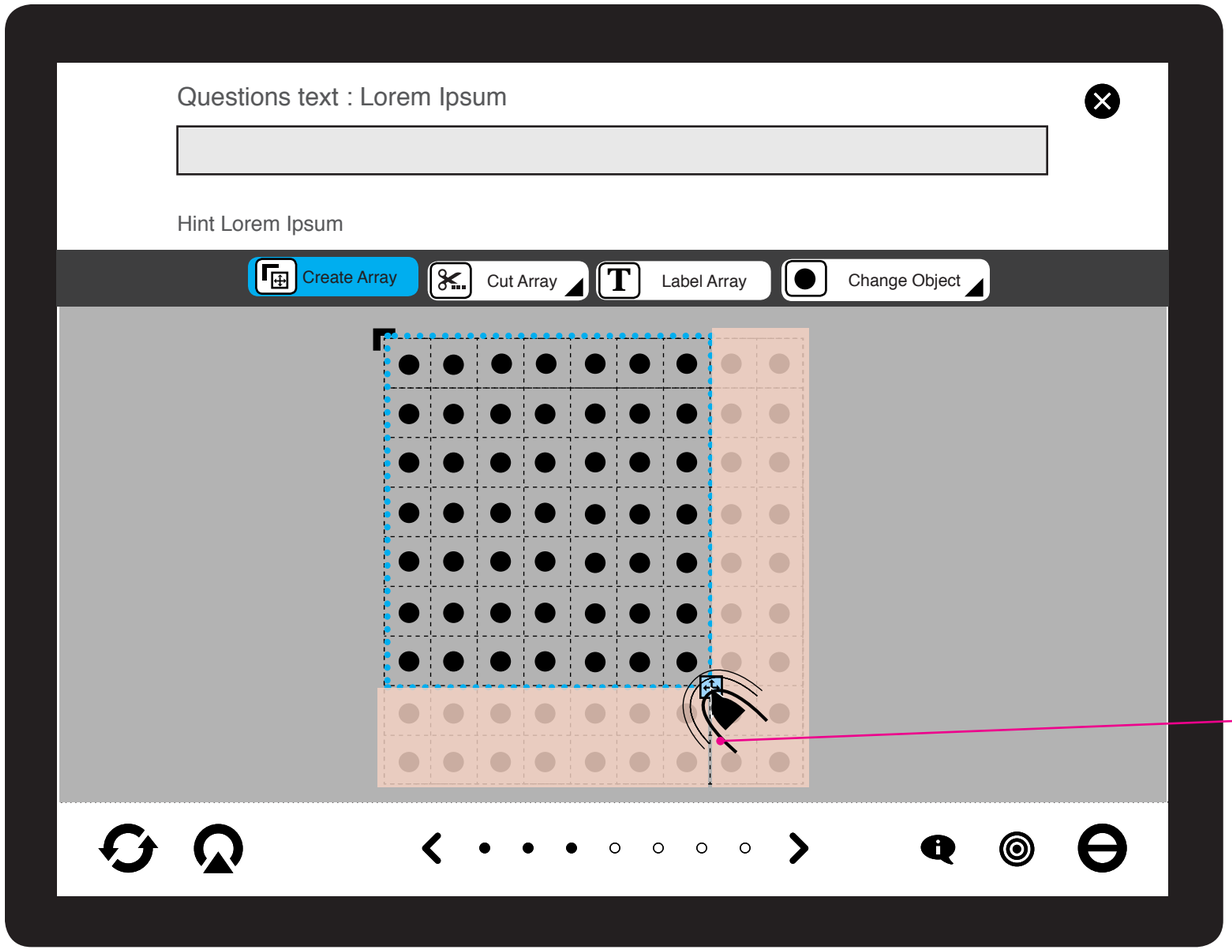
Deselecting an Array
To deselect, students may tap anywhere outside of the array on the array space.



2

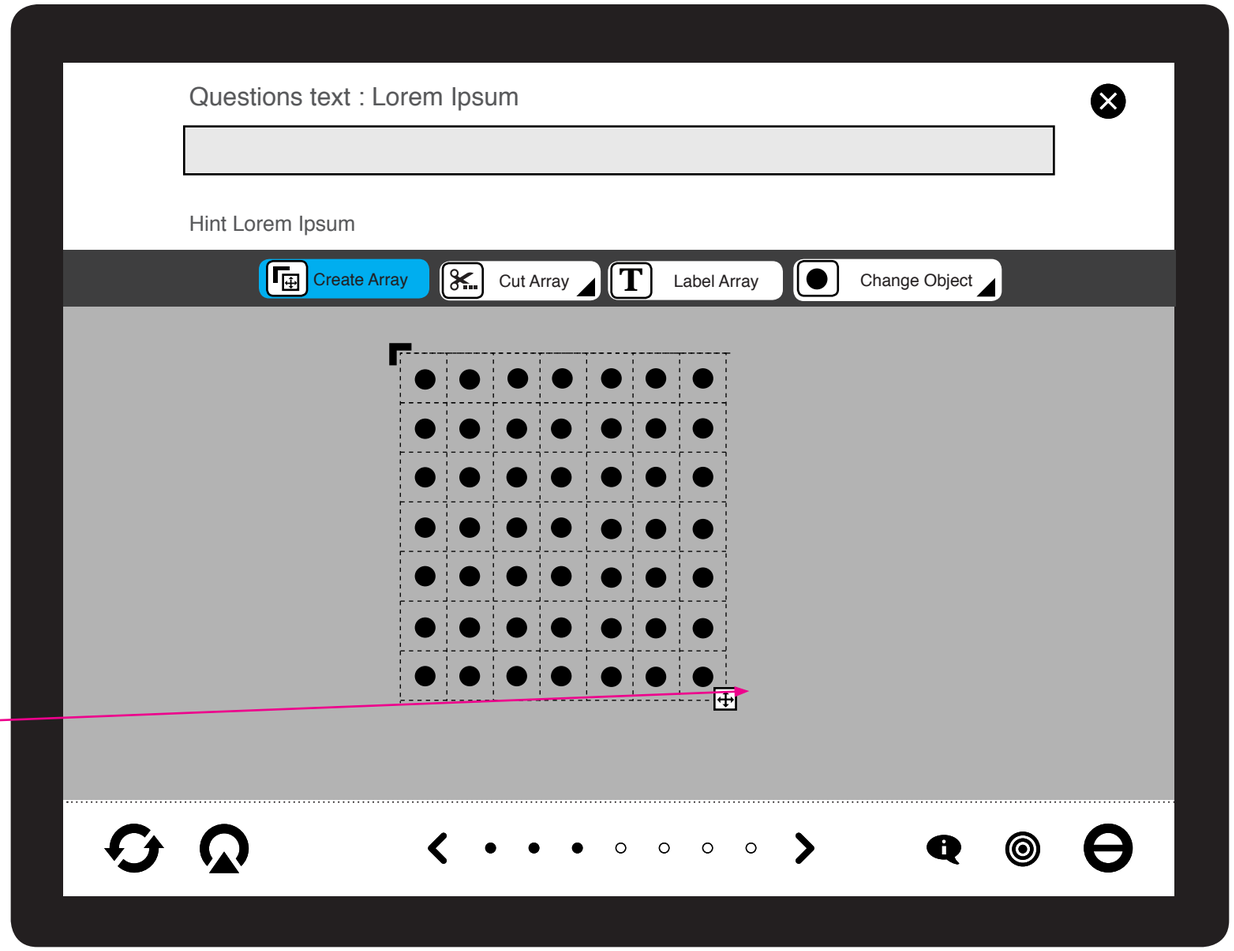
Selecting an Array / Step 2: Upon Selection Student can manipulate array size
Student selects array. Upon selecting array, array becomes highlighted and “create array” button turns into a selected state. Student can then drag the array to resize the array configuration.

ARRAY ENGINE Change an Array



3

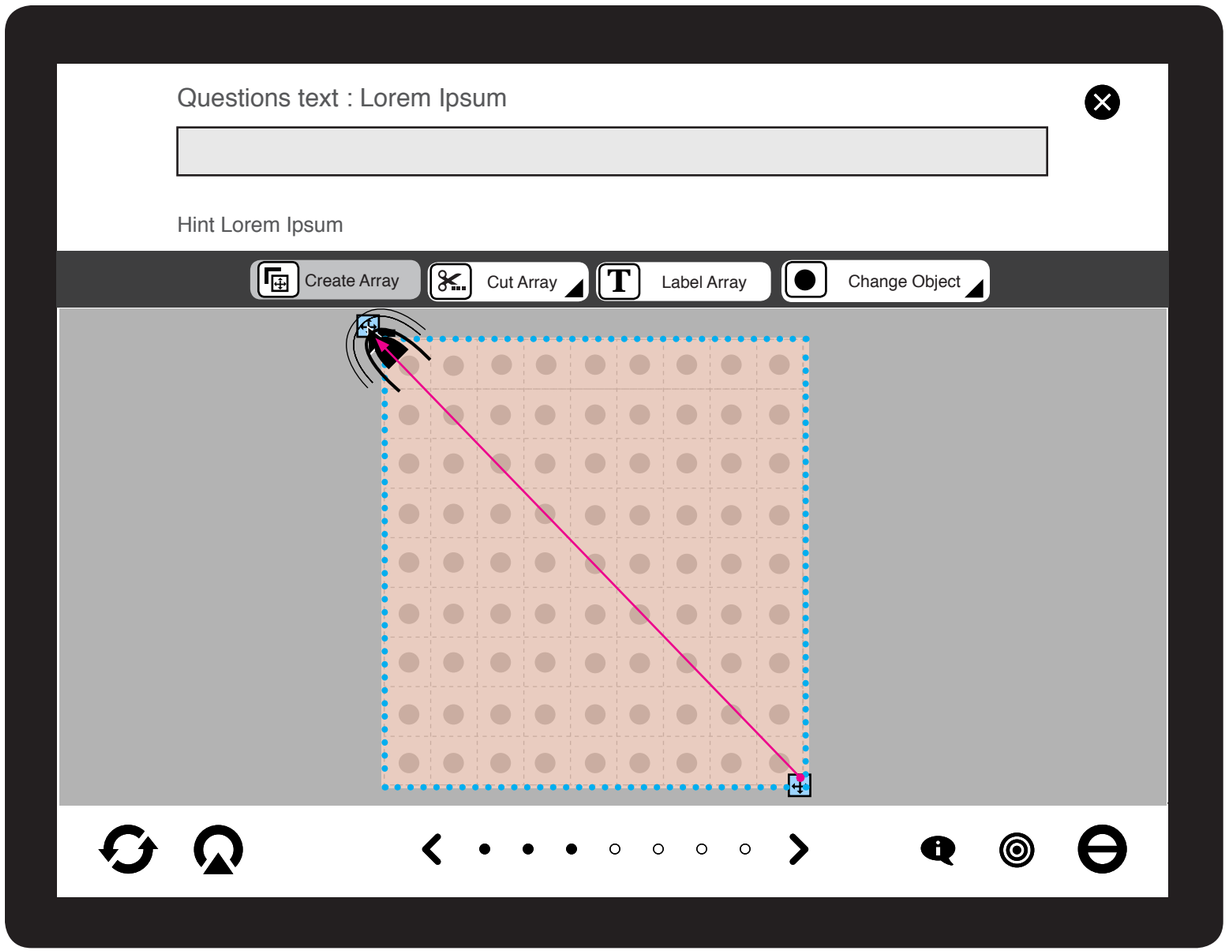
Manipulate an Array / Step 1: Changing Array Size
While still working with a single array (before cutting), students may change the size of their array. Dragging to resize reveals an overlay for the area which is being removed.



4

Manipulate an Array / Step 2: Changing Array Size
Upon releasing the overlay disappears and the array resizes.

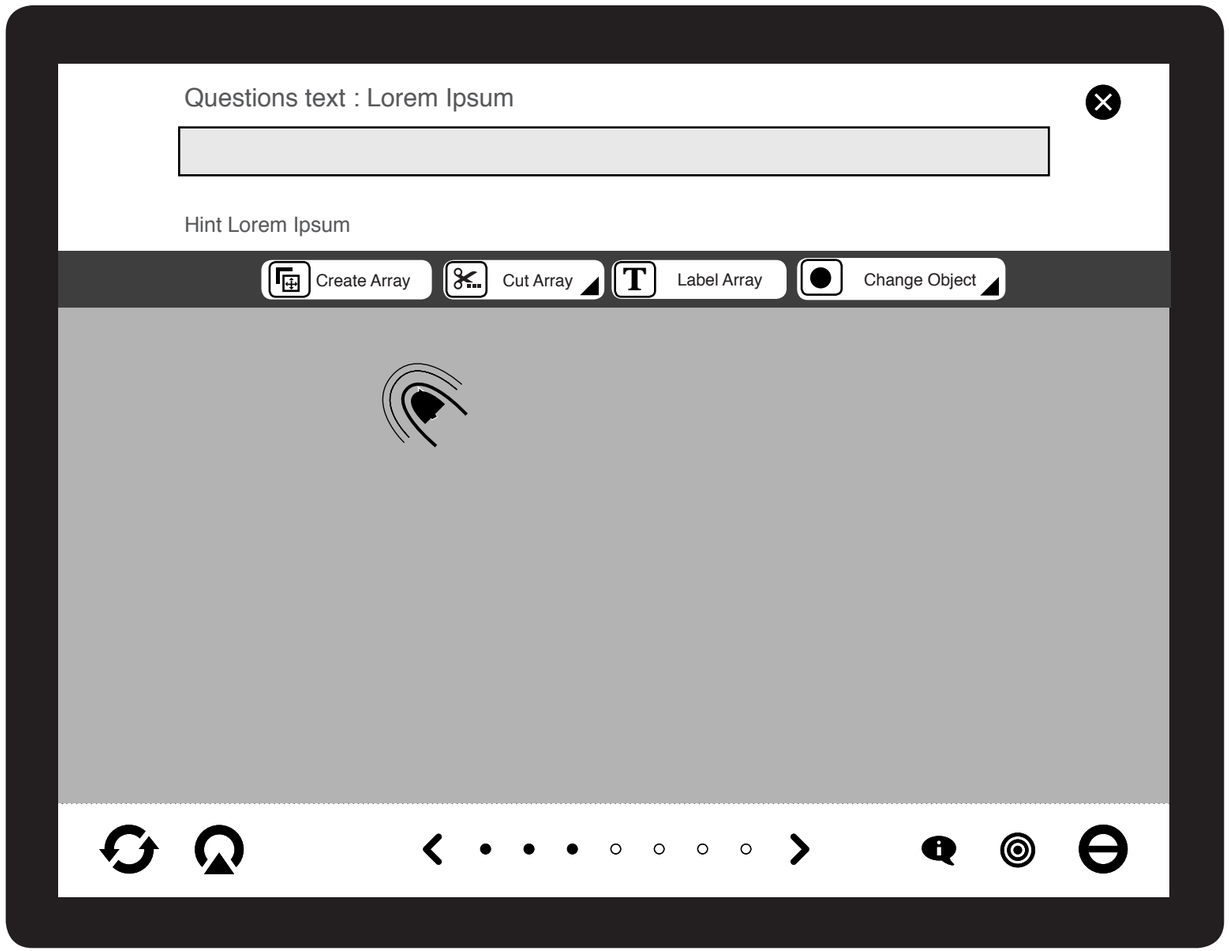
ARRAY ENGINE Delete an Array



1

Delete an Array: Step 1 -
User can remove an array from the array space by dragging the array to its origins.

Students may remove an array only when one array is on the stage.



2

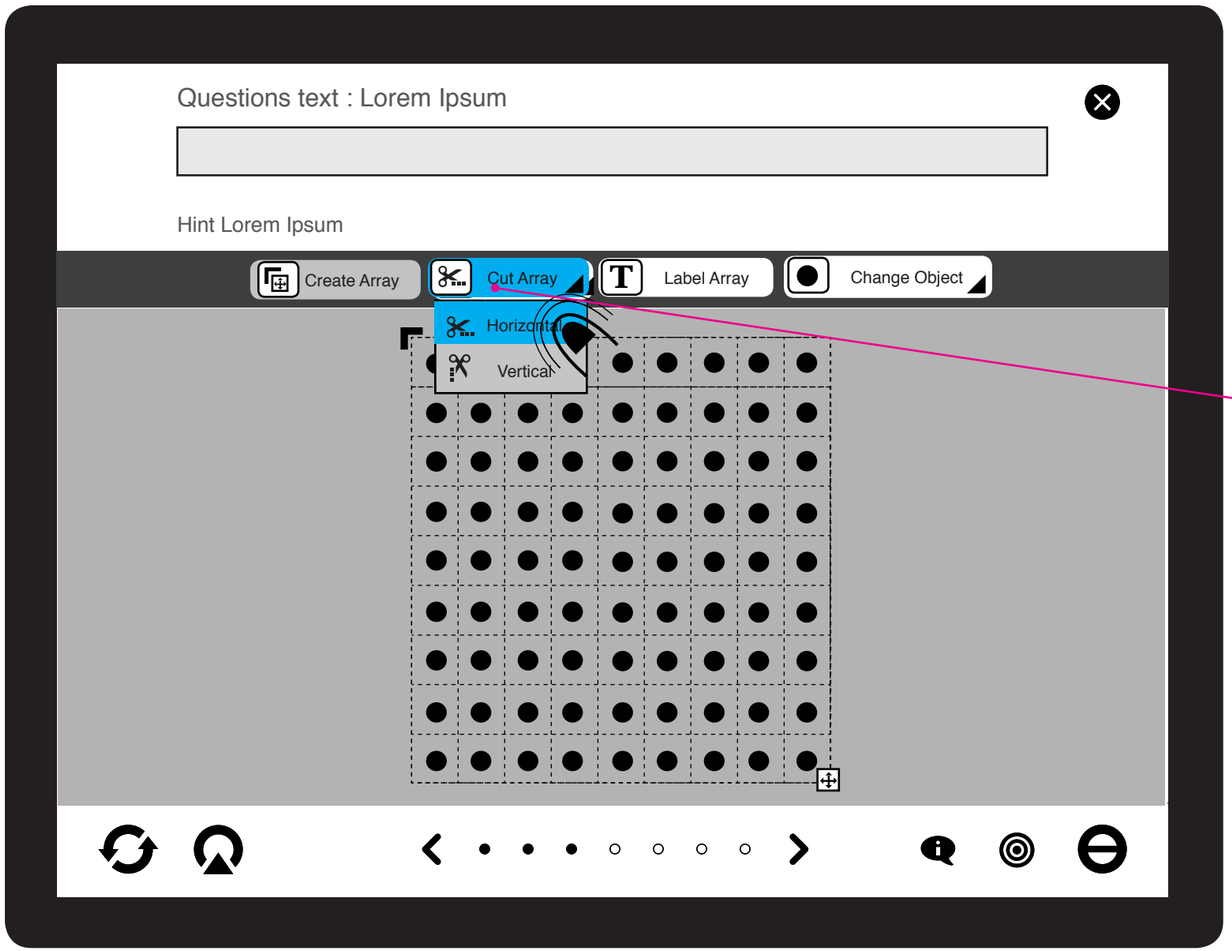
Delete an Array: Step 2 -
Upon dragging the array to its origin, the array is removed from the array space.

Once a student removes an array, the change array button becomes active. To add a new array, students may select the “create array” tool and re-build an array.

/ SCREEN FLOWS :

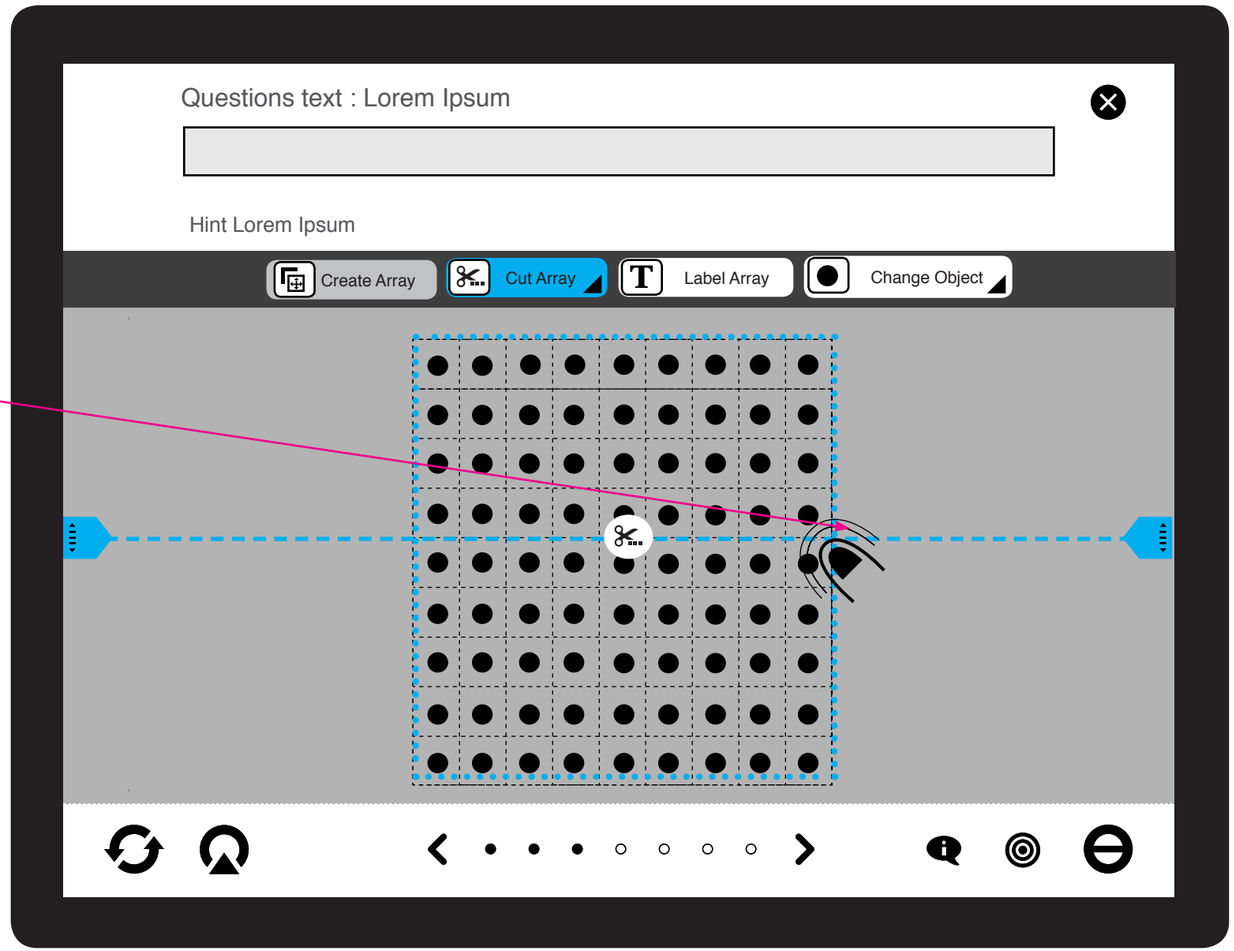
Break / Cut Array: Horizontal

ARRAY ENGINE Cut Array : Horizontal



1

Cutting / Breaking an Array - Step 1: Cut Array Tool
Student can cut / break / separate an array. Student selects the “cut array” tool. Student can select between horizontal and vertcal cutting options.



2

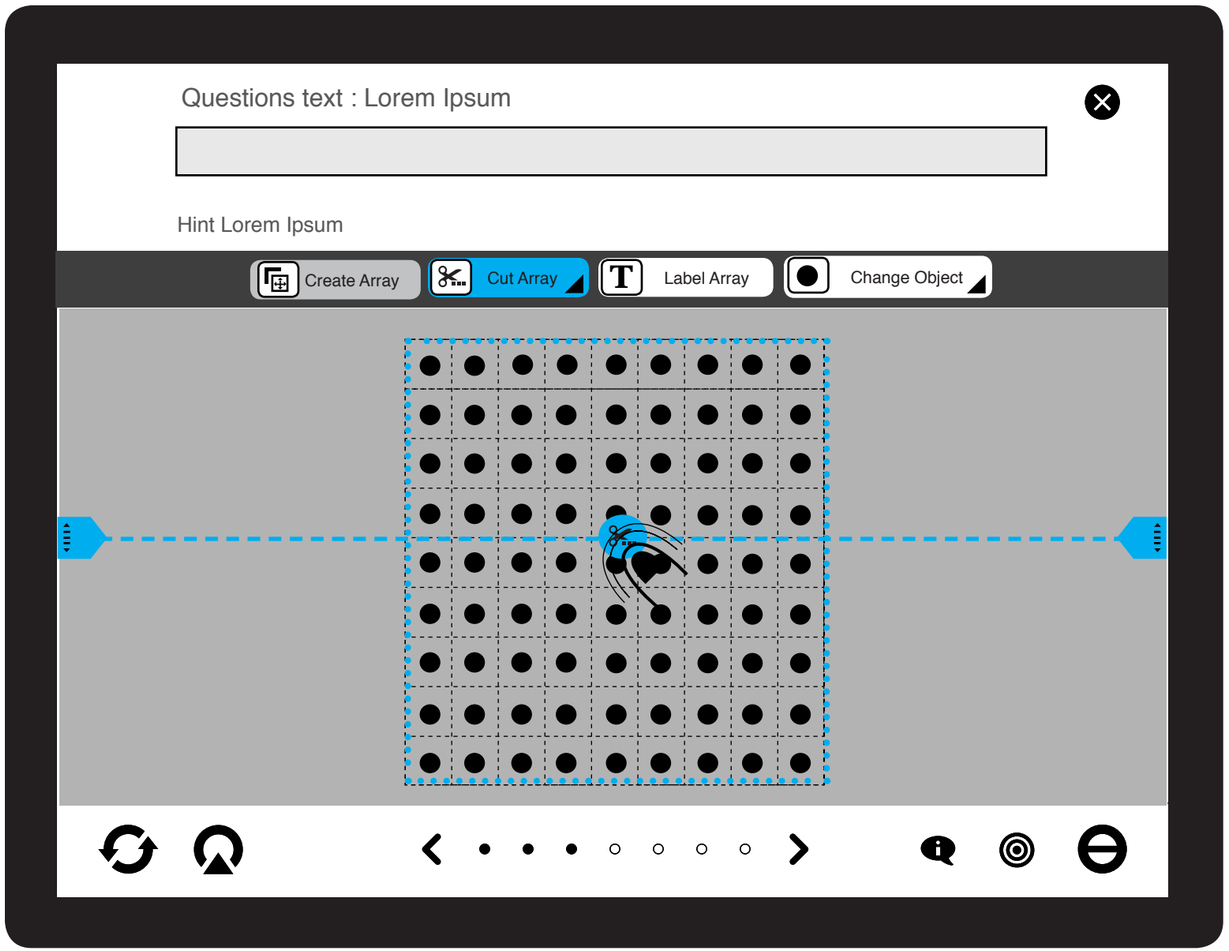
Cutting / Breaking an Array - Step 2: Break Array Tool
Selecting the horizontal option from the cut array tool adds a horizontal cut tool to the array space. Arrays may be cut in only one direction at a time.

3

Cutting / Breaking an Array - Step 3: Respositioning the Array Tool
Default positioning of the Cut Array tool on the Array Space should be on the top (for horizontal cuts) or the left (for vertical cuts). *(See pg. 19)*

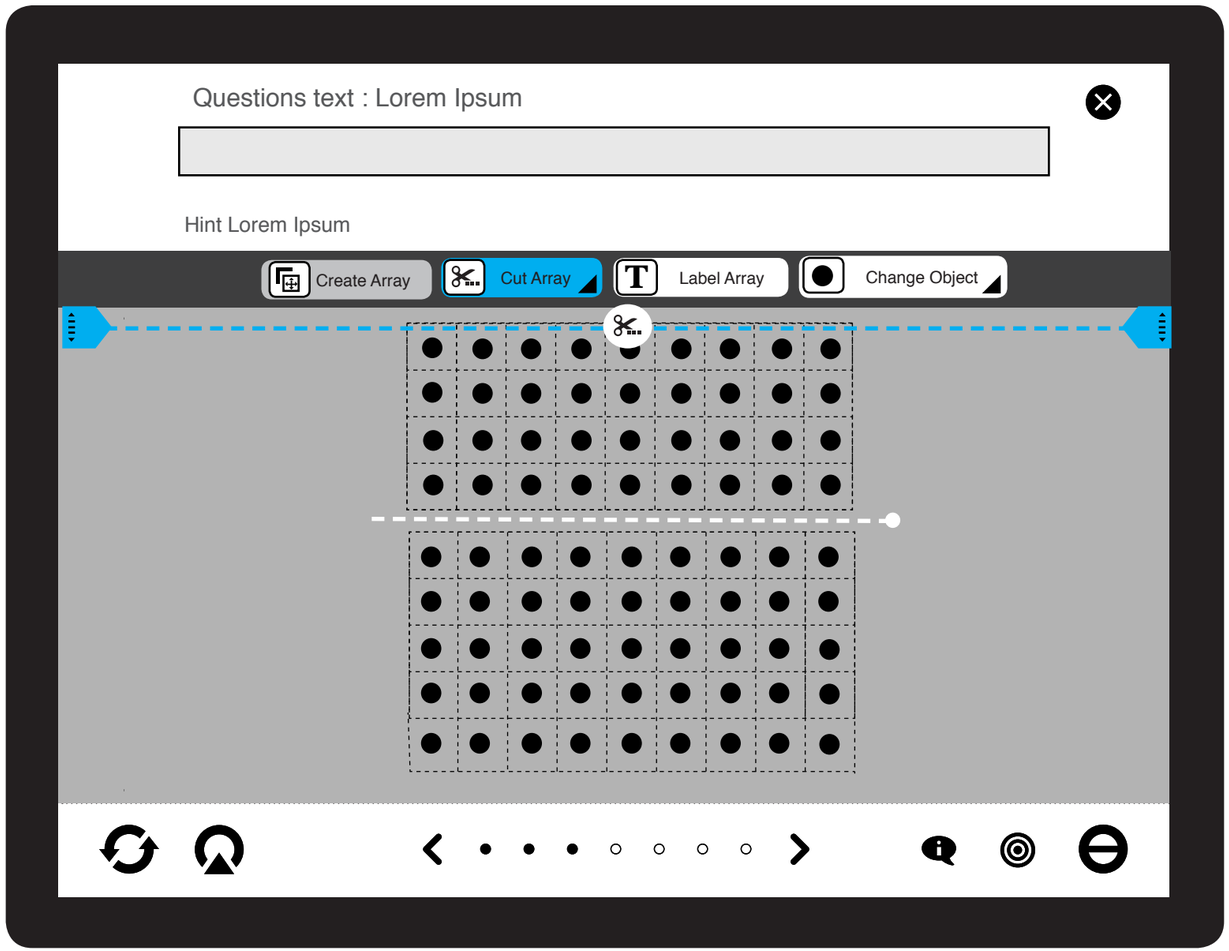
As students tap on an area in the array space, array tool should correspond by repositioning.

ARRAY ENGINE Cut Array : Horizontal



4

Cutting / Breaking an Array - Step 4: Cut Tool Activated
Student selects cut button to cut an array.

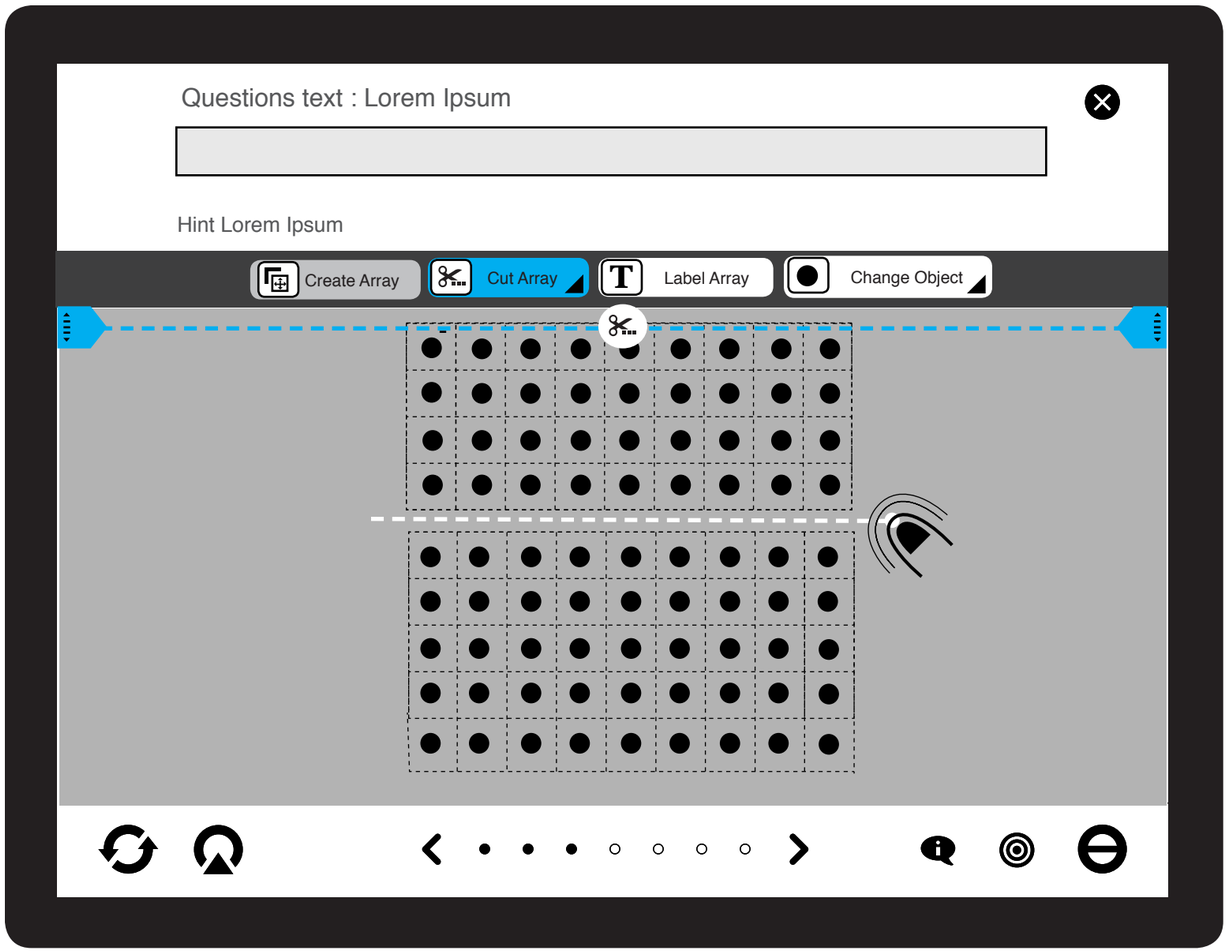


5

Cutting / Breaking an Array - Step 5: Cut accomplished
Once student has cut an array, array sections separate at cut line and split apart, adding a marker along the cut line.

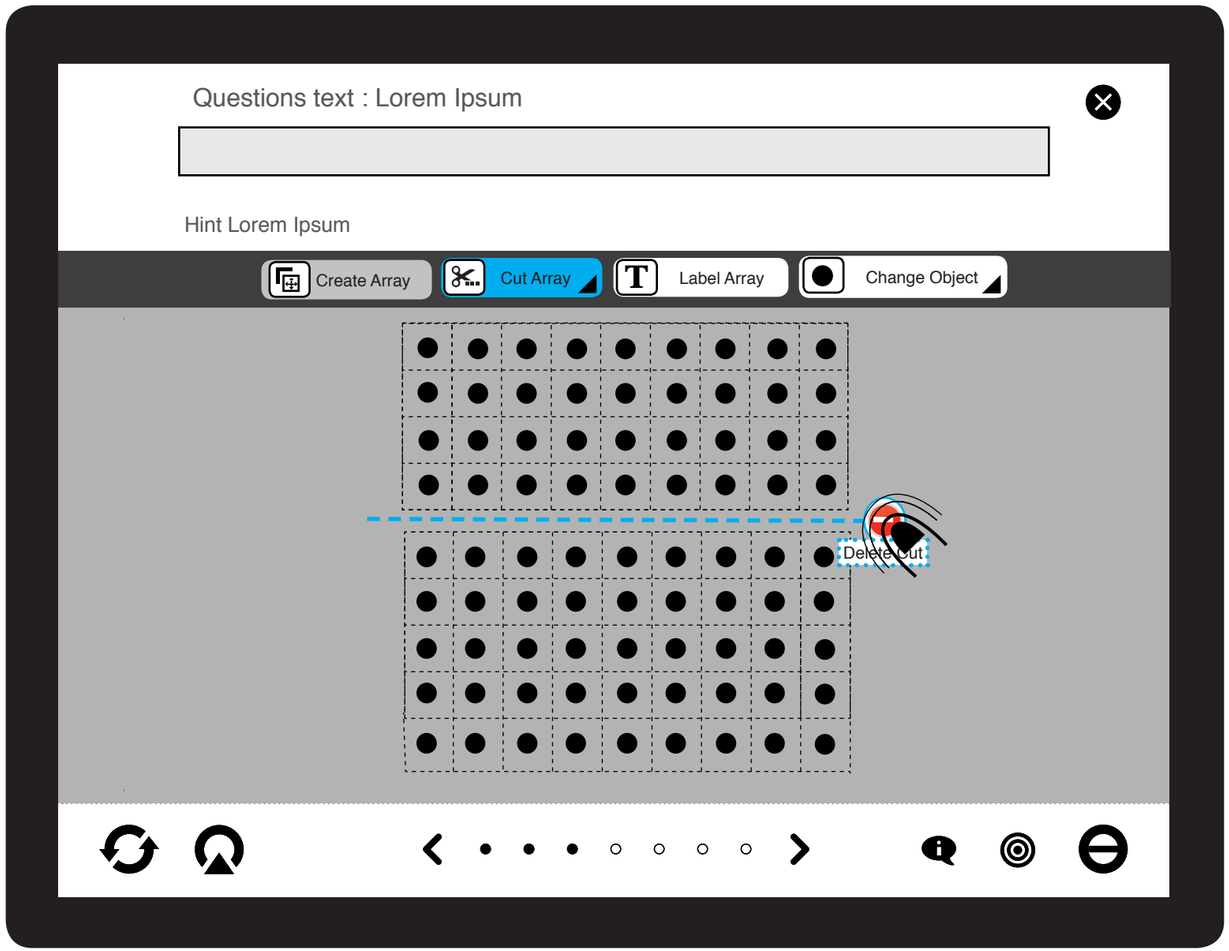
Cut tool defaults back to the top of the array space.

ARRAY ENGINE Cut Array : Horizontal - Delete Cut



1

Deleting a Cut of an Array - Step 1: Cut is a selectable element
Student selects a previously made cut by tapping to select the cut line element.

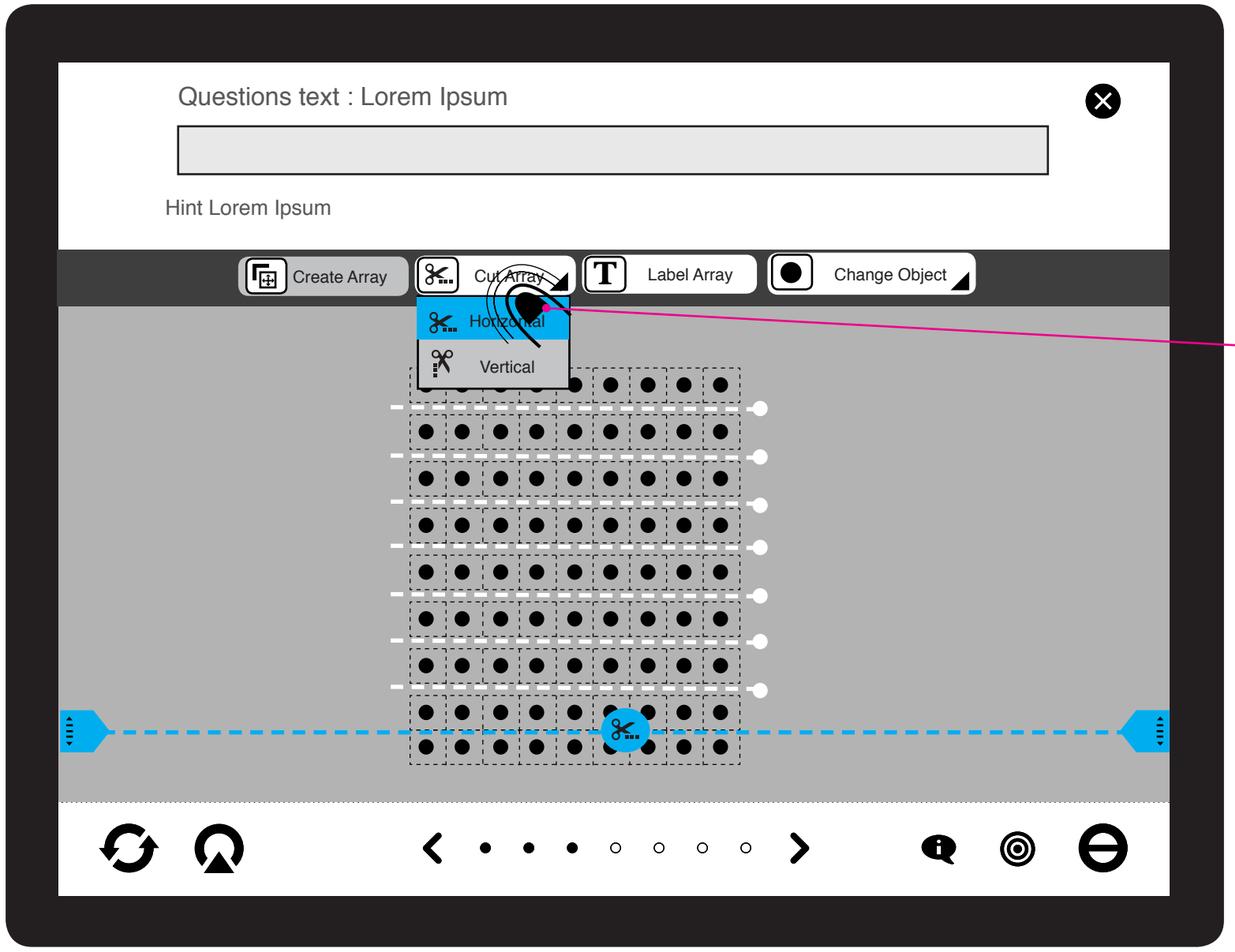


2

Cutting / Breaking an Array - Step 2: Delete Cut
Once student selects a previous cut, the student is giving the option to delete the cut (cut tool dissapears from the array space).

Upon selecting “delete cut”, the array rejoins along the cut line.

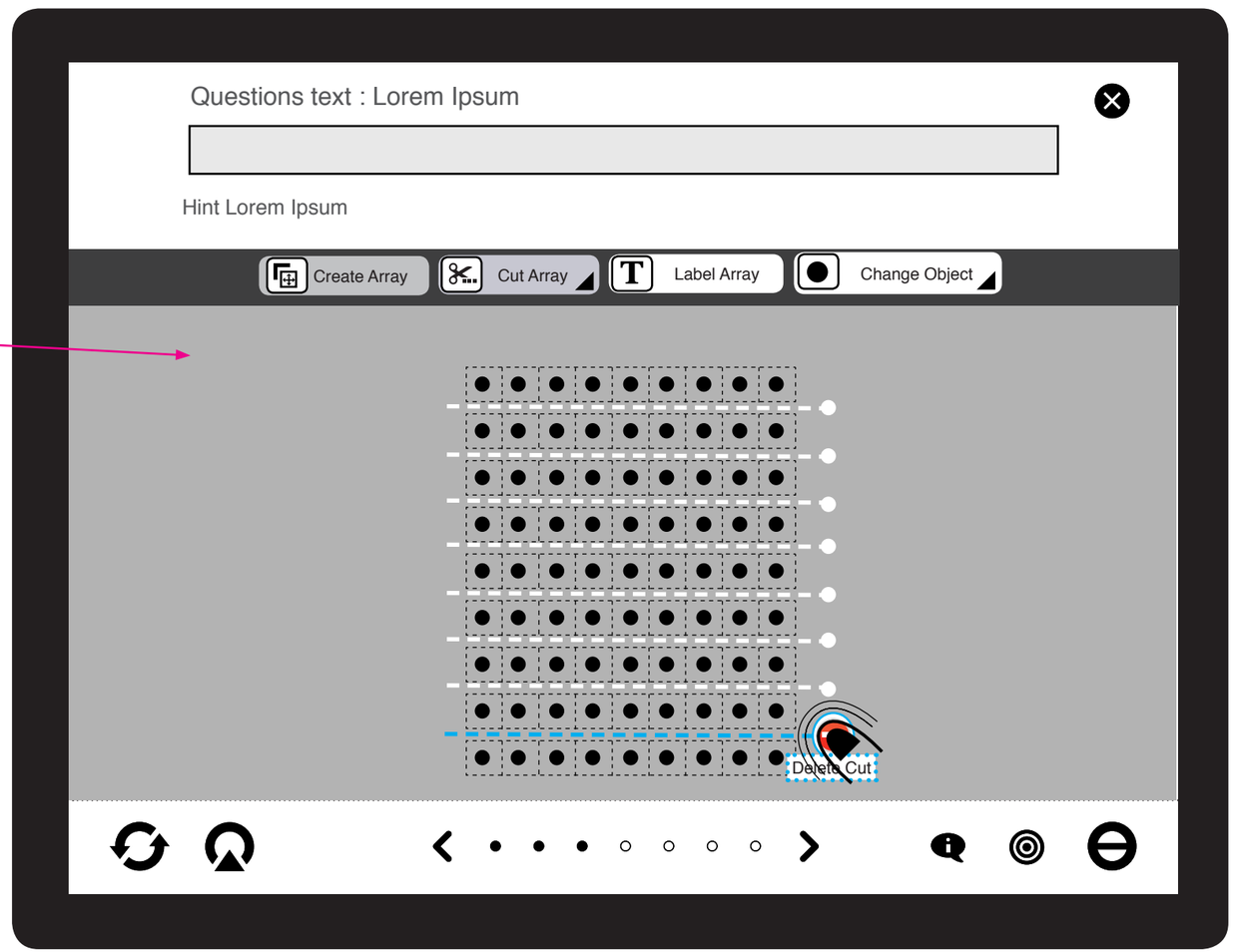
ARRAY ENGINE Cut Array : Max Case 8 Hortizontal Cuts



1

Cutting / Breaking an Array - Step 1: Max of 8 cuts
Student can cut / break / separate an array. Selecting horizontal within the cut array tool adds a horizontal cut tool to the stage. Student arranges the cut array tool and continues to make the max of 8 cuts.

Note on max cuts
The max number of cuts may vary depending on the current array in the array space. A max arrray is 9 x 9, therefore the max number of cuts is 8 cuts.



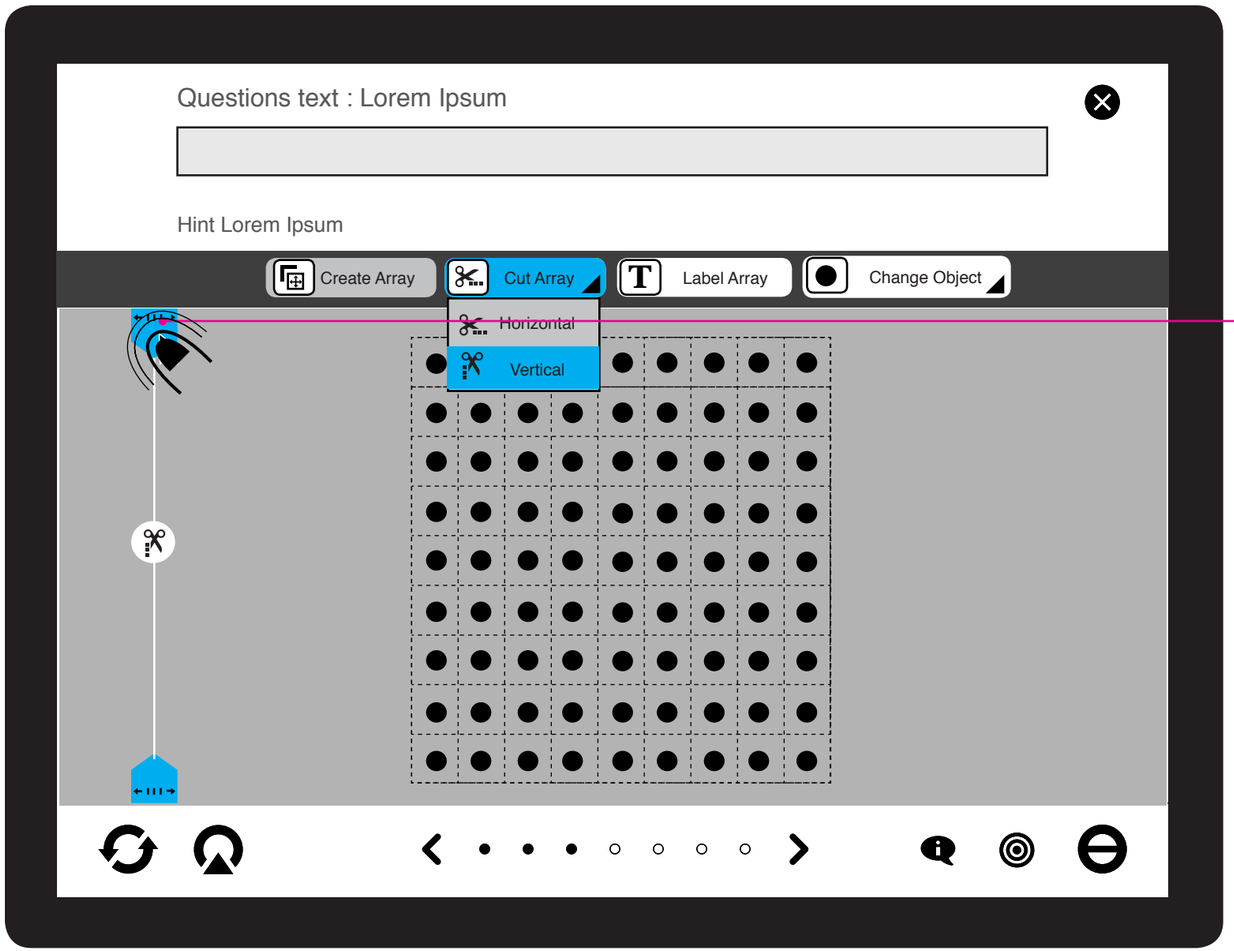
2

Cutting / Breaking an Array - Step 2: Max of 8 cuts
Upon cutting 8 times, the cut tool becomes inactive and the student may select any previous cut in order to delete the cut.

/ SCREEN FLOWS :

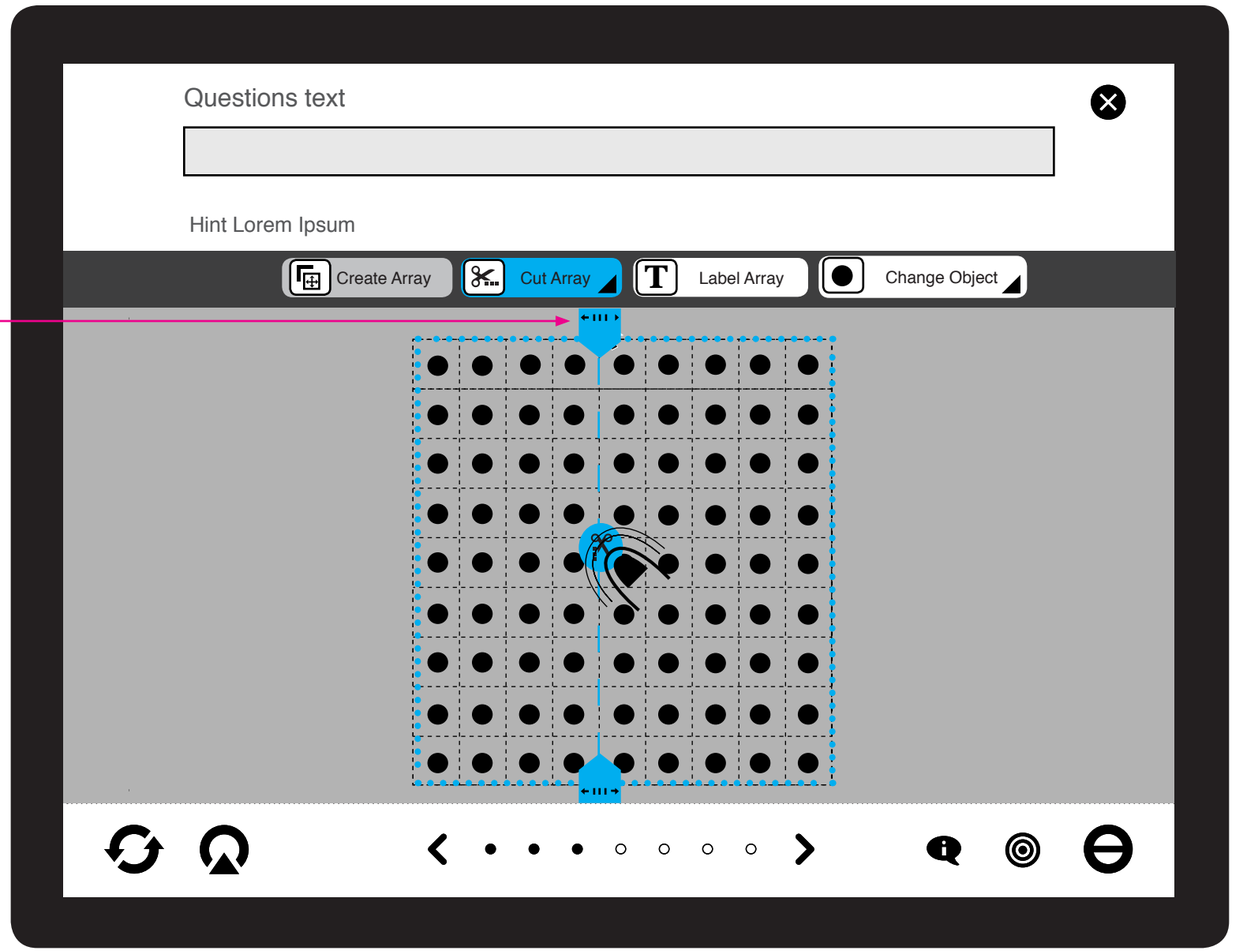
Break / Cut Array Vertical

ARRAY ENGINE Cut Array : Vertical



1

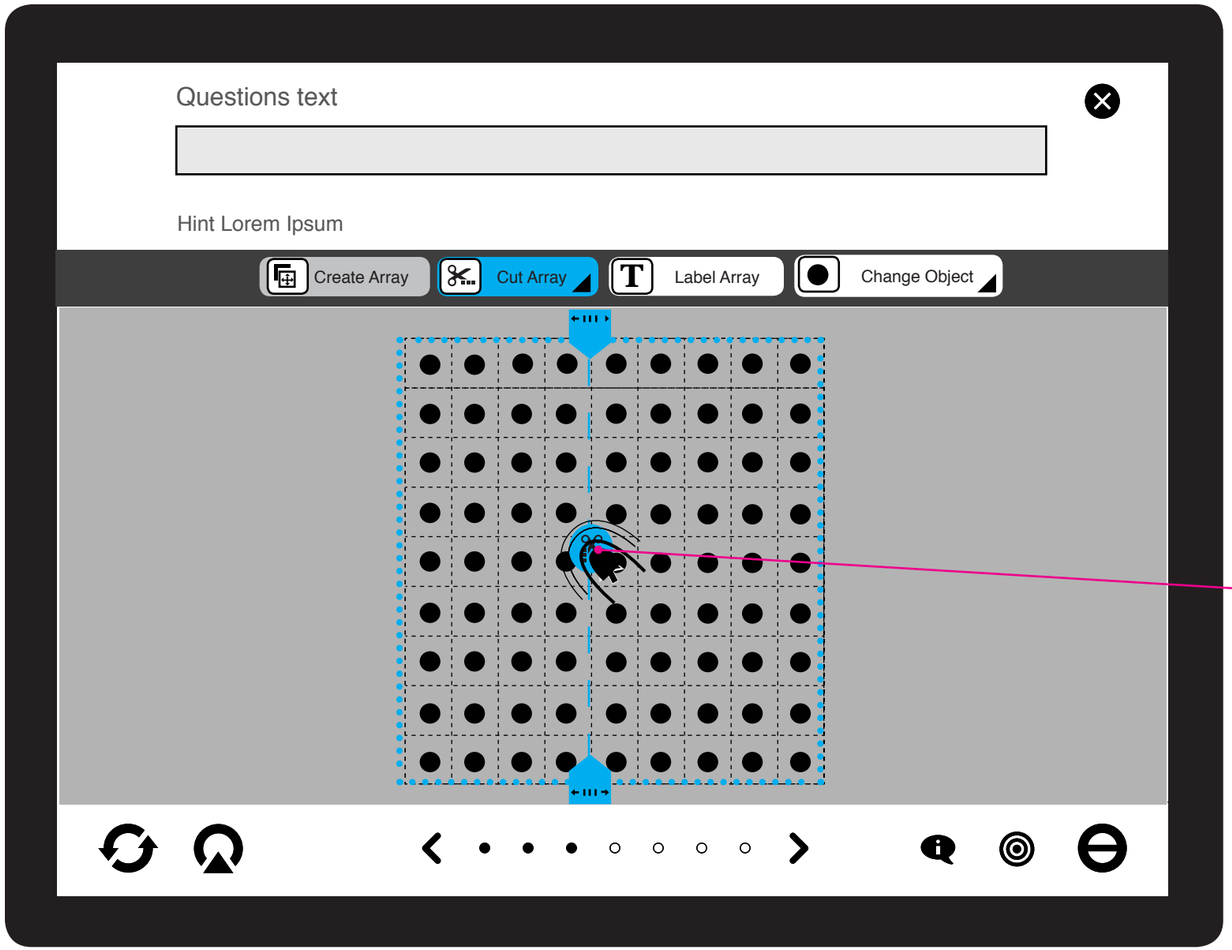
Cutting / Breaking an Array - Step 1: Cut Array Tool
Student can cut / break / separate an array. Student selects the “cut array” tool. Student selects the vertcal cutting option. Selecting the vertical option from the cut array tool adds a vertical cut tool to the array space.



2

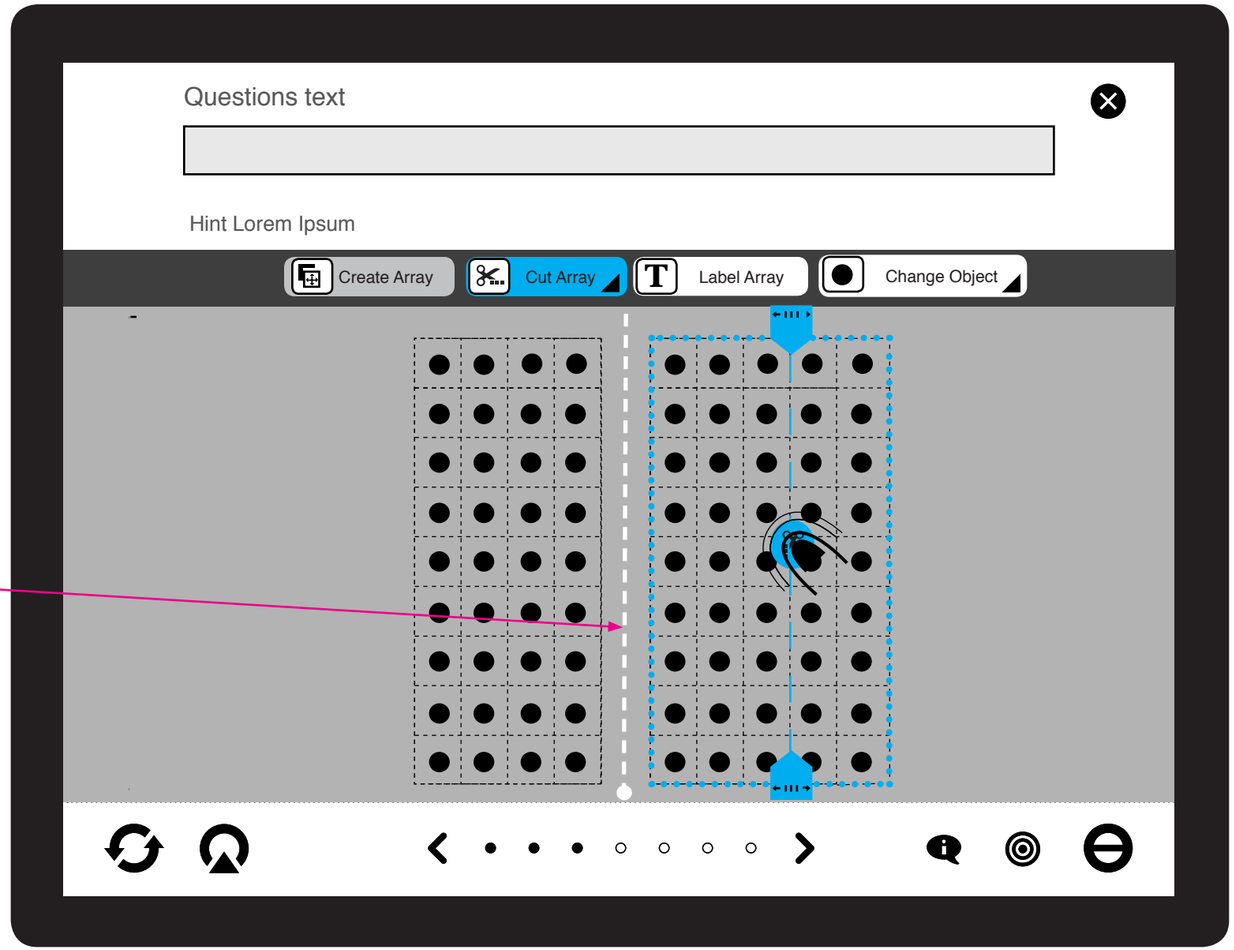
Cutting / Breaking an Array - Step 2: Cut Array Tool
Arrays may be cut in only one direction at a time.

ARRAY ENGINE Cut Array Vertical



3

Cutting / Breaking an Array - Step 3: Cut Tool Activated
Student selects cut button.

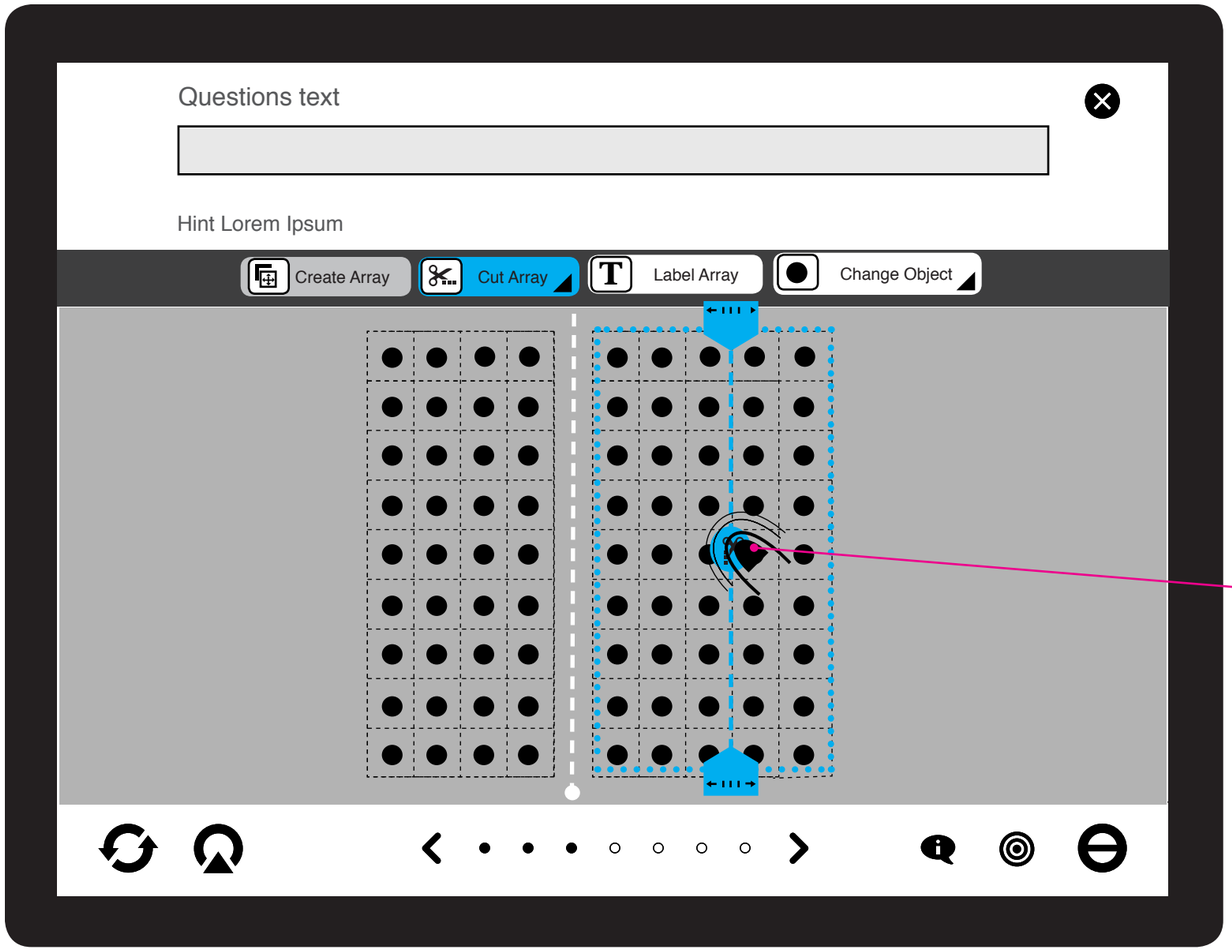


4

Cutting / Breaking an Array - Step 4: Cut accomplished
Once student has cut an array, array sections separate at cut line and split apart, adding a marker along the cut line.

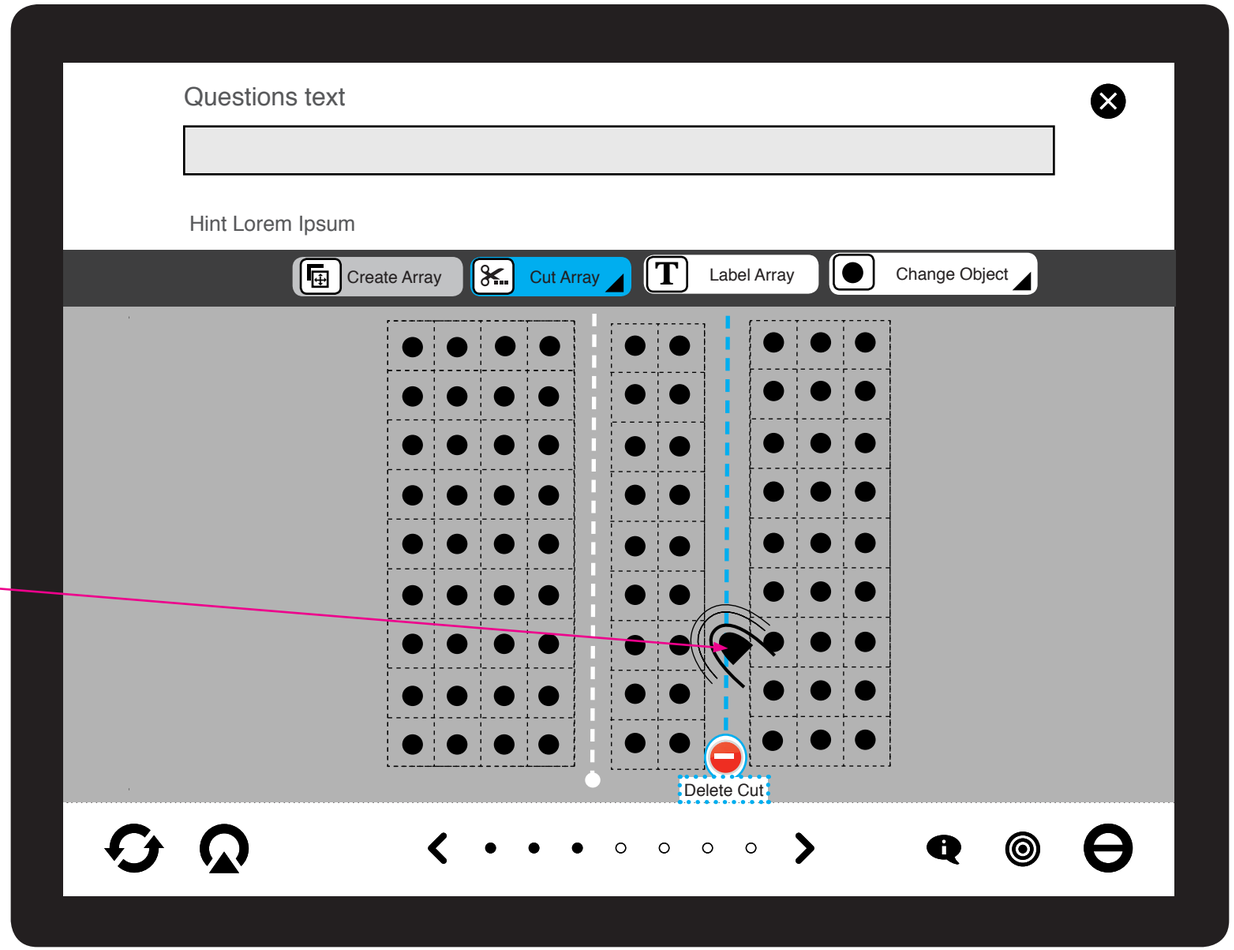
Cut tool defaults back to the left of the array space.

ARRAY ENGINE Break Array into 3 Arrays



1

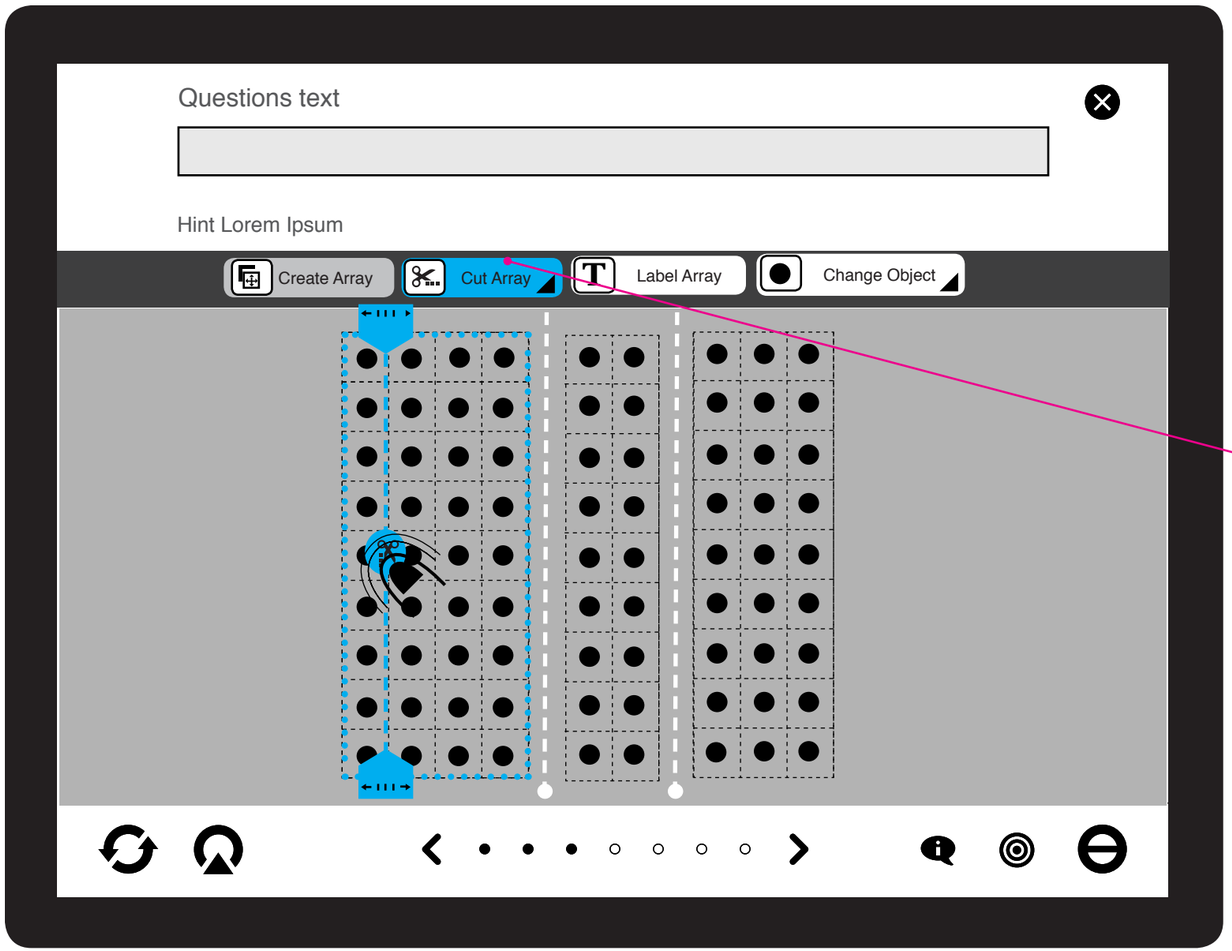
Cutting / Breaking an Array Multiple Step 1: Cut 2 into 3
After completeing 1 vertical cut, student decides to drag cut tool from the default position on left of array space and make another vertical cut.



2

Cutting / Breaking an Array Multiple Step 2: Cut 2 into 3
To return to only 1 cut, (2 arrays in the array space), student may select and delete a cut to rejoin.

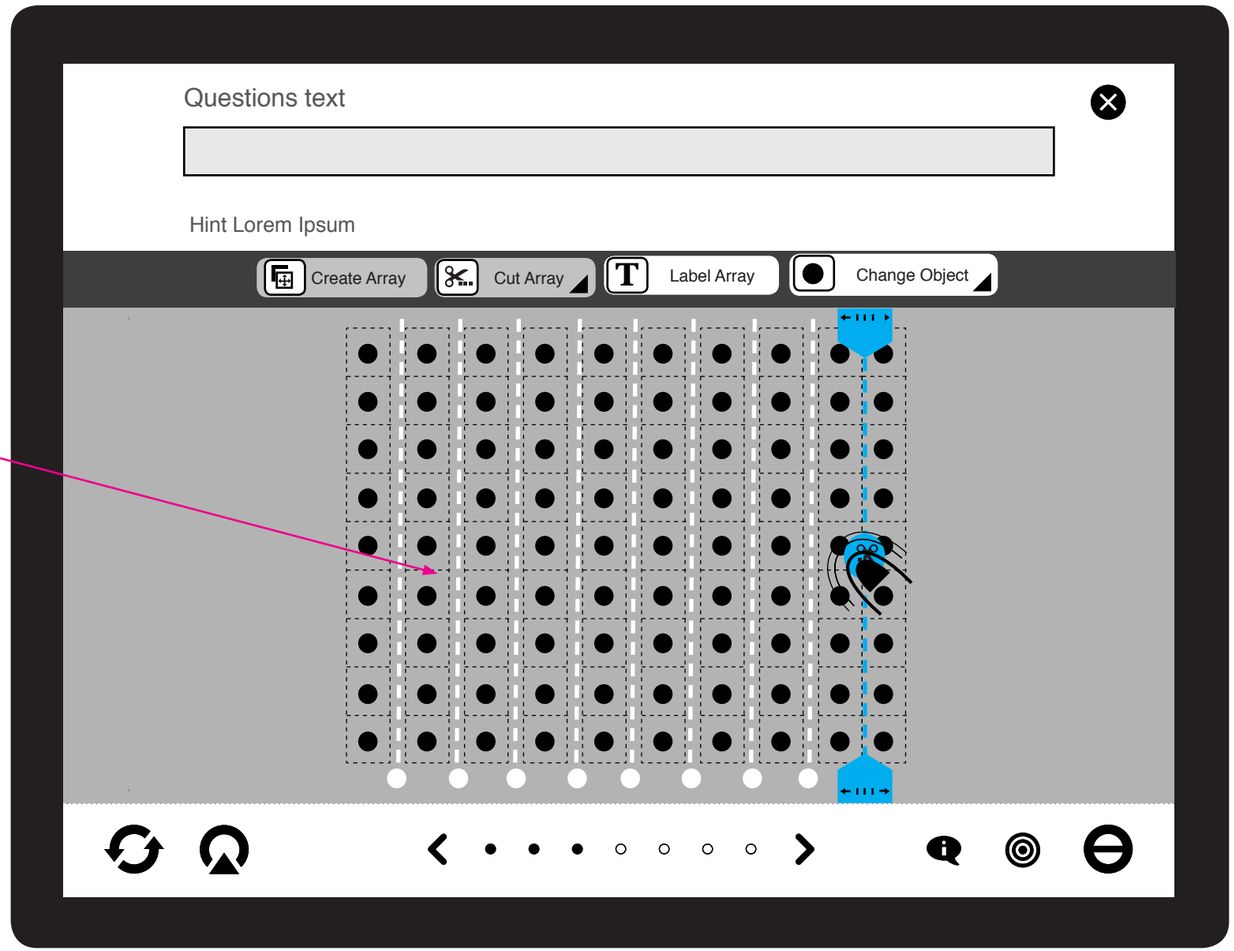
ARRAY ENGINE Break Array - Max Cuts 9 Vertical



1

Cutting / Breaking an Array Multiple Step 1: Multiple cuts
Student can cut / break / separate an array. Selecting vertical within the cut array tool adds a vertical cut tool to the stage. Student arranges the cut array tool and continues to make the max of 8 cuts.

Note on max cuts
The max number of cuts may vary depending on the current array in the array space. A max arrray is 9 x 9, therefore the max number of cuts is 8 cuts.

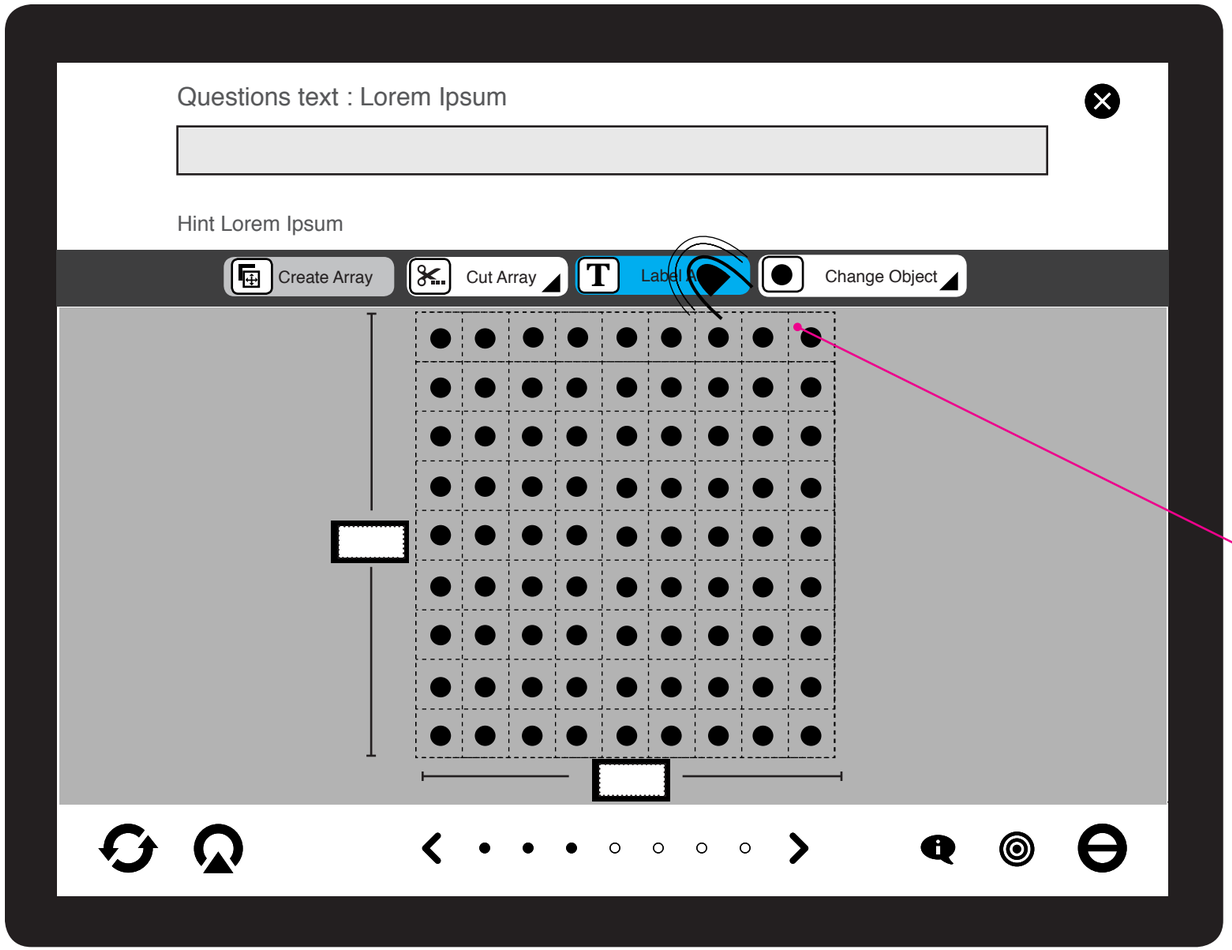


2

Cutting / Breaking an Array Multiple: Max 9 Cuts
Student may cut an array up to 8 times. After the 8th cut, the cut tool becomes disabled.

/ SCREEN FLOWS : Edit Labels

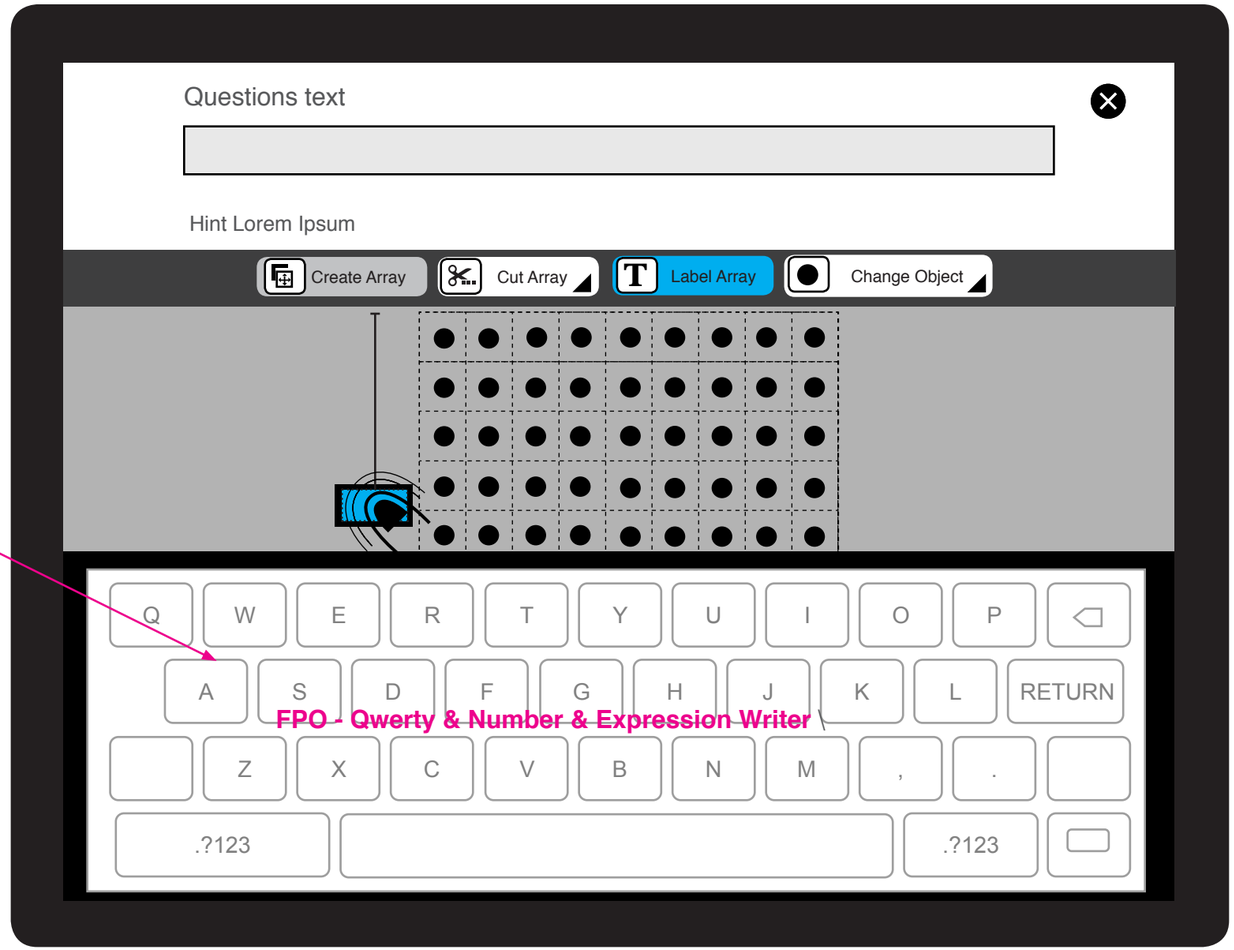
ARRAY ENGINE Add/Change Labels



1

Adding/Changing Labels: Step 1 - Selecting Label Tool
Students may select the “Label” tool to view empty, pre-filled or edited labels.

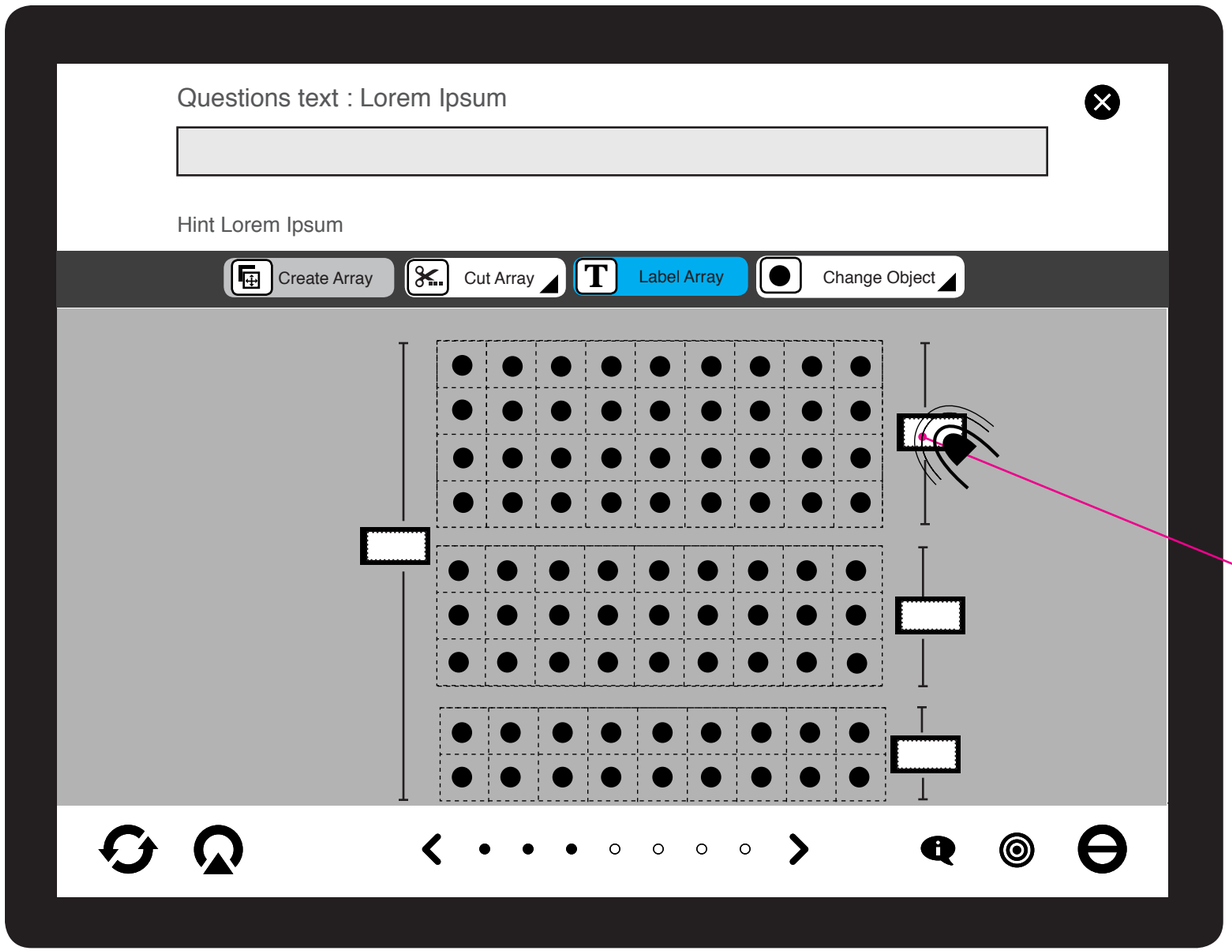
* For a single array, labels appear on the left (total array height) and bottom (total array width).



2

Adding/Changing Labels: Step 2 - Label becomes a form
Students may edit a label using the expression writer tool/native QWERTY keypad.

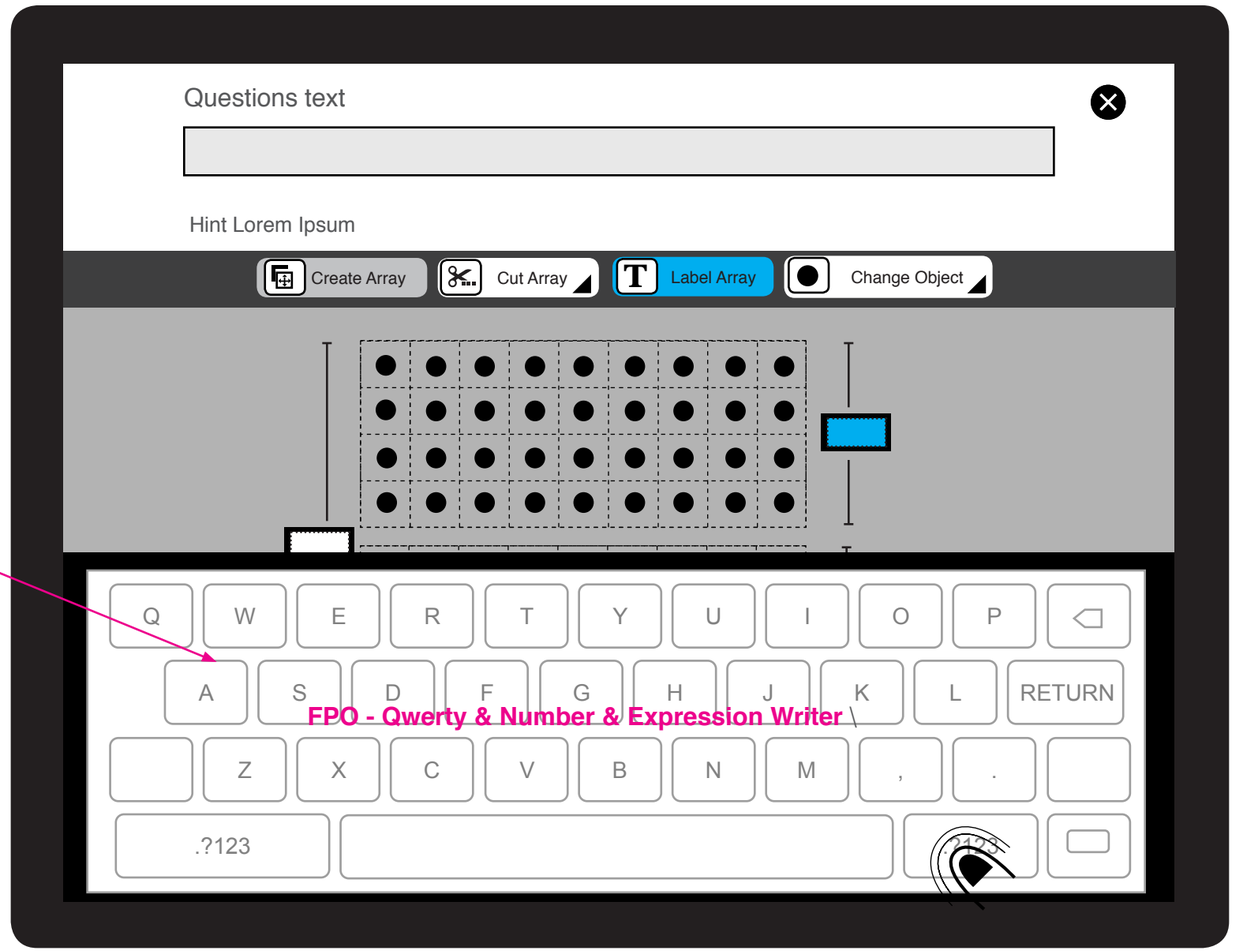
ARRAY ENGINE Change Label - Horizontal Cut Labels



1

Editing Labels: Step 1 - Select Label
Students may tap to select a label*.

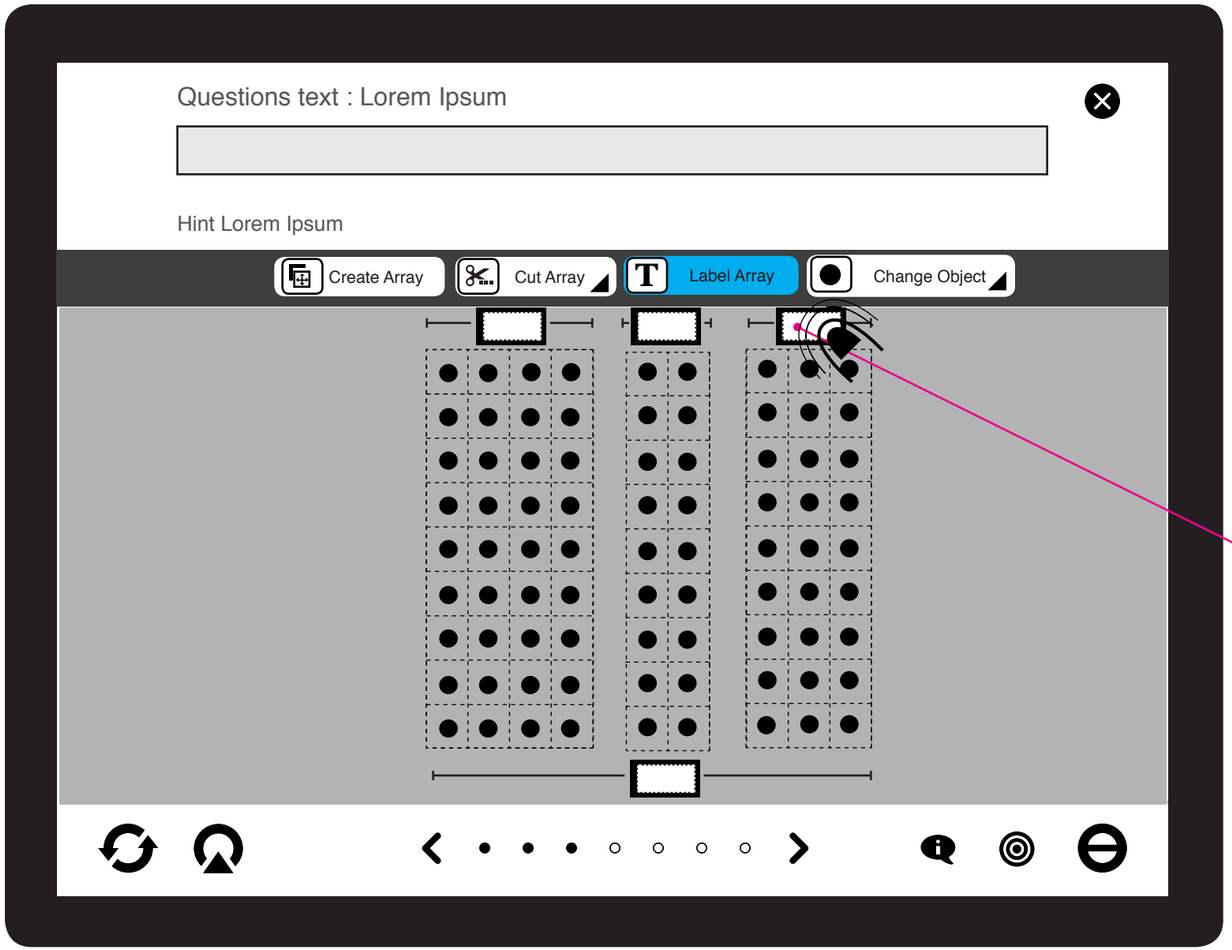
* For horizontal cuts, labels appear on the left (expression for total array) and right (expression for individual arrays).



2

Editing Labels: Step 2 - Label becomes a form
Students may edit a label using the expression writer tool/native QWERTY keypad.

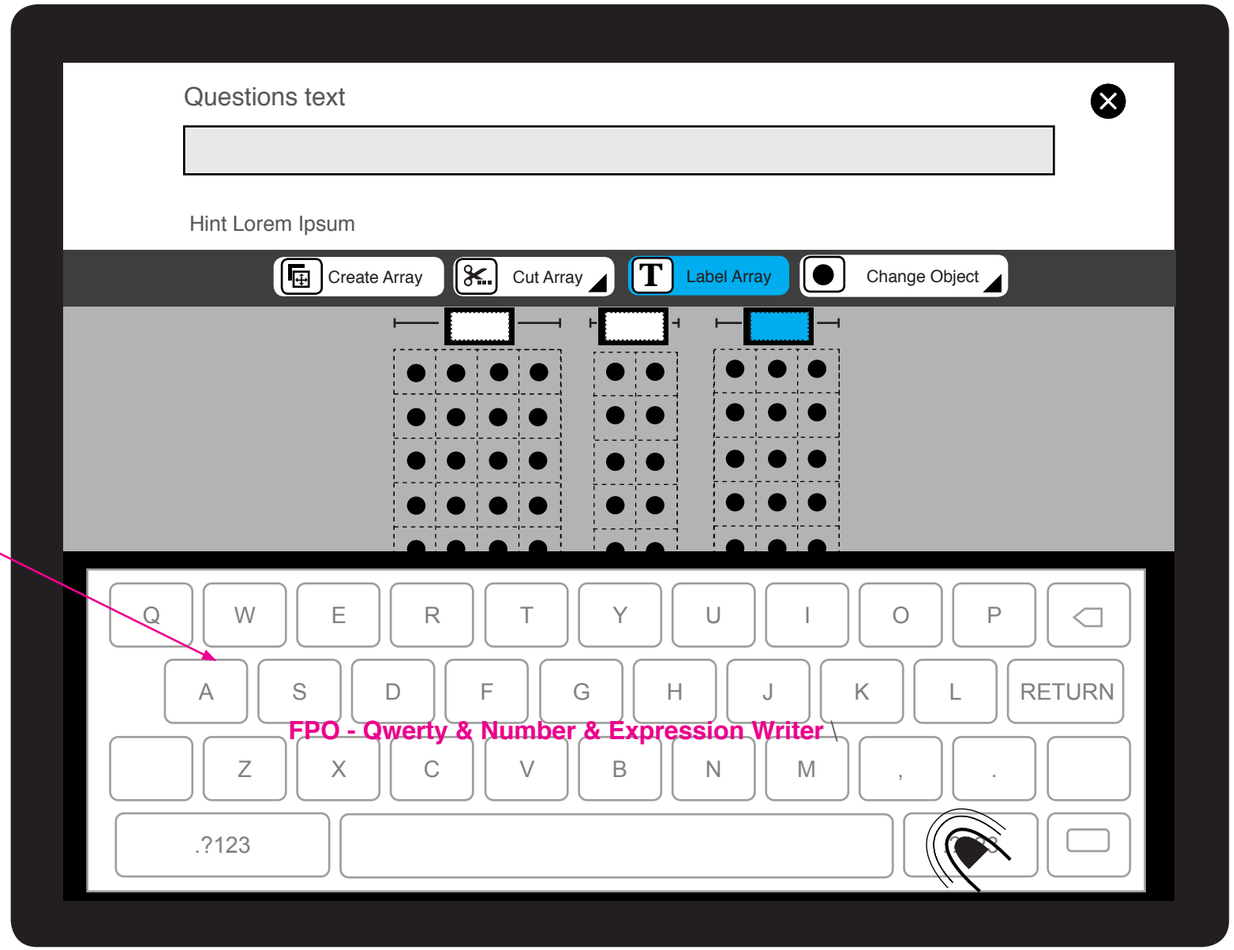
ARRAY ENGINE Change Label - Vertical Cut Lables



1

Editing Labels: Step 1 - Select Label tool
Students may tap to select a label*.

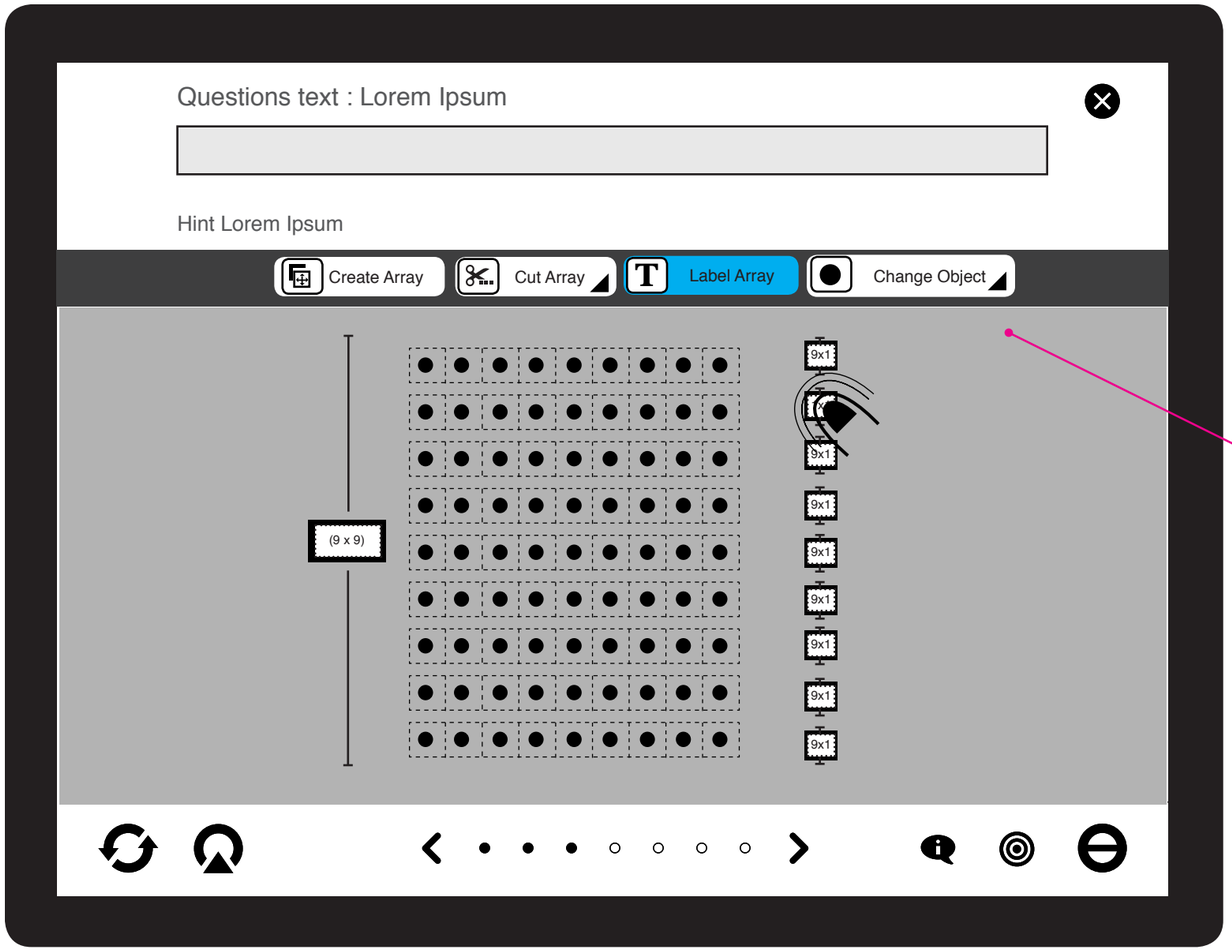
* For vertical cuts, labels appear on the bottom (expression for total array) and right (expression for individual arrays)



2

Editing Labels: Step 2 - Label becomes a form
Students may edit a label using the expression writer tool/native QWERTY keypad.

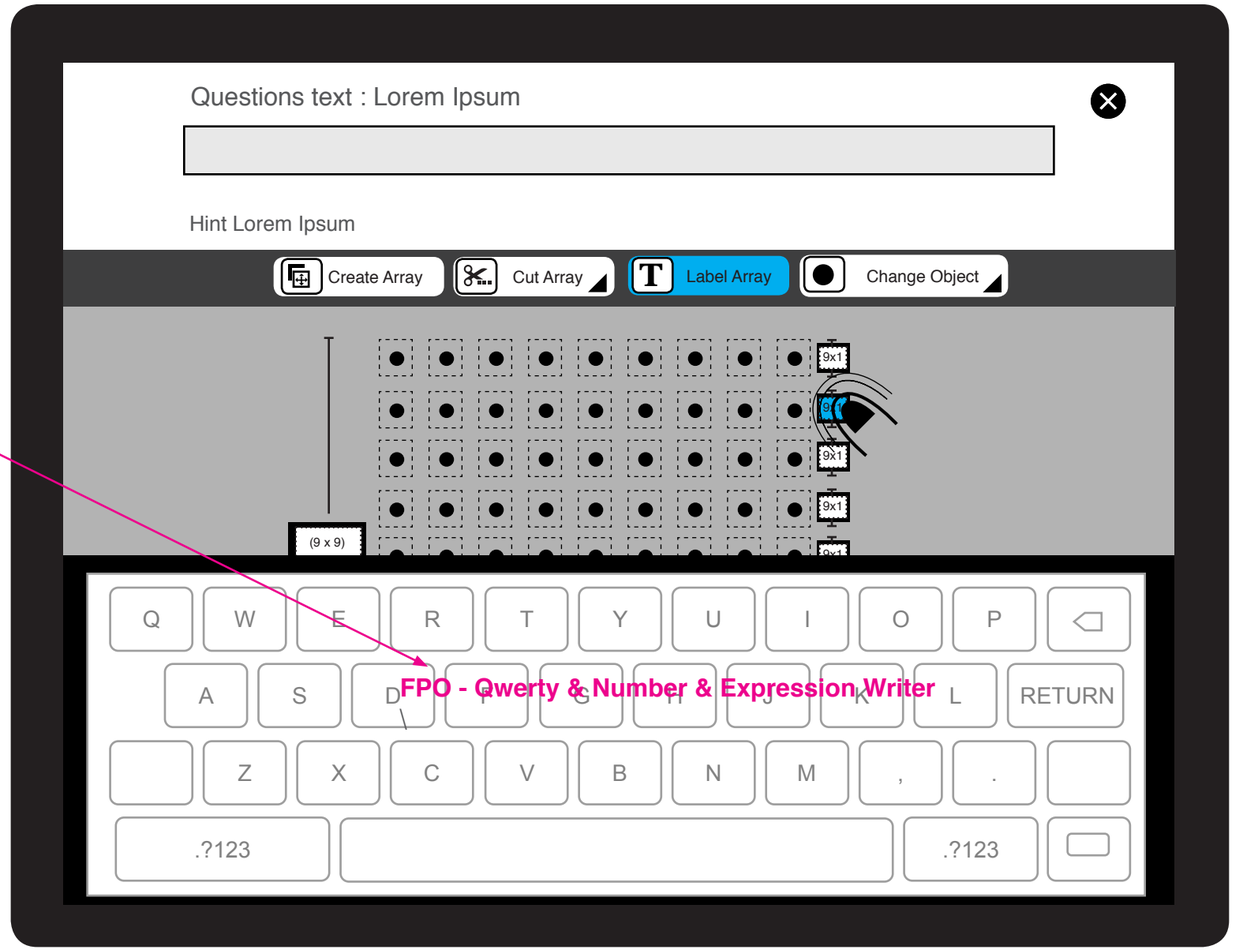
ARRAY ENGINE Change Label - Max Array Labels Horizontal- (9x1) = 9 Arrays, 10 Labels



1

Editing Labels: Step 1 - Select Label
Students may tap to select a label.

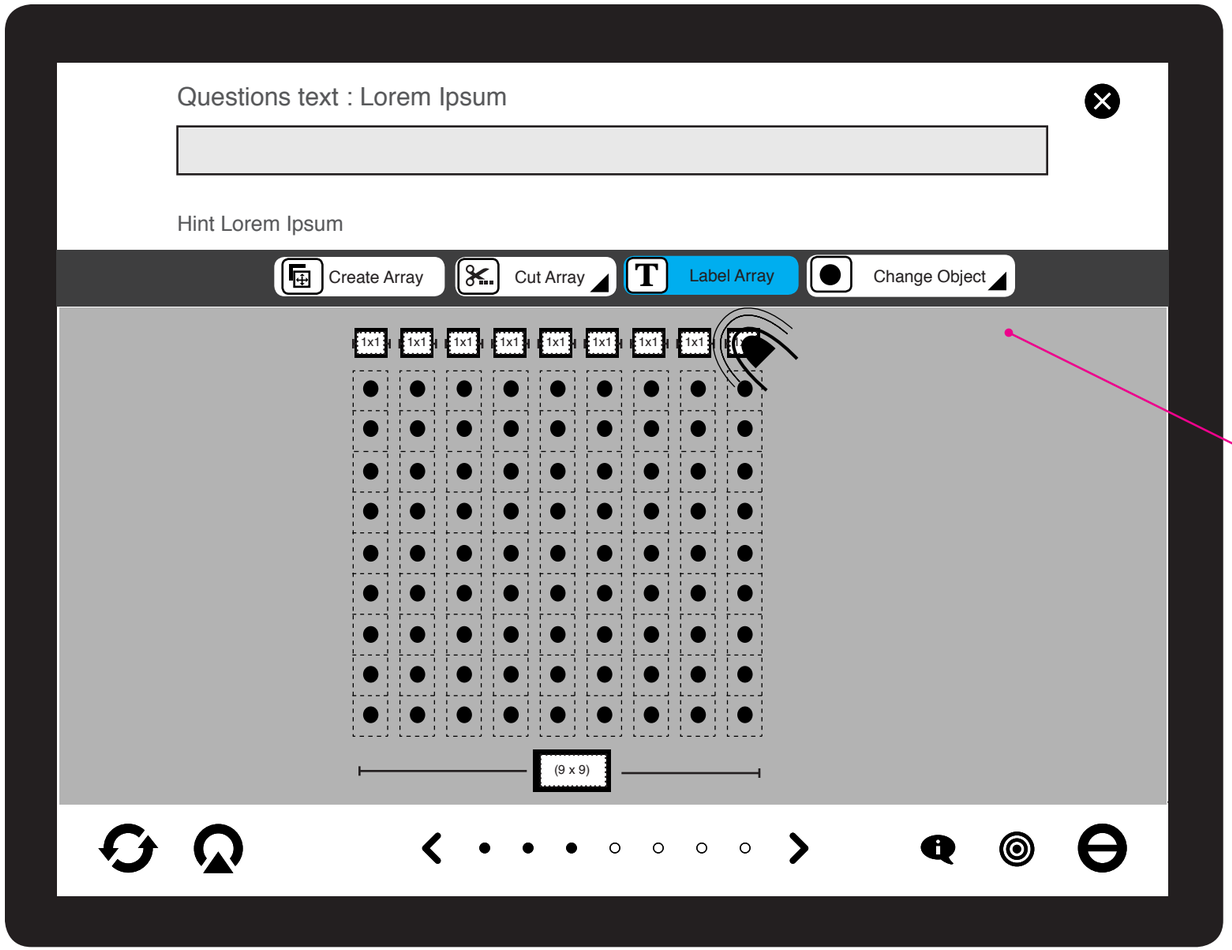
* For horizontal cuts, labels appear on the left (total array height) and rignt (individual array heights).



2

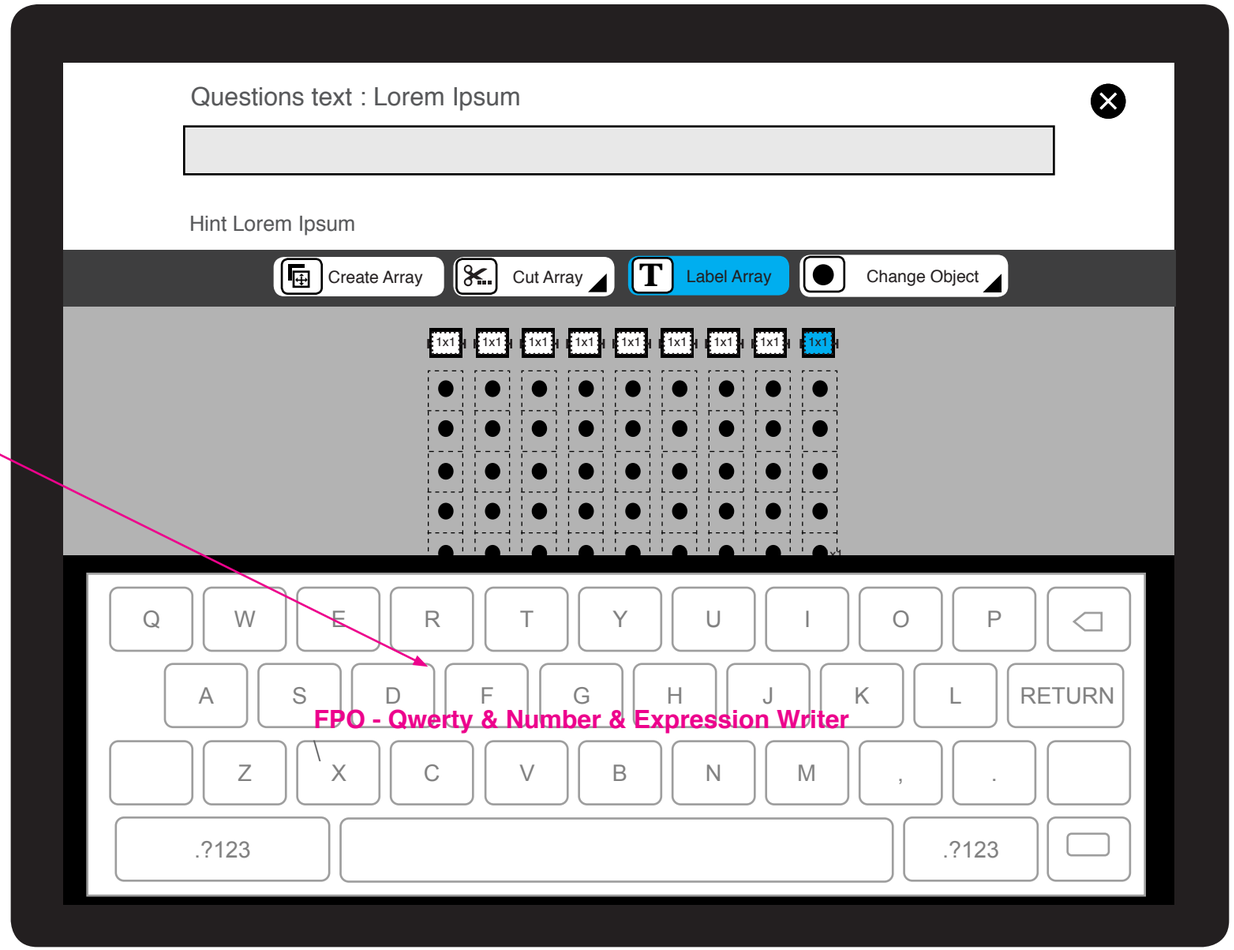
Editing Labels: Step 2 - Label becomes a form
Students may edit a label using the expression writer tool/native QWERTY keypad.

ARRAY ENGINE Change Label - Max Array Labels Vertical- (1x9) = 9 Arrays, 10 Labels



1

Editing Labels: Step 1 - Select Label
Students may tap to select a label.

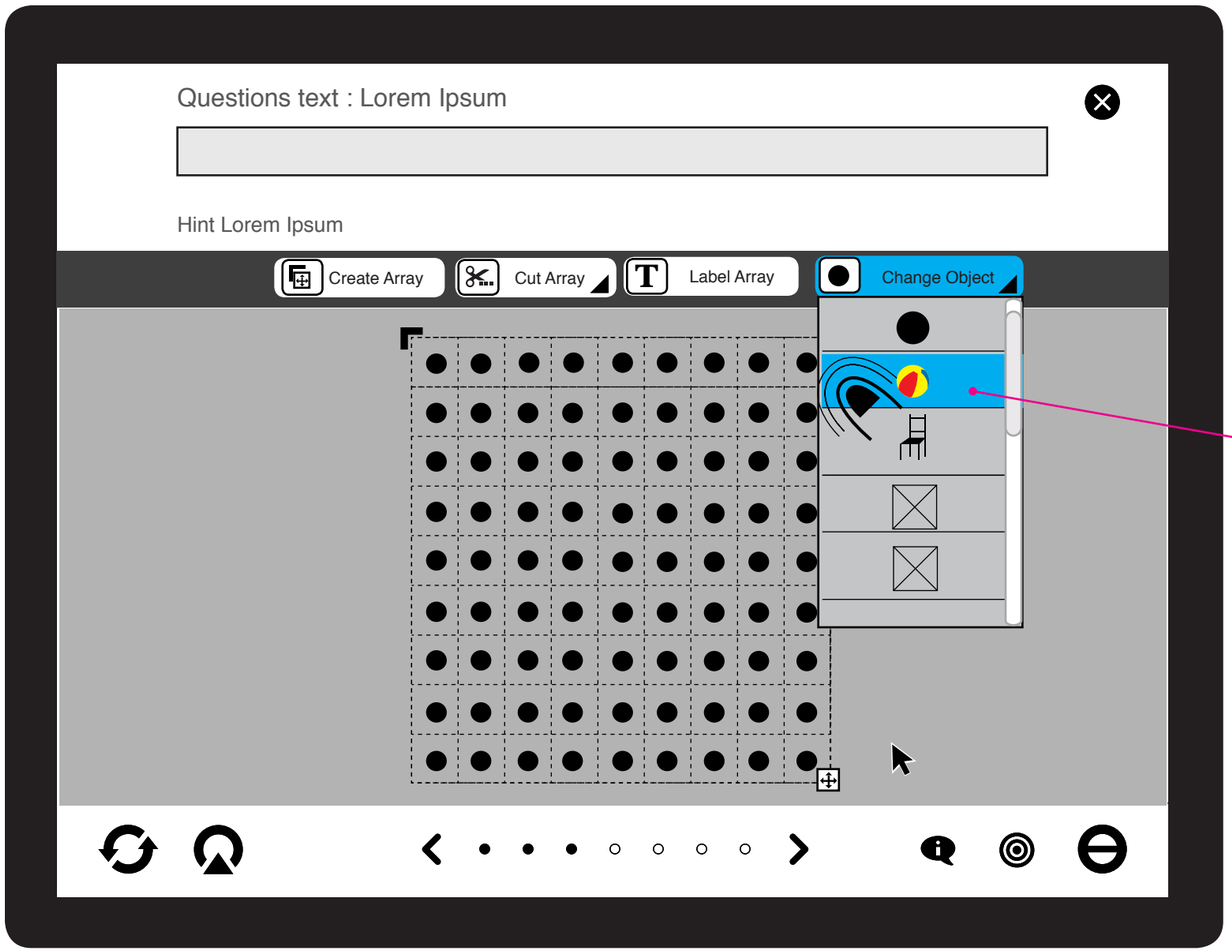


2

Editing Labels: Step 2 - Label becomes a form
Students may edit a label using the expression writer tool/native QWERTY keypad.

/ SCREEN FLOWS : Change Objects

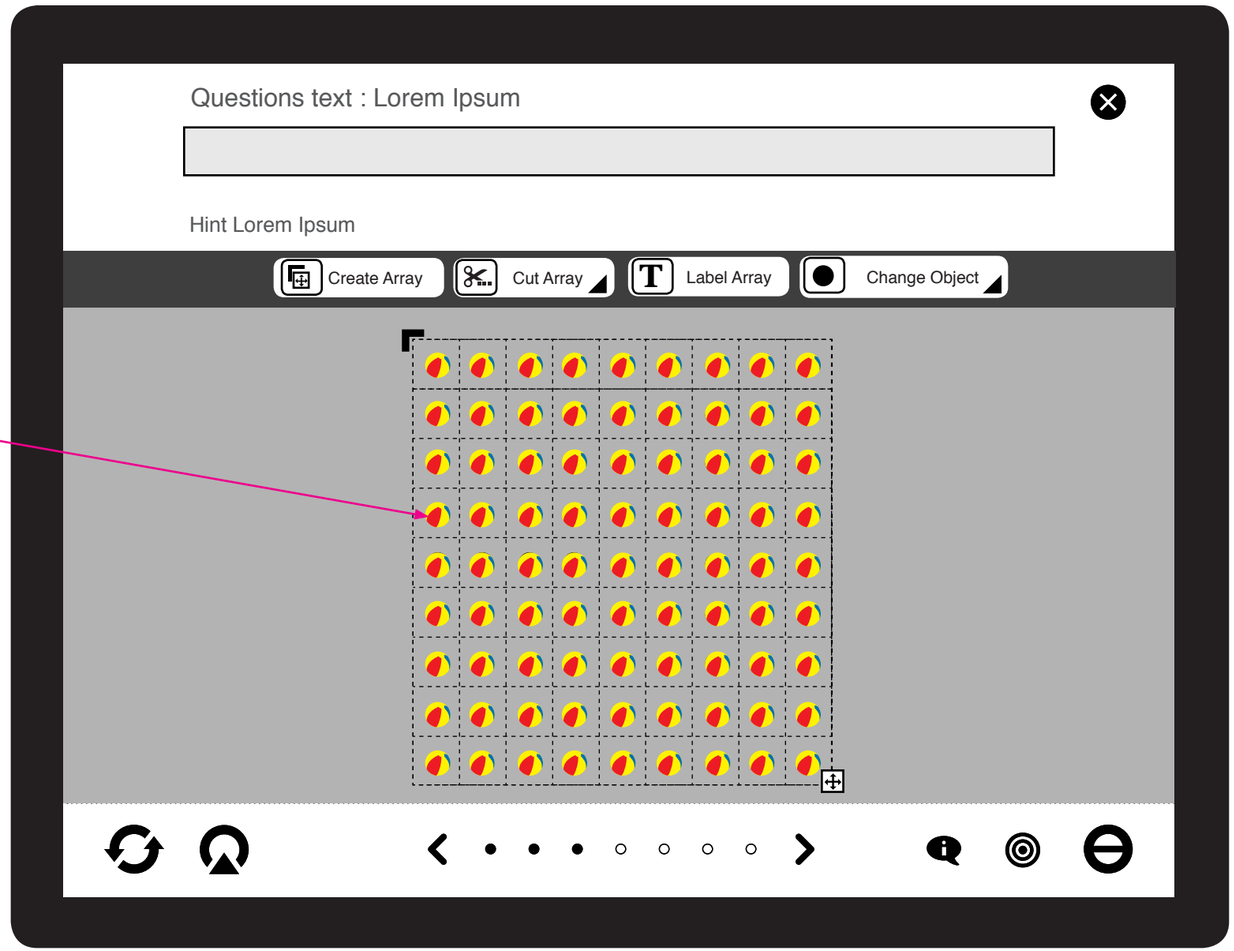
ARRAY ENGINE Change Object



1

Change Object: Step 1 - Select Change Object
If outlined in the lesson, student may change the object image in the array space.

Object dropdown may show up to a list of 5 and will get a scroll bar for > 5.
Object List ((final list of images FPO).
- Beach ball
- Flower
- Chair
- Penguin
- Dots (may be a list of colored dots: ROYGBIV)

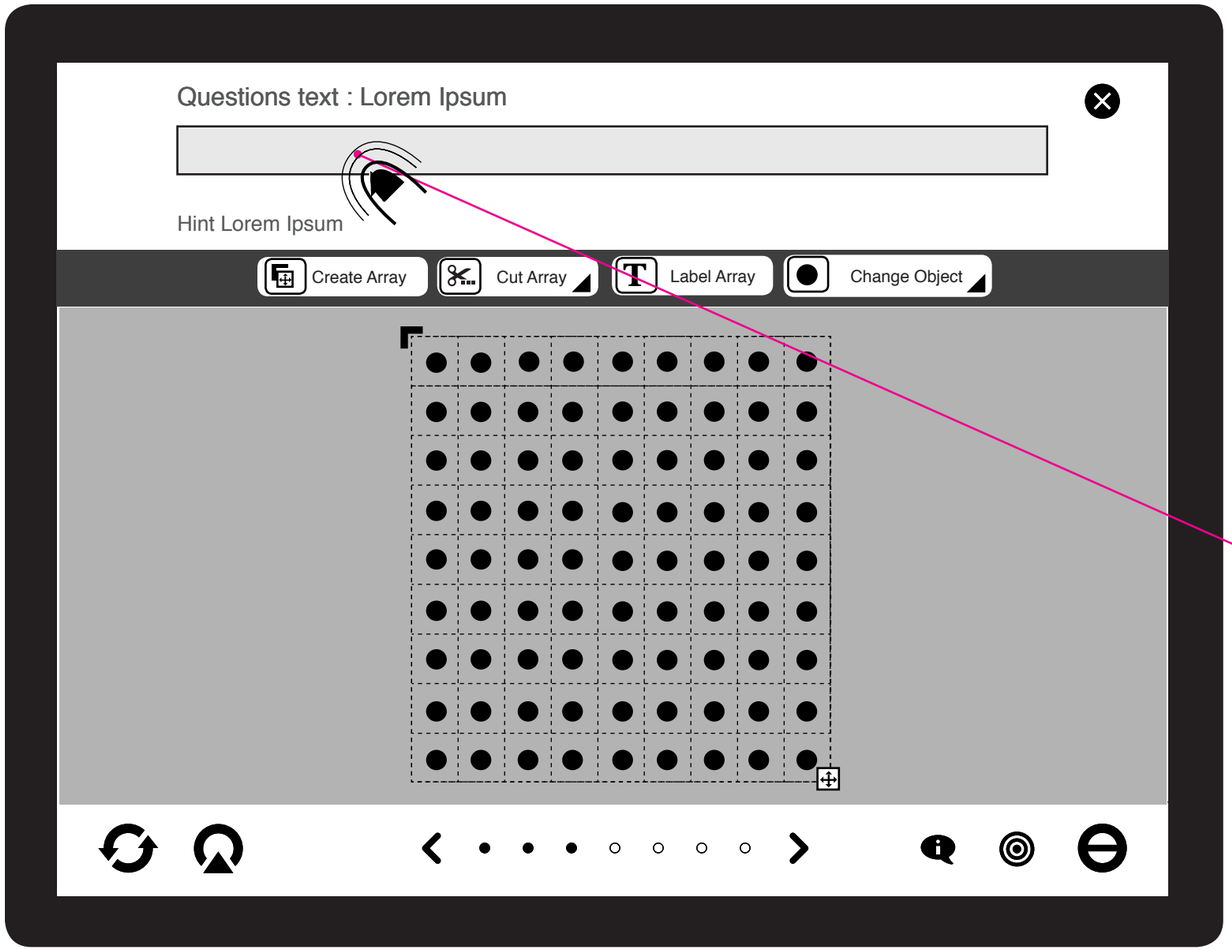


2

Change Object: Step 1 - Select Change Object
Upon selecting a new object from the dropdown list, all images change.

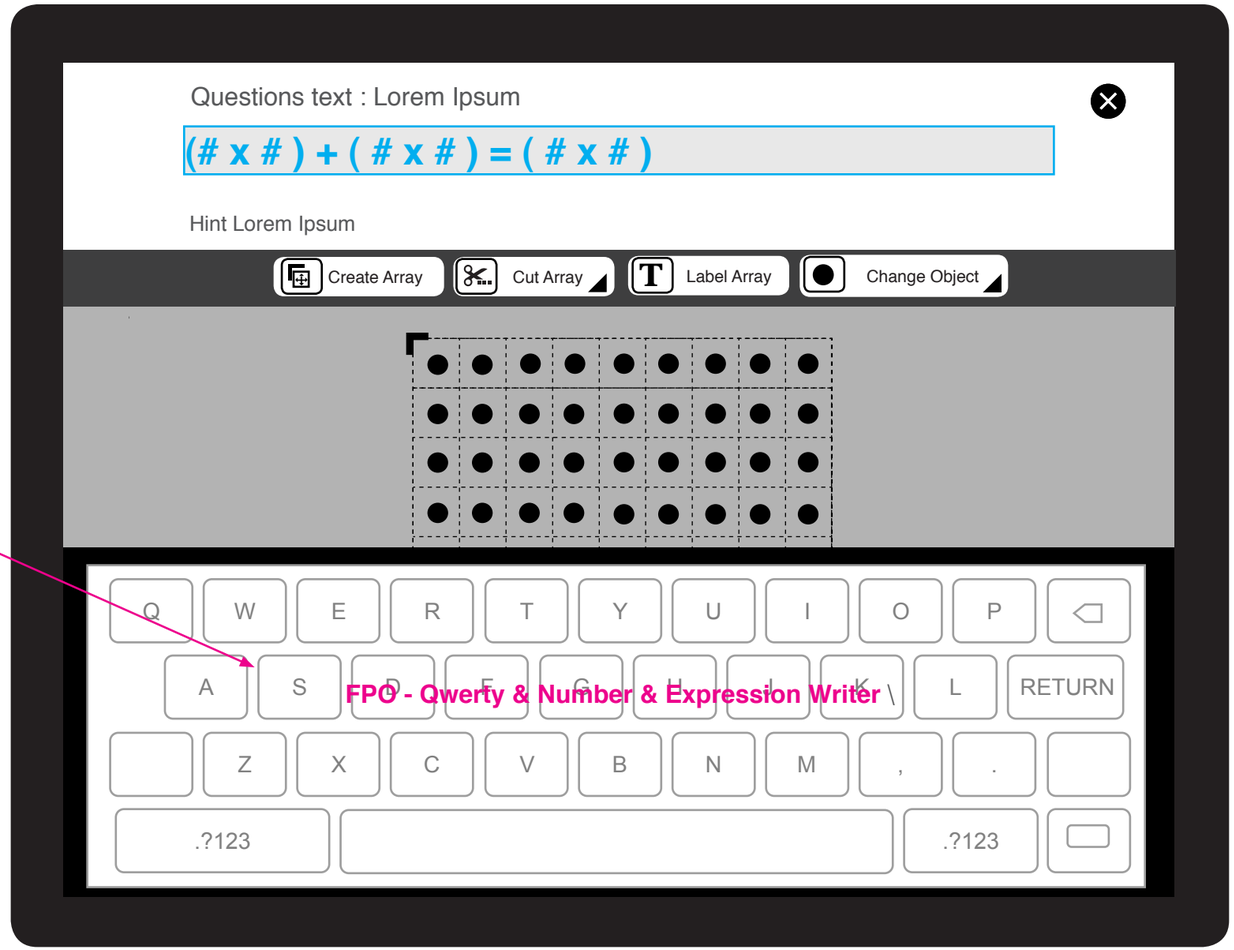
/ SCREEN FLOWS : Equation Space

ARRAY ENGINE Fill out Equations Form



1

Editing Equation Form : Step 1 - Select Equation form
Student may tap form to select and fill and/or edit equation form.



2

Editing Labels: Step 2 - Edit Equation Form
Students may fill/edit form using the expression writer tool/native QWERTY keypad.

Note: Student Accountability for Correct form Notation
It is up to the student to ensure that the form represents the correct expression format as well as correct number of expressions to reflect arrays as they are built/presented in the array space.