Balancing the scales: Inequalities

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Set Up

• Create a new Alice world with any template.
• Save the world somewhere you can find it.
• Click **Add Objects**.
• Click People in the Local Gallery.
• Add Teacher to your scene.
• Then go to the Musical Instruments folder in the Local Gallery and add a TimbalesCowBell.
• Right click TimbalesCowBell in the object tree, click rename, and type “scale”.

Overview

• This tutorial will show you how to create a game where the player has to compare numbers using the >, <, and = signs.
• Numbers are placed on a scale, and the player clicks on the correct sign to indicate which side is greater.
• This game can be used in a middle school math class to practice inequalities, decimals, addition, multiplication, division, and fractions.

• We need to put the teacher’s arms down.
• Click on the + sign next to **teacher** in the object tree and click on the + sign next to **upperBody**.
• Right click on the teacher’s **leftArm**, and then click methods >> **teacher.upperBody.leftArm roll** >> left >> ¼ revolution.
• Right click on the teacher’s **rightArm**, and then click methods >> **teacher.upperBody.rightArm roll** >> right >> ¼ revolution.
Fixing the scale

• The left and right parts of our scale don’t look like an actual scale. Let’s fix this.
• Click on scale in the object tree.
• Click on the + sign next to scale.
• Click on leftTimbale and click on its properties tab.
• Set isShowing to false.
• Do the same for the rightTimbale.
• Click on the Shapes category in the Local Gallery and add 2 Bump objects.

Adding >, =, < signs

• Go back to the Local Gallery and scroll to the end to find the Create 3D Text category.
• Add 3 3D text objects to say “>”, “=“., and “<“.
• Rename the objects in the object tree to say greaterThan, lessThan, and equals.
• Use the Turn Objects Left and Right, Move Objects Up and Down, and Move Objects Freely buttons so that the >, =, and < signs are in the top right corner.

Adding placeholders

• Go back to the Local Gallery and click on the Shapes category.
• Add a Square and use the Turn Objects Left and Right button so that it is facing forward.
• Right click on the Square and click methods >> move to greaterThan so that it moves to the “>” sign.
• Resize the Square so that it is about the same size as the > sign.
• Rename the square “greaterPosition.”
Adding objects to the scale

- Add two 3D text objects into the world that say “1234” (we will change these numbers later).
- Move and resize one of the text objects to fit on the leftSide of the scale and one to the rightSide.
- Rename them leftObject and rightObject.
- Under their properties tabs, change the colors to your two favorite colors.
- Change isShowing to false for leftObject and rightObject.

Adding vehicles

- We want the left object to move with leftSide and for the right object to move with rightSide.
- Go to leftObject’s properties tab and change the vehicle to leftSide.
- Do the same for rightObject on rightSide.

Adding the score

- This is the last object we’ll add for now.
- From your Local Gallery, add a 3D Text object that says “Score: 0”.
- In the object tree, rename the new object “score”.
- Move score to the bottom right corner below the scale.
Keeping score

- We want to keep track of the score.
- Click on world in the object tree.
- Below the object tree, you’ll find the world’s details section.
- Click on the properties tab.
- Select create new variable at the top.

Teacher gives instructions

- Click on the teacher’s methods tab.
- Drag teacher say into world.myFirstMethod.
- Click other...
  - Type “Here’s how the game is played.”
  - Right click on the line you just made and click make copy.
  - Make 3 more copies.
  - Change the second line to say Click the > or greater than sign if the number on the left side of the scale is greater than the number on the right side.
  - Change the third line to say Click the = or equals sign if the two sides are equal.
  - Change the fourth line to say Click the < or the less than sign if the number on the right is greater.
  - Change the fifth line to say You earn a point if you choose the correct answer.
- Beside Name, type in “scoreTracker”.
- Under Type, select Number.
- We want the score to start at 0.
- Click on the 1 next to Value and then click other...
- Type in 0.
- Click OK.
- You should now see your new scoreTracker variable listed in the world’s properties tab.
• Play your world.  
• You’ll notice that the teacher’s directions show up too quickly to read them.  
• Click on more in the first teacher say line.  
• Click on duration.  
• You’ll notice that the default duration is 1 second.  
• Click on other... and type in 3.  
• Do the same for the other 4 teacher say lines.

Setting the duration

Creating events

• Find the Events section in the top right corner box in Alice.  
• Click create new event and select When the mouse is clicked on something.  
• Change anything to greaterThan.

Adding world variables

• Drag playerAnswer from the world’s properties panel into the Do together.  
• Select set value, and then select greaterThan.  
• Next drag hasClicked from the properties panel into the Do together.  
• Select set value, and then select true.  
• We will now be able to tell if the > sign has been clicked.
Creating similar events

• Drag the entire blue “When mouse is clicked on greaterThan” box to the clipboard in the top right corner to make a copy.
• Now drag the clipboard to the line under the blue box. You should see 2 blue boxes now.
• Drag the clipboard to the line under the second blue box to get a 3rd box.

• In the second When mouse is clicked on box, change the two instances of `greaterThan` to equals.

• In the third box, change the two instances of `greaterThan` to `lessThan`.

Creating a checkAnswer method

• Click on `world` in the object tree and go to the methods panel.
• Click `create new method` and call it `checkAnswer`.
• This method will respond to the player’s answer.

Adding parameters

• It should take in 3 parameters: the number on the left side of the scale, the number on the right side of the scale, and the correct answer.
• Click on `create new parameter` at the top of the method.
• Name the parameter `leftObjectText`, click `Other` for the type, and then make sure that the type is `String`.
• Create a `rightObjectText` parameter the same way.
• Create a `correctAnswer` parameter of type `Object`.
Changing the objects on the scale

- Click on `leftObject` in the `object tree`, and go to its properties.
- Drag `text` from the `properties` panel into the method.
- Under `value` click `expressions`, and then `leftObjectText`.
- Click on more at the end of the line and select `duration`, other..., and then type in `0`.
- Do the same for `rightObject` and `rightObjectText`.

- Find the `teacher’s methods` panel and drag `teacher say` into the method.
- Under what, select `other` and type in “Click on the correct answer.”
- In the next line, make the teacher say “Let’s see if you’re correct.”

Writing the rest of checkAnswer

- Drag `hasclicked` from the `world’s properties` panel into the method, and select set `value`, then `false`.
- Drag in a `Do together` from the bottom.
- Click on `leftObject` in the `object tree` and go to the `properties` panel.
- Drag `isShowing` into the `Do together` and set the value to `true`.
- Do the same for the `rightObject`.

- We need to wait until the player clicks on something before we can decide if it’s correct.
- Find the green `While` at the bottom of the screen and drag it in between the two `teacher say` lines, and select `true`.
- Drag `hasClicked` from the world’s properties panel onto the `true`.
- Click on `world.clicked` >> `logic` >> `not hasClicked`.
- Now the world “Does nothing” until `greaterThan`, `equals`, or `lessThan` has been clicked.
Creating a helper method with parameters

- To prevent checkAnswer from getting too cluttered, let's create a new method to check if the player’s answer is right.
- In the world’s methods panel, click create new method and name it checkAnswerHelper.
- Create a parameter of type object called correctAnswer.

If/Else Statements

- Drag in an If/else from the bottom and select true.
- Drag playerAnswer from the world’s properties panel into the true and select playerAnswer ==, and then select greaterThan.
- Drag playerAnswerPosition into the first Do nothing and select set value >> greaterPosition.

Creating variables

- Since we’re going to be moving the >, =, and < signs around, we want to remember where their starting positions were.
- Create 2 new variables of type object:
  playerAnswerPosition and correctAnswerPosition.

- Drag an If/Else statement into the Do nothing and select true.
- Drag playerAnswer from the world’s properties panel into the true.
- Select playerAnswer ==, then lessThan.
- Drag playerAnswerPosition into the first Do nothing and select set value >> equalsPosition.
- Drag playerAnswerPosition into the last Do nothing and select set value >> lessThanPosition.
• Drag the huge If/Else statement onto the clipboard, and then drag the clipboard to the next line to copy/paste.

• By clicking on the small arrows, change world.playerAnswer to correctAnswer and playerAnswerPosition to correctAnswerPosition everywhere in the second huge If/Else statement.

• Drag a Do together into the first Do Nothing.

• Click on leftSide in the object tree and find leftSide move in its methods panel.

• Drag leftSide move into the Do Nothing and select down, ½ meter.

• Do the same for rightSide but move it up.

• The reason we are moving these objects in opposite directions than you’d expect is that we turned them upside-down when we added them.

Animating the scale

• Drag in playerAnswer from the world’s properties panel and select move to, equationPosition.

• Drag in an If/Else statement and select true.

• Drag correctAnswer into the true and select correctAnswer ==, then greaterThan.

• Drag the If statement onto the clipboard and then into the Do Nothing to make a copy.

• Change greaterThan to lessThan, and switch the up and down commands.

• We don’t need to move the scale when the two sides are equal because they’re already balanced.
Congratulating if correct

- Drag in an `If` statement and select true.
- Drag `correctAnswer` onto the `true` and select `correctAnswer ==`, expressions, `playerAnswer`.
- Drag a `Do nothing` into the first `Do nothing`.
- Find `teacher say` in the teacher’s methods panel, drag it in, and type “Good job!”
- Now go to the world’s properties tab, and drag `playerAnswer` into the `Do together`.
- Select set color then green.

Correcting the player if incorrect

- Drag a `Do nothing` into the Else’s `Do nothing`.
- Drag `teacher say` into the new `Do nothing`, select other, and type “That is incorrect.”
- Find `playerAnswer` in world’s properties panel and select `world.playerAnswer set color to`, and select red.
- Below the Do together, drag `teacher say`.
- Select other and type “Here is the correct answer.”

Incrementing the score

- Find `scoreTracker` in the world’s properties panel and drag it after the `Do together`.
- Select increment `world.scoreTracker` by 1.
- Find `text` in the score’s properties panel and drag it below the `Do together`.
- Select other and type “Score: ”.
- Drag `a joined with b` in the world’s functions panel onto `Score: .` Select default string.
- Drag what as a string from world’s methods and onto default string, select expressions, `scoreTracker`.
Moving the scales back

- Scroll up to find the If/Else statement that begins with If correctAnswer == greaterThan and moves the scales.
- Drag that whole If/Else onto the clipboard to make a copy and the drag the clipboard to the bottom of the method.
- Switch all of the ups and downs.

Connecting checkAnswer and checkAnswerHelper

- Open the checkAnswer method and scroll to the bottom.
- Drag in checkAnswerHelper from world’s methods panel and select expressions, and then correctAnswer.
- After the helper checks if the answer is correct, we want the objects on the scale to be invisible again.
- Find the Do together from a few lines up, drag it to the clipboard, and then drag it to the bottom of the method.
- Change true to false in both lines.

Resetting the answer signs

- At the bottom of the method drag in the parameter correctAnswer, select move to >> expressions >> correctAnswerPosition.
- Drag in a Do together.
- Find greaterThan’s properties tab and drag color into the Do together, and select no color.
- Do the same for lessThan and equals.

Creating examples

- In the world’s method pane, click create new method, and name it examples.
- Drag in checkAnswer from world’s methods, and select default string, default string, and <None> for the parameters right now.
- Change leftObjectText to 15, rightObjectText to 20.
- What is the correct answer? Put in greaterThan, lessThan, or equals into correctAnswer. You decide.
Add these examples the same way:

<table>
<thead>
<tr>
<th>leftObject</th>
<th>rightObject</th>
<th>correctAnswer</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.90</td>
<td>3.9</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
<tr>
<td>10.3</td>
<td>5+4</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
<tr>
<td>8*8</td>
<td>9*7</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
<tr>
<td>4/7</td>
<td>19/35</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
<tr>
<td>4/3</td>
<td>1.4</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
<tr>
<td>4-7</td>
<td>-18/7</td>
<td>greaterThan, lessThan, or equals</td>
</tr>
</tbody>
</table>

Add in your own example! Add in your own example! greaterThan, lessThan, or equals

Finishing the world!

- Open my first method, and scroll to the bottom.
- Drag in examples from the world’s methods panel.
- Drag in an If/Else statement and select true.
- Find scoreTracker from the world’s properties and drag it onto the true.
- Select scoreTracker <=, then other, then type 4.

• Drag in teacher say into the first Do Nothing and select default string (we’ll change this later).
• Drag a joined with b from world’s functions onto default string and select default string again.
• Drag another a joined with b onto the second default string.
• Change the first default string to “You got: ”.
• Drag what as a string from world’s functions onto the second default string and select expressions, and then world.scoreTracker.

• In the last default string, type “/7 correct. You should work on your math facts.”
• Drag an If/Else statement into the Do Nothing and select true.
• Drag scoreTracker onto the true, select scoreTracker <= and then other, and type in 6.
• Make two copies of the long teacher say line and move each into a Do Nothing.
• In the first one, change You should work on your math facts. to Great job!
• In the second one, change it to Perfect!
• If you added in your own examples and there are more than 7, change the “/7” accordingly. Change the 4 to about half of the total number of examples, and the 6 should be the total minus 1.

Finished!!
Play the world!