Adding objects

- Add an object called text item 3, 2, 3, and 4.
- Add any 4 kids that you want, and also a teacher.
- Local Gallery and click on the folder called Walking People.
- Find the People section in the local Gallery and click on the
  billboards, events, and all of the more basic
  programming concepts covered include loops,
  and all the possible
demonstrations that shows all the possible

Overview
Counting the permutations

For the value, select other and then 0
For the type, and then counter, select Number variable, and name it

Click create new

Go to permutationsText's methods tab.

Rename 3D Text in the object tree to permutationsText.

Move the 3D text object to the top right corner.

Find Create 3D Text in the local gallery and type #

Rearranging the world

It doesn't matter which is the front of everything.
The center object, and move them to the right bigger, move them to the front both of them.

Do the same for the billboardboard.

Click File at the top of the screen, and select Make Billboardboard, and click on permutationBillboardboard.

If you haven't already, download the two images:

Rolling the arms down
Wait, select other, and type in 6.
In between the IsShowing lines, drag in a
copy, and change true to false.
Right click on the IsShowing line, select make
just added, and select true.
Drag IsShowing into the Do in order that you
tree and go to its properties tab.
Click on PermutationBillboard in the object

PermutationBillboard to FactorialBillboard.
In both of the IsShowing lines, change
then F.
If is typed, click on the p and select letters,
and To change the When p is typed to say When F
the clipboard below the block to paste it.
the clipboard to make a copy, and then drag
the entire When p is typed block onto

factorialBillboard.
Do the same for
true to false.
Next to IsShowing, change
in the object tree and find it's
properties tab.
Click on permutationBillboard.

Hiding the billboards

The billboards should be

Nothing.
Bottom from the
order in Events
Drag a Do in
Events

Change any key to letters >>p
Select When a key is typed.
PermutationBillboard.
When the user types p, we want them to see the
on create new event.
In the Events section in the top right corner, click
at the right to stop adding objects.

Creating events
Start Game.
then and not
and select Logic.
Click on start game.
Drag start game into the true.
Properties tab.
Click on world in the object tree and find it.
true.
Drag a while into the Do Nothing and select
has pressed 5 to start the Game.
We want the program to wait until the player

- The number of ways that n people can be arranged is n! or "n
  factorial." Drag in another teacher say line, click more.

- At the end of each teacher say line, click more, drag in another teacher say line, type: The number
  of ways that n people can be arranged is n!, or "n
  factorial." Drag in another teacher say line, type: Let's show how factorials relate to
  permutations by seeing how many ways we can
  arrange you all in a line.

- Drag a teacher say into the bottom of the method
  Write5 world_my first method,
  drag and then true.
  Drag start game into the true.
  letters, and then.
  Click on any key and select create new event, and select
  back in the Events section, click
  the value.
  select boolean for the type, and select false for
  Click create new variable, name it start game,

- Drag in another teacher say into the Do Nothing.
  another method. Drag in another teacher say line, click more, drag in another teacher say line, type: Tell me about permutations, f to learn about factorials, select other, and type: f to learn more, drag in another teacher say line, type: Let's show how factorials relate to
  permutations by seeing how many ways we can
  arrange you all in a line.

- Drag a teacher say into the bottom of the method
  Write5 world_my first method,
  click and then true.
  Drag start game into the true.
  letters, and then.
  Click on any key and select create new event, and select
  back in the Events section, click
  the value.
  select boolean for the type, and select false for
  Click create new variable, name it start game,

- Drag in another teacher say into the Do Nothing.
  another method. Drag in another teacher say line, click more, drag in another teacher say line, type: Tell me about permutations, f to learn about factorials, select other, and type: f to learn more, drag in another teacher say line, type: Let's show how factorials relate to
  permutations by seeing how many ways we can
  arrange you all in a line.

- Drag a teacher say into the bottom of the method
  Write5 world_my first method,
Change the duration to 4 seconds.

type „of your.

e joined with b onto numpeople as a string and

Drag a Joined with b onto numpeople as a string and

Expressions, and then numpeople.

Drag what a string onto default string, and select

functions, and select default string.

On the let’s see...Drag a Joined with b from words, see how many ways we can arrange „let’s

drag in teacher say into the method, and type: „let’s

Teachers Instructions

Create a permutation method

Create a permutation method

Only numpeople showing

Only numpeople showing

Drag a Loop into the method, select other, and type 4.

We only want numpeople to show in the line.

Create a permutation method.

Find permutation on the object tree, and then

Drag counter into the do nothing and select set

its methods tab.

Find permutation on the object tree, and go to

click create new method and name it Permute.

tab.

Find world in the object tree and go to its methods

Create a permutation method.

Expressions at the bottom, and then

string onto default string and select

words’ functions) onto default

string.

Permutations, and select default

Drag a Joined with b onto #

Go to the word’s functions tab.

select other, and type in # Permutations:

still in permutation text’s properties tab, drag text.
Standing in a line?

- Into the second default string type „people
- Select expressions and then numpeople.
- Drag in what a string (from world's
- string, and select default string again, for now.
- Drag another a joined with b onto default
- Also from the world's Functions tab, drag in a

Setting up the example

and name it switch.
- Create new method, click under the world.
- We need to create a method to have two people
- person 2, or person 2 person T.
- There are only 2 permutations here: person T
- numpeople == and then 2.
- Drag numpeople onto the true, and select
- Drag in an if/else statement and select true.
- Drag in an if/else statement and type „let’s

playGuessess, and select type number.
- Click create new variable and the

the „many permutations are there for
- Select other, and type in „How
- The T.
- Drag ask user for a number onto
drag the world’s Functions tab,
- From value and then T for now.
- Below the loop, and select set
- Drag playGuesses, and select type
- Top of the method and name it

playGuesses
Think about how your code makes this happen.

Here is the animation you just created.

 incrrement line to 0.5 seconds.

 change the duration of all the lines except the expressions, and then permutations:counter.

 drag what as a string onto default string, and select permutations: and select default string.

 from world's functions, drag a joined with b onto # permutations: "permutations: counter by 1."

 from permutations: properties tab, drag counter

 incrementing the counter

 This will move the person in index to the temporary spot so that the second person has room to move.

 item from array expression >> index.

 from array visualization, properties tab, drag, or select the elements onto the first icelidcell, and select the same.

 item = index.

 click on the second line and select make copy, and icelidcell, for now.

 from array visualization, methods tab, drag in let

 select expressions >> index, icelidcell >> the entire array visualization [index] = item = into the method, and
This is expected because $3! = 3 \times 2 \times 1 = 6$.

These are the only possible 6 orderings of the 3 squares.

- Drag a loop into the first true and select 3.
- Drag another if/else statement into the do nothing.
- Drag numPeople onto the true, and select 0.
- From world’s methods, drag switch into the first do.
- Drag another if/else statement into the if/else statement at the end of the permute method.
- Scroll down to the if/else statement at the end of the permute method.
- Drag numPeople onto the if/else statement.
- Drag numPeople onto the true, and select 0.
- Drag a last if/else statement into the else’s do.
- Drag switch below that and select 1.
- Drag switch into the do nothing and select 1.
- Drag switch into the do nothing and select 1.
- So let’s code this...

Using switch

When the world starts, do.
Repeat the last step.

line, and select logic 0, and then true.
Click on the arrow at the end of index \#2 = 0.

Let’s see if you can build some code on your own.

What we code for the 4-person case.

Refer to the previous slide for visualization of

Increment the score to 1.
Then copy and paste the last two lines of switch to
order you are standing is the first permutation.
Drew a teacher say before the loops and type „The
original order as the first permutation right away.
In this case, however, it will be more complicated to
positions and count that is the final back to their original
the students were standing in a permutation
the switches we didn’t count the order

For the 2 and 3 switches, we didn’t count the order

Try to follow the pattern: switch 2/3, switch 1/2, switch 0/3 at the
switch 2/3 switch 1/2, switch 2/3, switch 1/2.

We’ll make.
The next slide explicitly shows all the switches
person problem, again, as we did previously.
Once its a 3-person problem, we make it a 2-
already solved.

We want to hold the first person in place and
permutations of 4 people standing in a line:

We need a way to show all 4! = 4 * 3 * 2 * 1 = 24

4 people switching
column numbers:
and not index 2 since we are referring to noticing that we are now talking about index
so in the else do nothing, create this code,

made the last line: 

- On the true, create this line the same way you
  select true.
- Drag an if/else into the first do nothing and
  other time, as shown in the chart.
- This is because we switch the last 2 places every

Change the second true to index 2 = 4.

Change the first true to index 2 = 2.

column 3: Nothing happens.
- column 2: items 0 and 3 switch.
- column 0: items 0 and 1 switch.

Notice on the chart:
- the last item in the column.
- the only other possible value for item "#2 is 5, or
  
1, 2.
- Drag in switch into the first do nothing and select
  and permutation 3 have places 1 and 2 switching.
that, if we start counting from 0, permutation 1

Looking down a column in the chart, we notice

Was the player correct?
today. Good Job!

Drag in a teacher say and type „That’s all for respectively.“
These will be the 2, 3, and 4-person examples.
Drag in permute again and select 4.
Drag in permute again and select 3.
and select 2.
From world’s methods tab, drag in permute.
Go back to my first method.
permute
Connect the first method and

Onto the fourth, type „people in a line.“
Onto the third, drag in what as a string and select
expression.
Drag default string, and repeat this 4 times.
Dragging a Joined with on top of that and select
„There were „Below the if/else, drag in a teacher say and type
Try something reasonable.
Change the duration on both teacher say lines.

Play the world!
Finished!!