An Intentional Life

Reconciling Science and the Bible

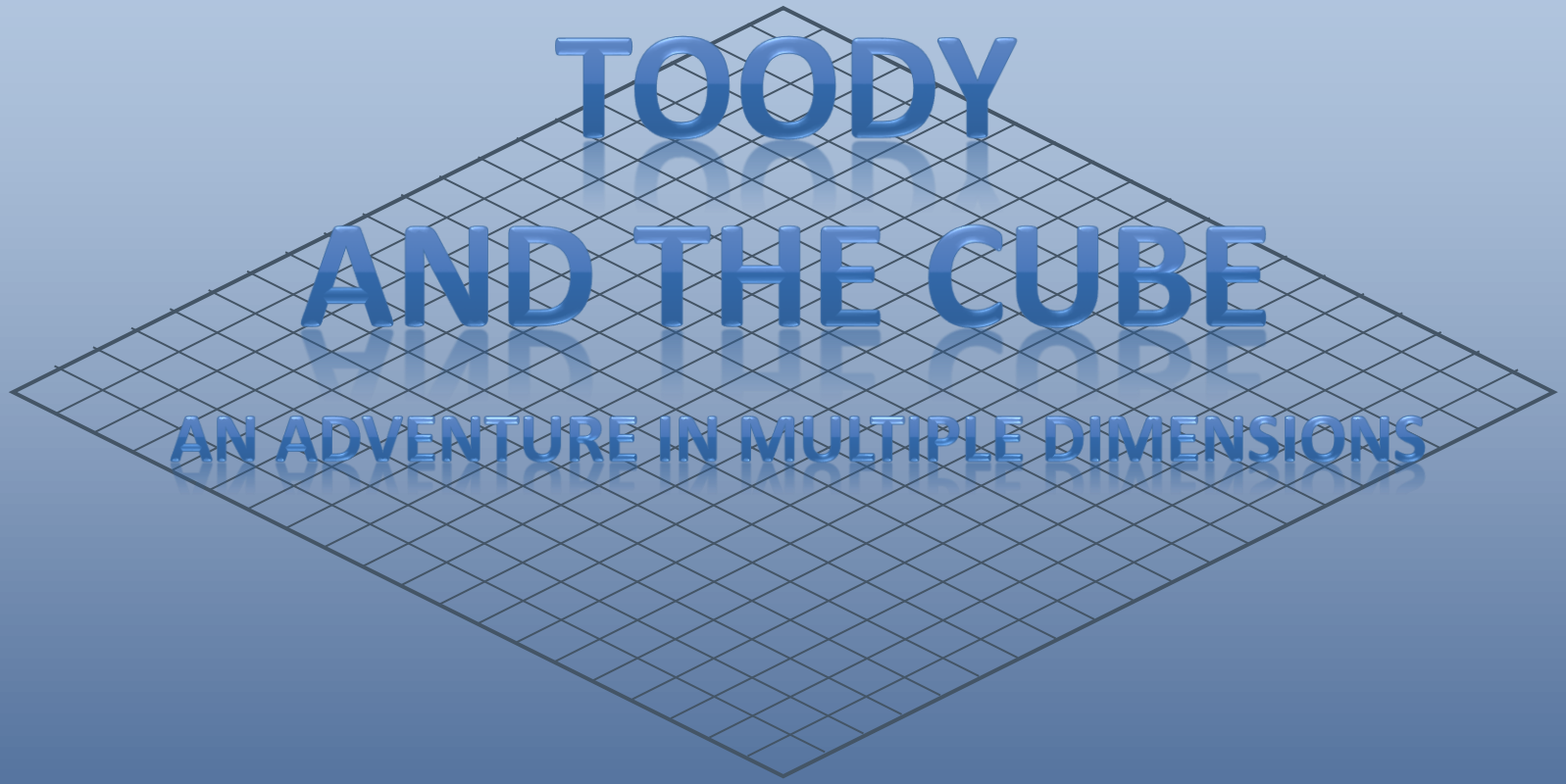
Lesson 12: Toody and the Cube

An Adventure in Multiple Dimensions

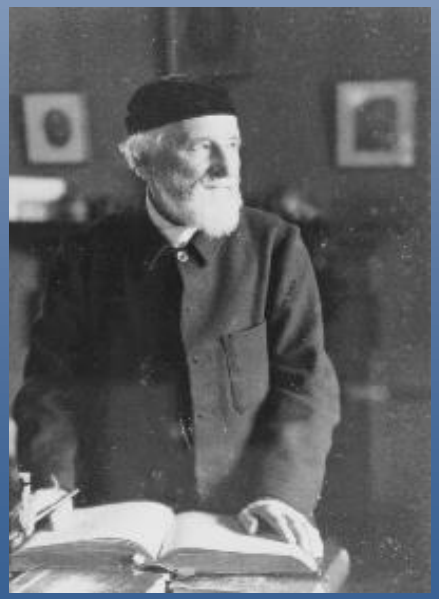
Earl F Dulaney, Ph.D.

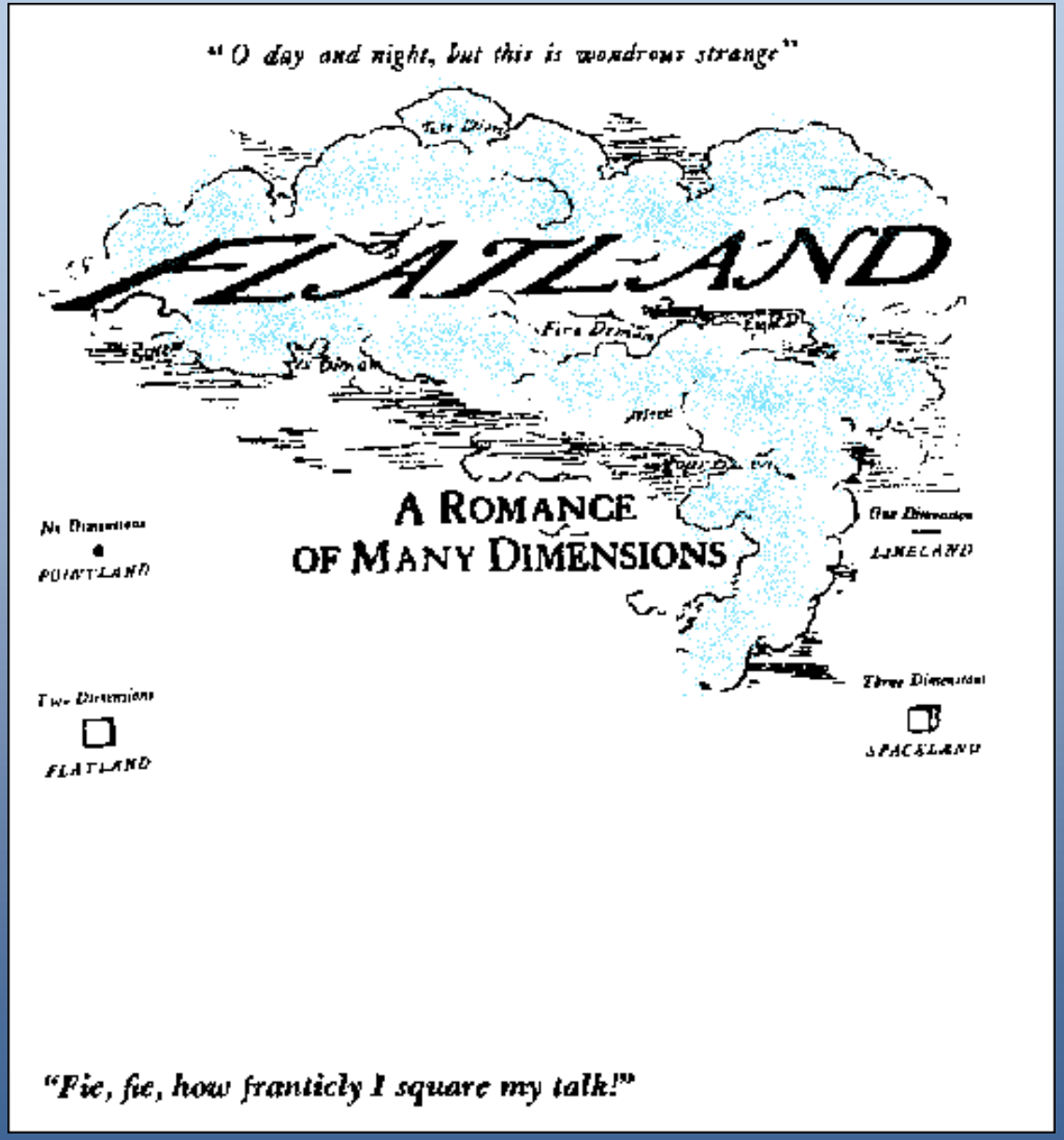
Lessons: Reconciling Science and the Bible

1. 7 days of Creation
2. In the Beginning (the Big Bang)
3. Did dinosaurs really exist? How old is the Earth?
4. The Existence of God: The Ontological Argument
5. The Existence of God: The Anthropological Argument
6. The Existence of God: The Argument from Logic
7. The Existence of God: The Argument from Intelligent Design
8. What is truth? Is the Bible true and can you trust it?
9. Was Jesus a REAL person?
10. Why does God allow evil to exist?
11. Is there life after death?
12. **Is God multidimensional?**
13. Living an intentional life!


TOODY
AND THE CUBE
AN ADVENTURE IN MULTIPLE DIMENSIONS

Edwin Abbott
1838-1926





Flatland by Edwin A. Abbot

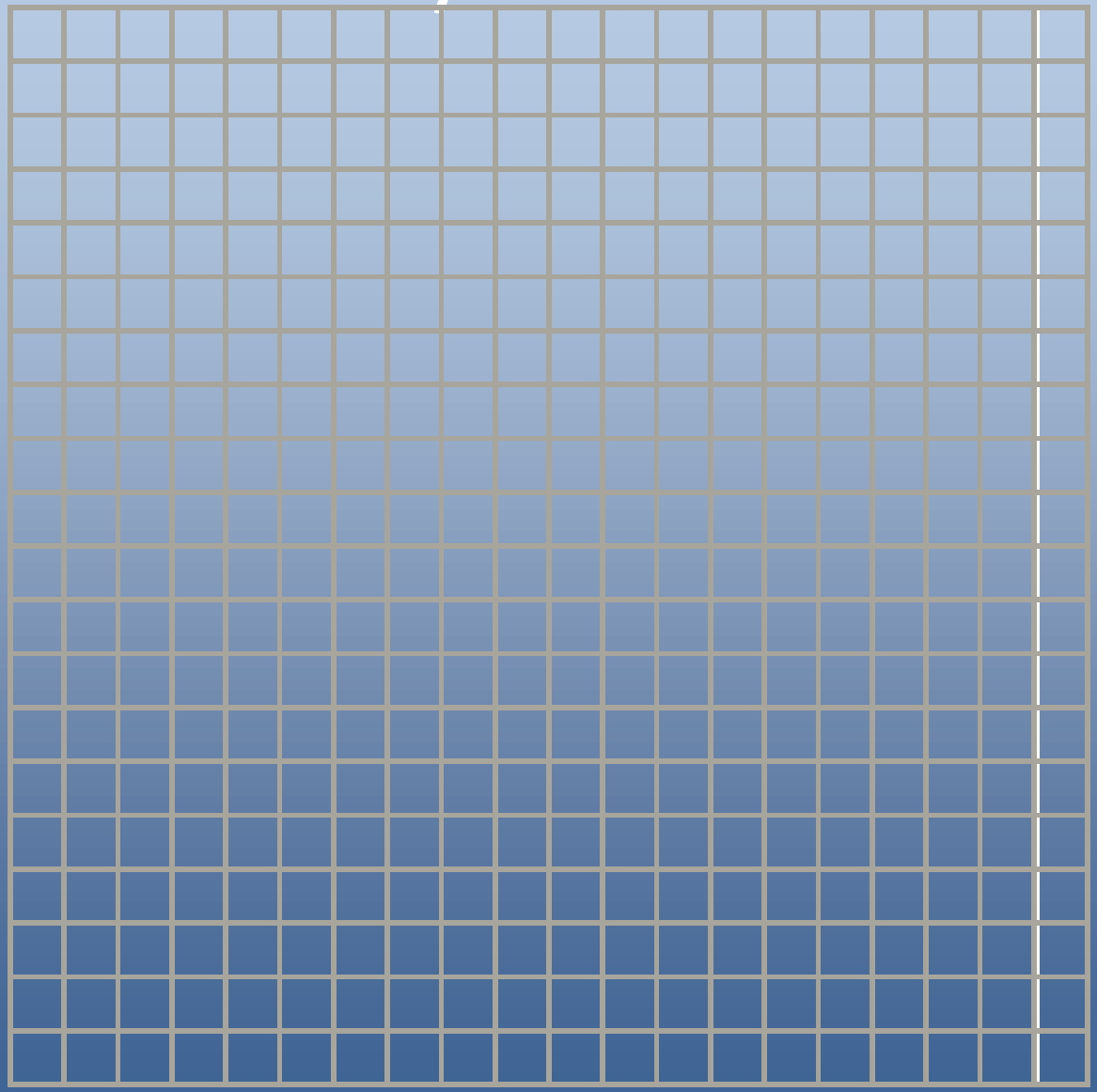
- Edwin Abbott, a headmaster of a school in Victorian England in 1884, wrote Flatland, A Romance of Many Dimensions
- It was intended as a satirical social novella, a statement against the culture of the conservative Victorian notions of the day regarding the advancement of science
- It dealt with the idea of how we who are constrained to live in three dimensions might react if we were to meet someone from a higher dimension
- It struck out against scientific repression
- In the end of the book, the protagonist winds up in prison for attempting to spread the gospel of the knowledge of the third dimension among a two dimensional universe that rejects the notion and punishes anyone who dares believe in the possibility
- This little presentation is an adaptation directly from the book with more theosophical interpretations

Toody's World

This is Toody's World.

It is very flat.

People who live here are also very flat.

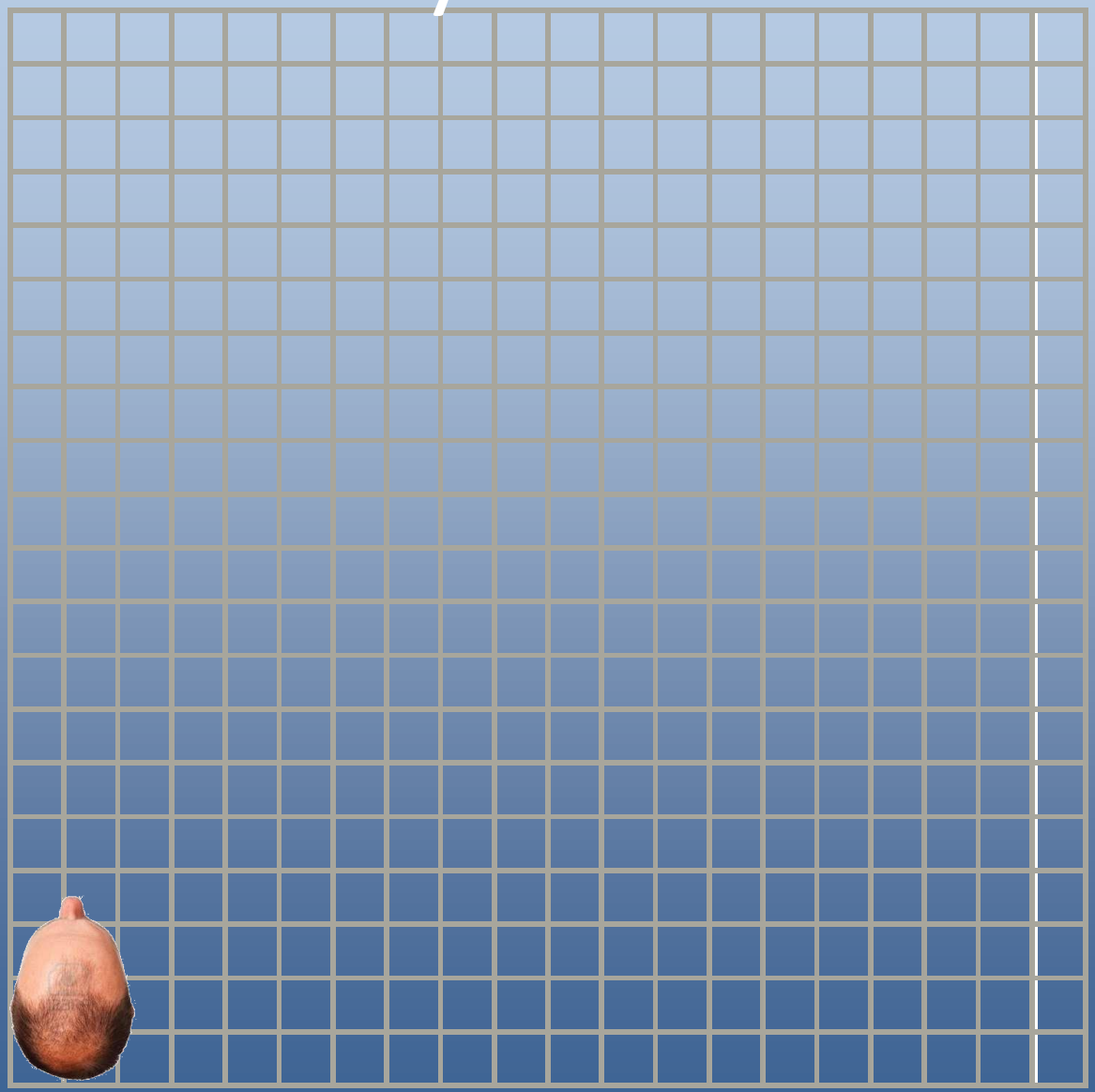


Toody's World

This is how you might look in Toody's flat world…

You'd be squashed down to a very thin pancake!

Since you could not look up or down, your eyes would look forward

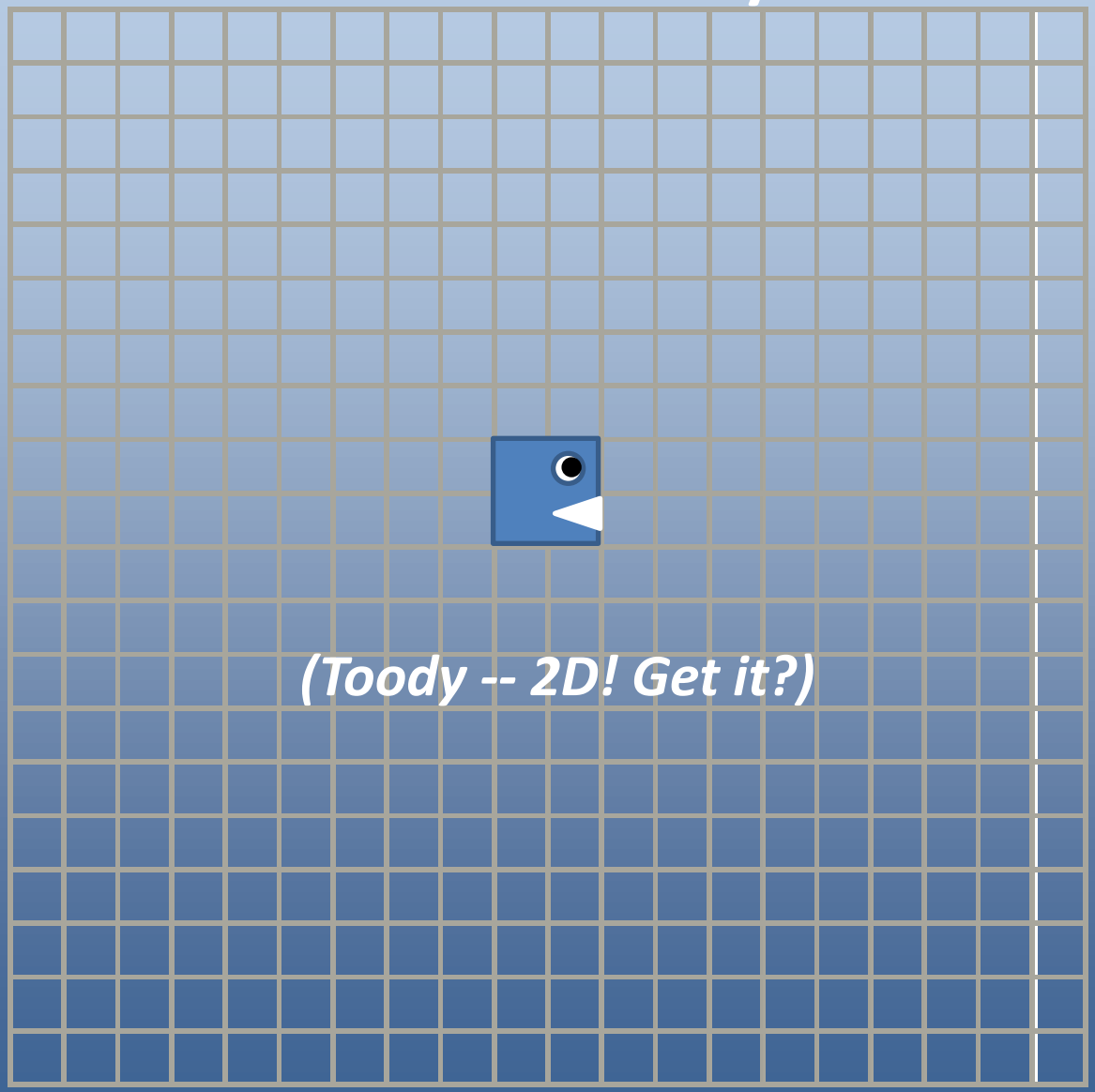


Meet Toody

This is Toody.

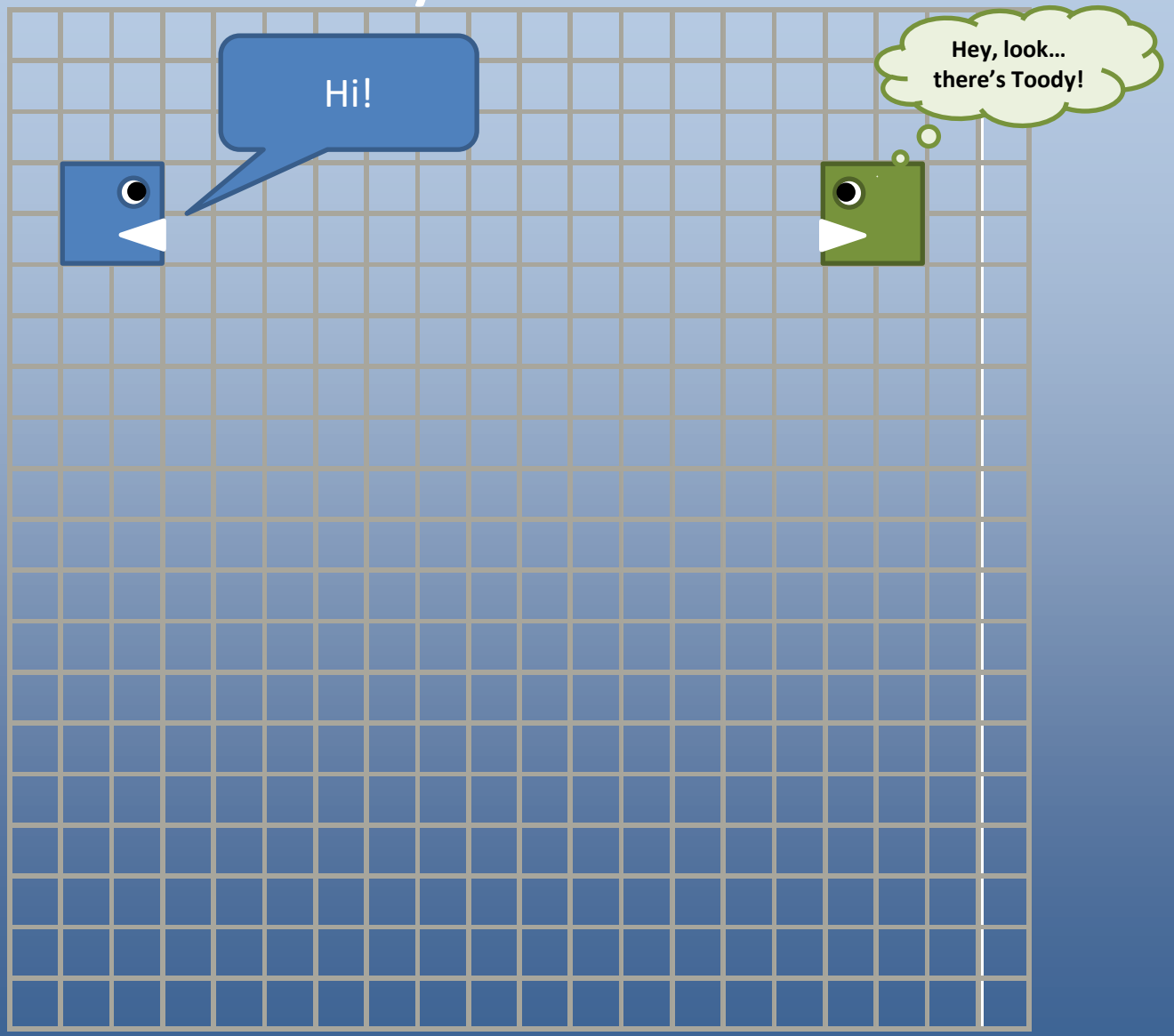
He's the Hero of this story.

He's a square.

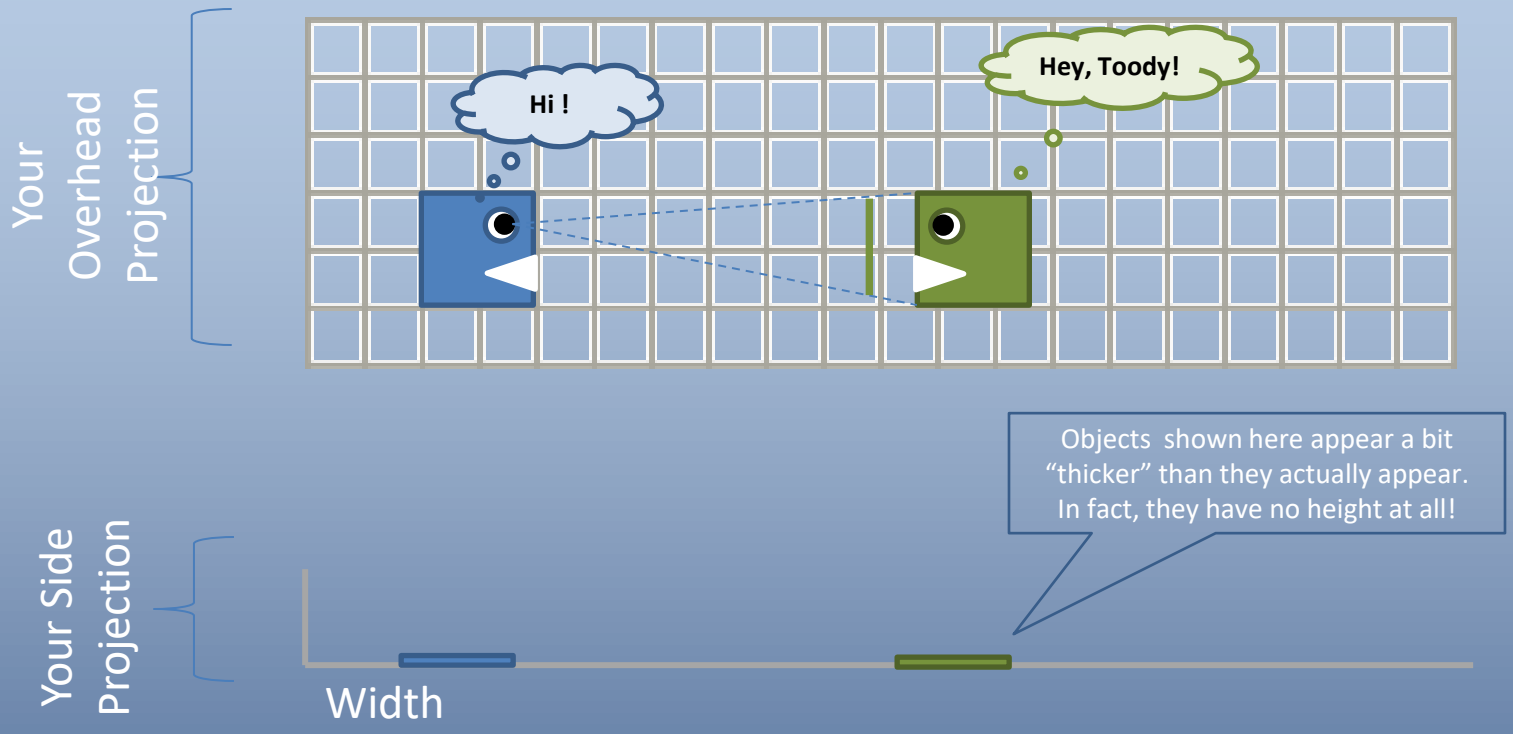


(Toody -- 2D! Get it?)

Toody's Friend



Toody's Friend



- Toody and his friend exist in a world of two dimensions.
- They understand space to be defined as length and width only.
- They have no conception of depth.
- In this world, they do not see as you or I see…

A 2D World?

Here is a quarter.

Laying on a table in our 3D world, we can see from the top that it is a round circle.

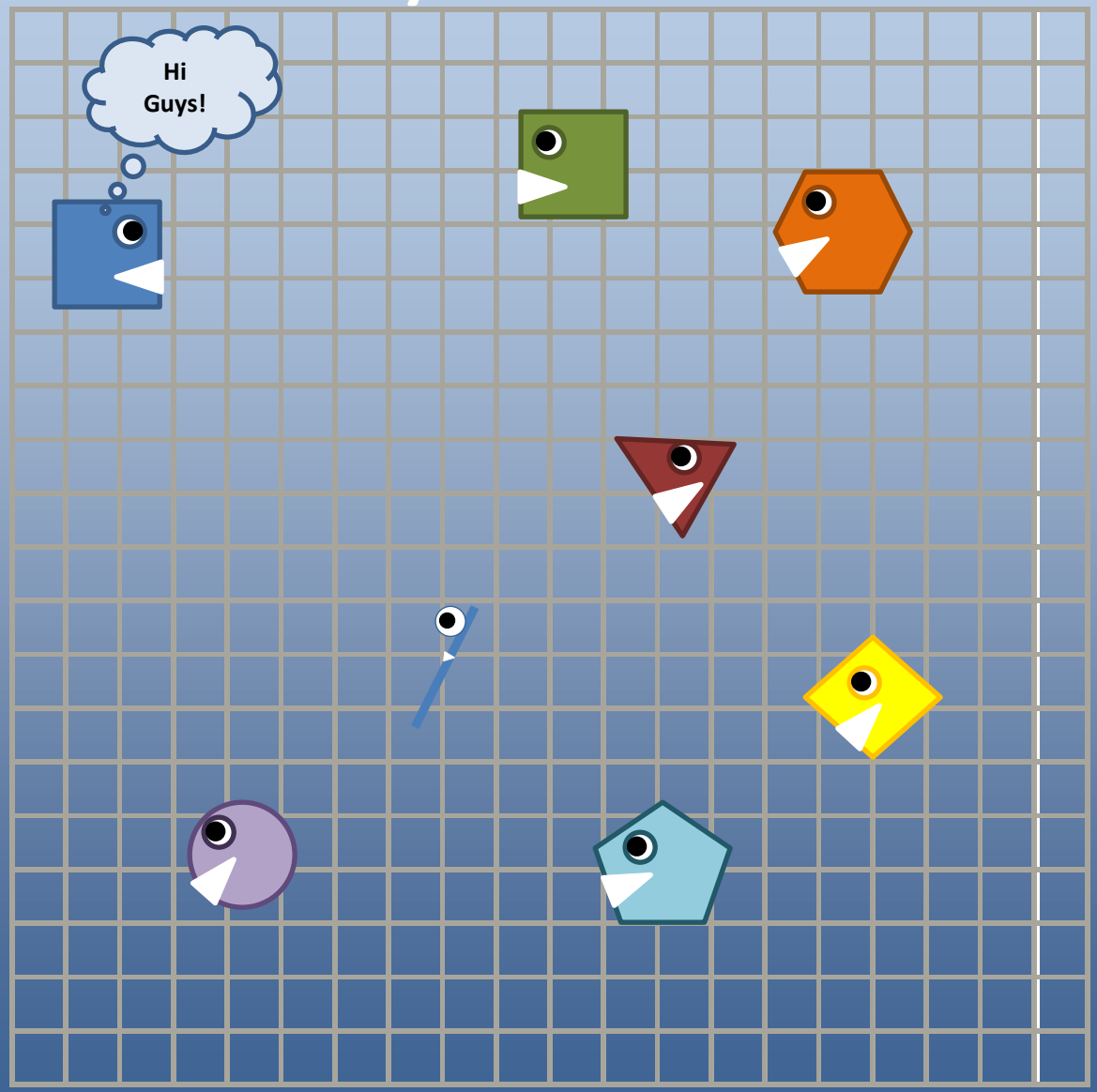
What Toody Sees…

Now, move yourself down until your eyes are at the level of the table.

What do you see?

This is what Toody sees. Everything looks a bit like a line…

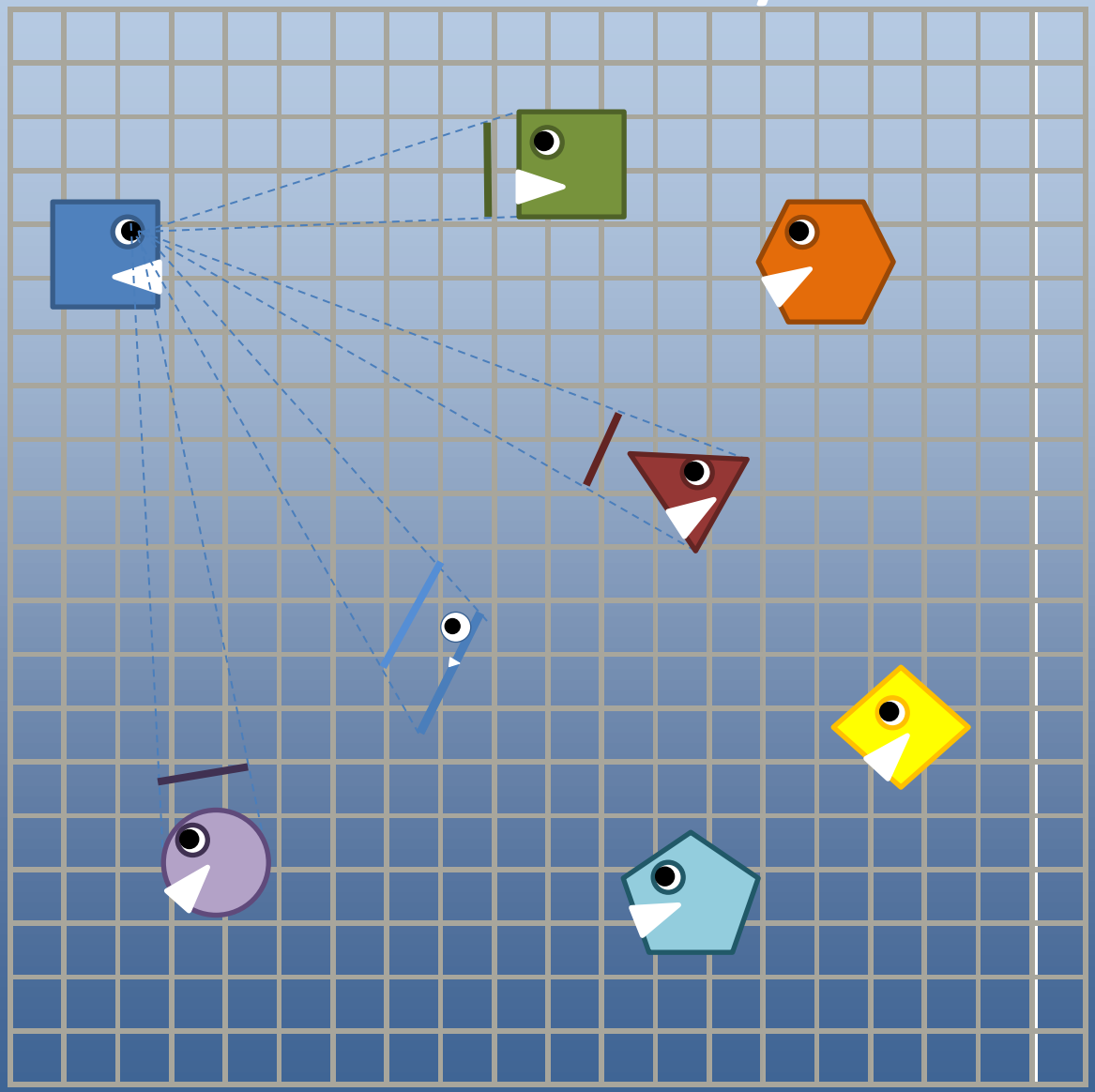
Toody's Friends



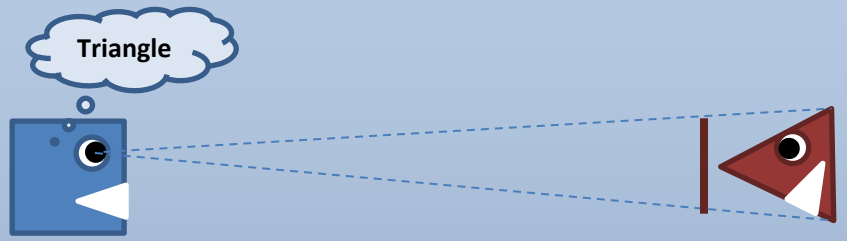
What Does Toody See?

Toody only ever sees objects in his world as a line or line segments!

You and I, from our position above them, can see all the shapes of Toody's friends.

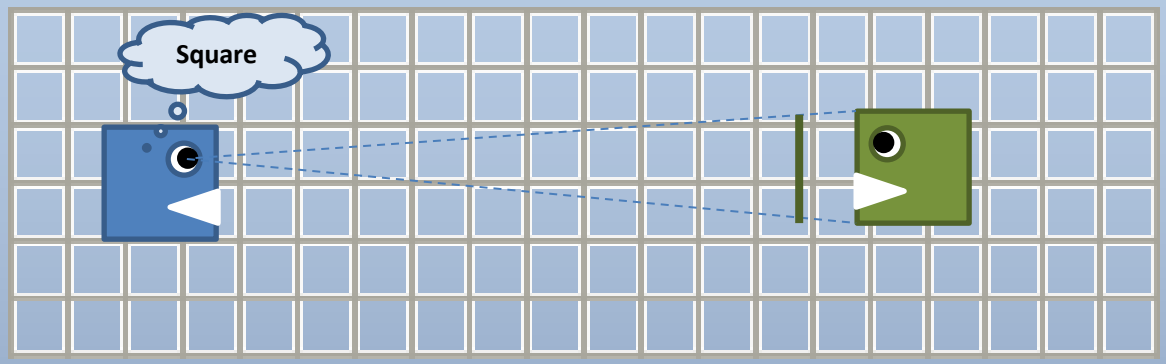


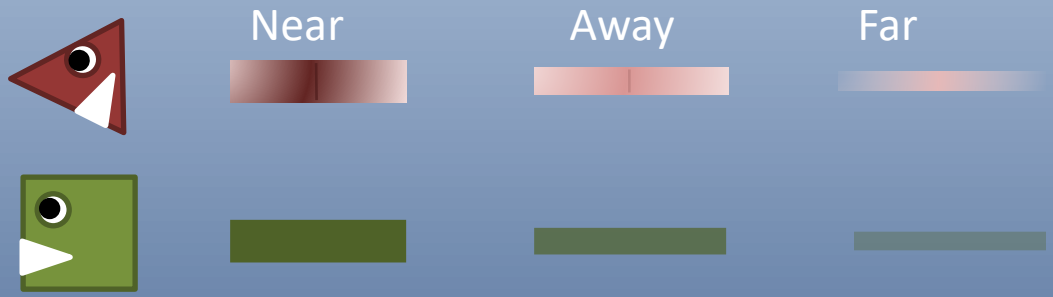
Can Toody Determine a Friend's Shape?



- Since there is no depth, then everything is flat
- Everyone appears as a line to Toody (drawn here as a rectangle)
- Consider his friend, the Isosceles Triangle
- Because there is distance in Toody's world, entities closer appear larger and entities further away appear smaller.
- And, closer points appear more defined than points further away
- So, the triangle has a well defined point near the middle and because the sides slope away, they appear less and less well defined out to the edges

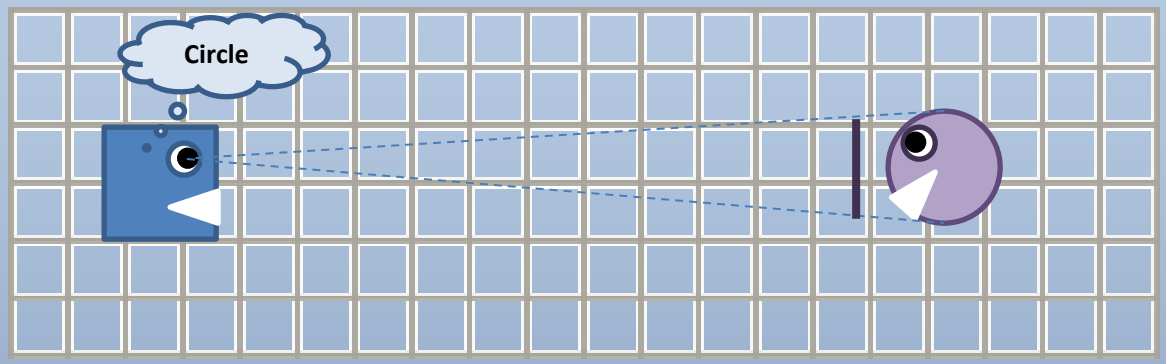
How Can Toody Determine Shape?

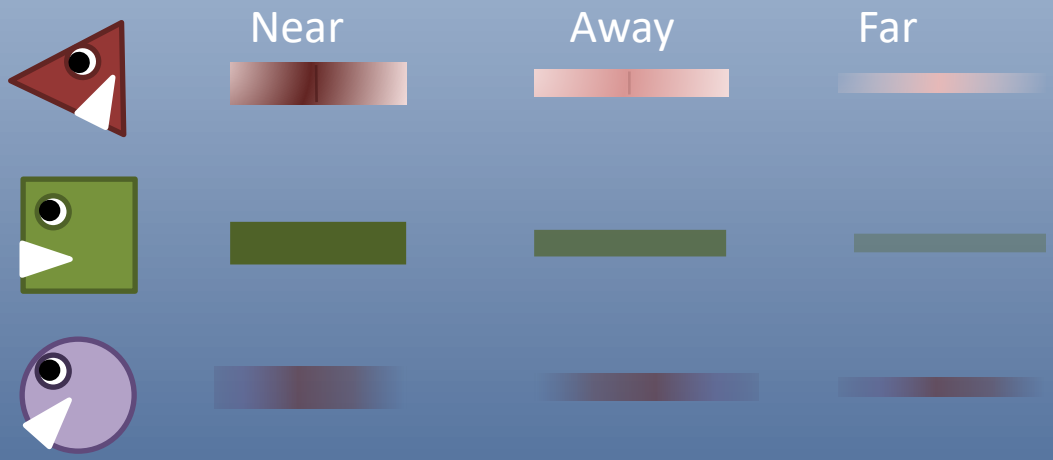




- In the case of the square, there are no points closer or further away
- The square appears as a fairly solid, non-varying rectangle at all distances

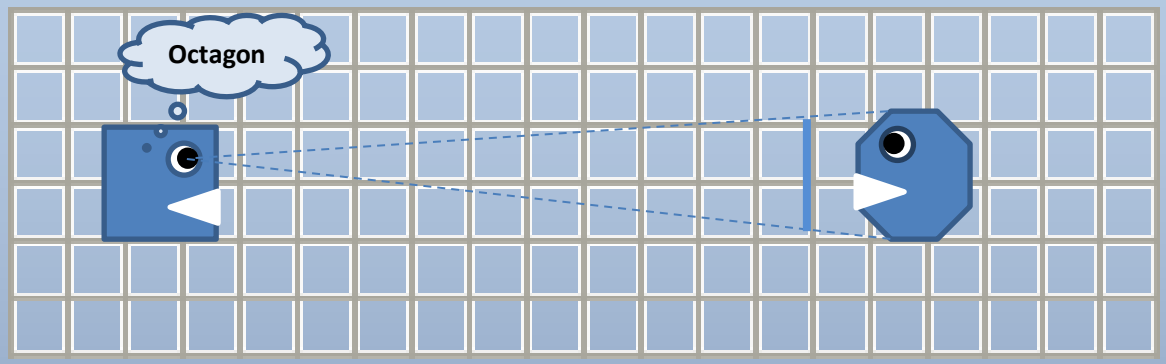
How Can Toody Determine Shape?

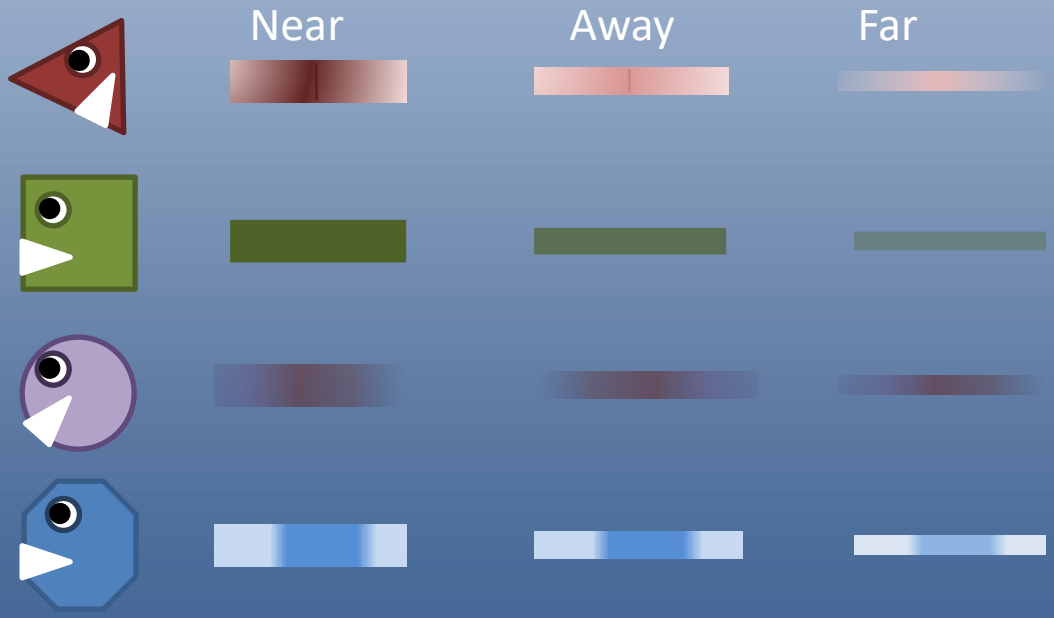




- The circle, too, has no point that is distinct and presents the same image, regardless of distance
- But, because there are points on the circle further away, they do appear to diminish out to the edges

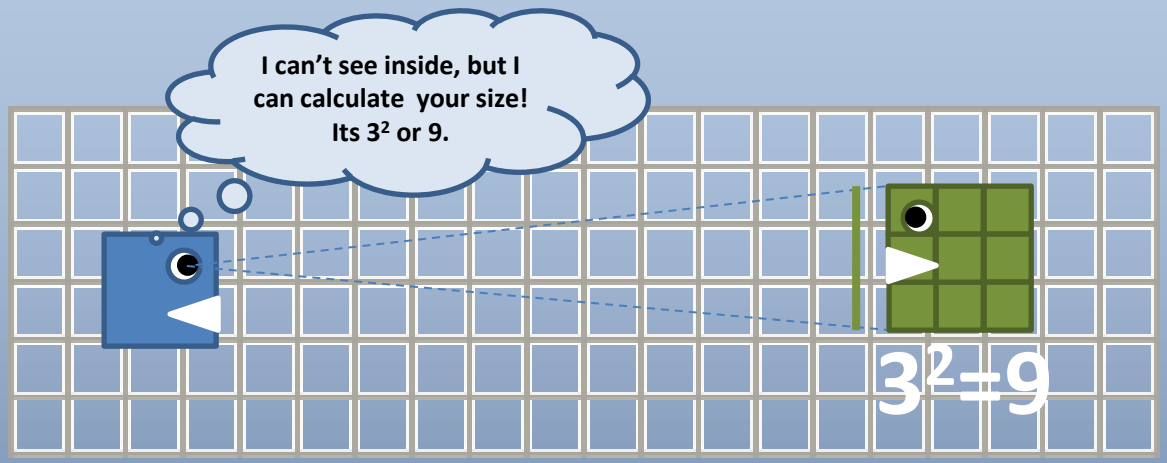
How Can Toody Determine Shape?





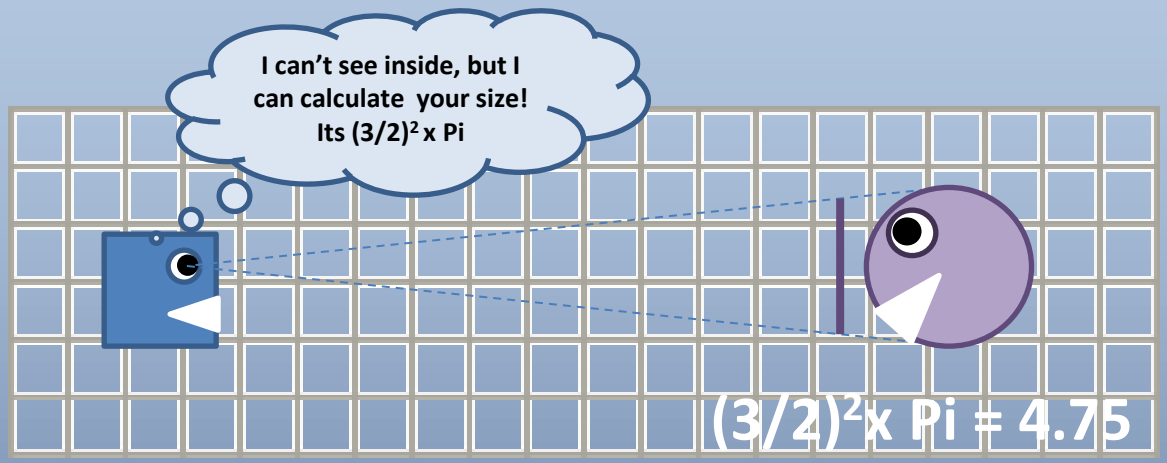
- The octagon has a closer, solid, projecting section near the middle

Seeing “Inside”



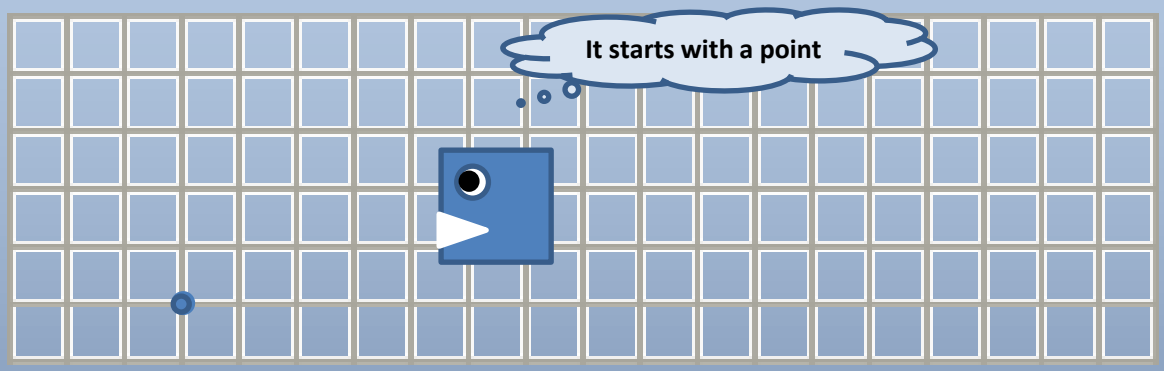
- In a 2D world, you can’t see inside others, because everything looks like a line
- But, you can calculate how big they are…if you can figure out their shape
- In this case, a square of thee units in length would by definition consist of three units long by three units wide for a total of 9 units in size (or 3^2)
- He can also calculate the size of a circle…

Seeing "Inside"



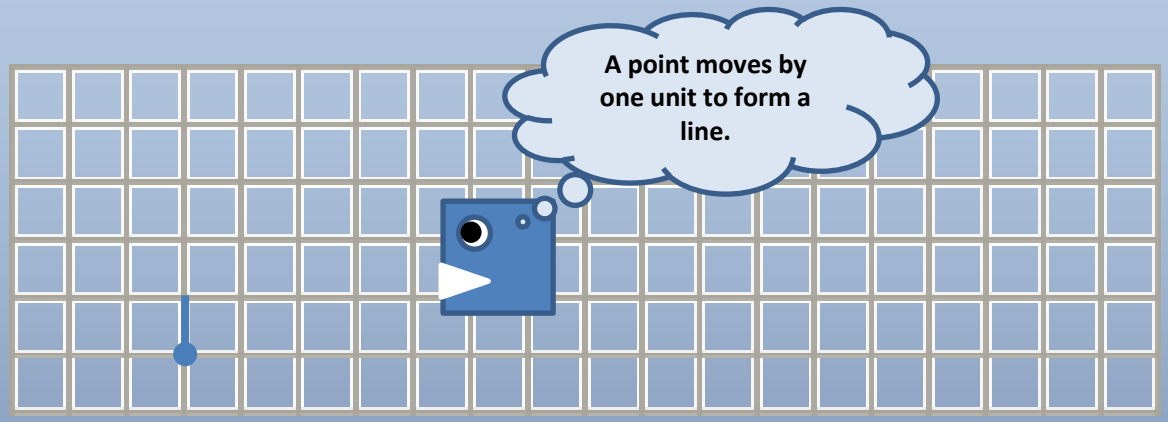
- The size of a circle would be only slightly more difficult to calculate. It would be (Diameter /2)^2 x Pi
- Other people's sizes could be determined using a little more math once you inferred their shape
- The more sides, the more difficult the calculation
- But, Toody can never see inside others or see their shape as we see them

How is a Square Made?



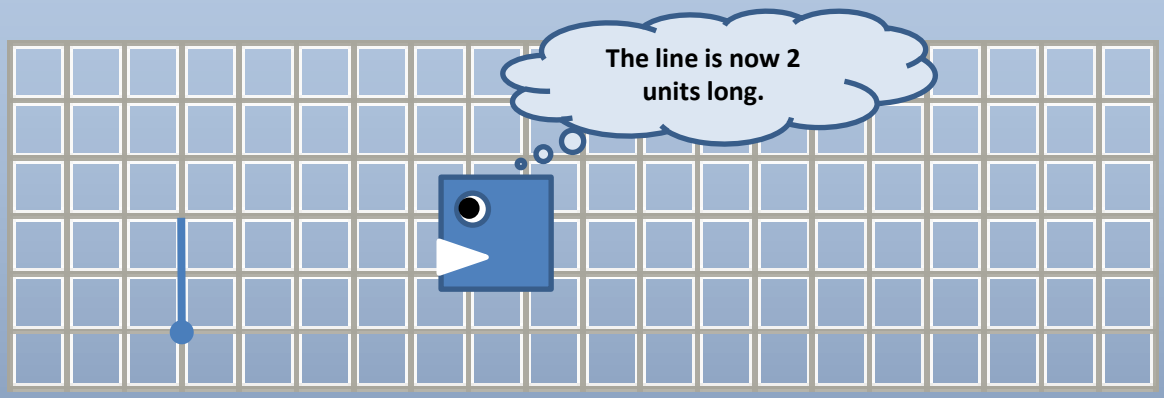
- A point is actually a zero-dimension element!
- It technically has NO size (no height, width, or depth)
- Being a zero-dimension element, it is definitely something people in a 1D or 2D world would know
- Here's a principle. People in a 3D world can see and manipulate things that are in a 0D, 1D, or 2D space. People in a 2D space can see and manipulate things that are in a 1D or 0D space. What do you think people in a 4D world might be able to see and manipulate?

How is a Square Made?



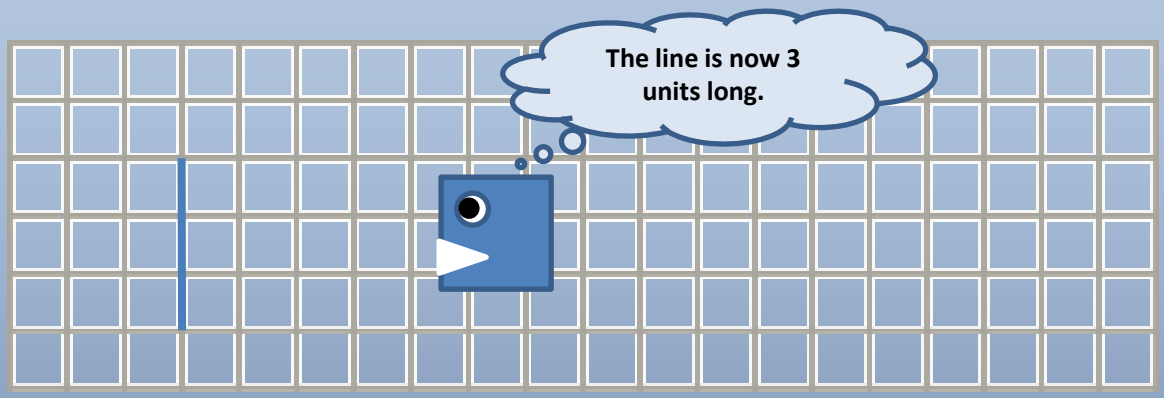
- A point moves in one of the two dimensions by one unit to produce a line

How is a Square Made?



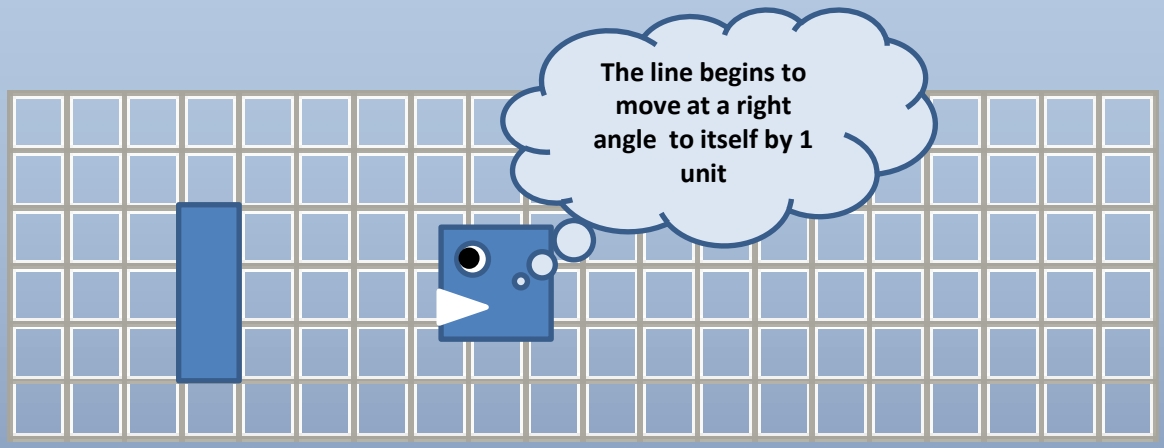
- A point moves in one of the two dimensions by one unit to produce a line
- Then, it proceeds to move by another unit…

How is a Square Made?

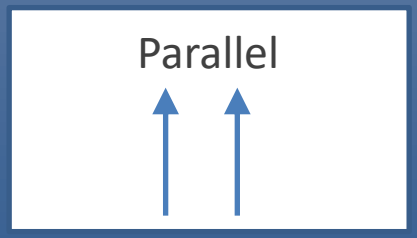


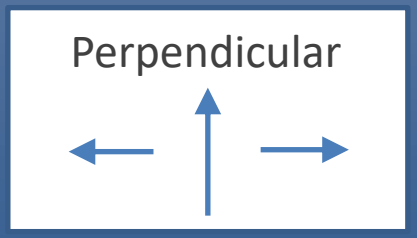
- A point moves in one of the two dimensions by one unit to produce a line
- Then, it proceeds to move by another unit…
- And another, until the line reaches three units in height. Then…

How is a Square Made?



- A point moves in one of the two dimensions by one unit to produce a line
- Then, it proceeds to move by another unit…
- And another, until the line reaches three units in height.
- Then, the line moves perpendicular to itself by one unit…





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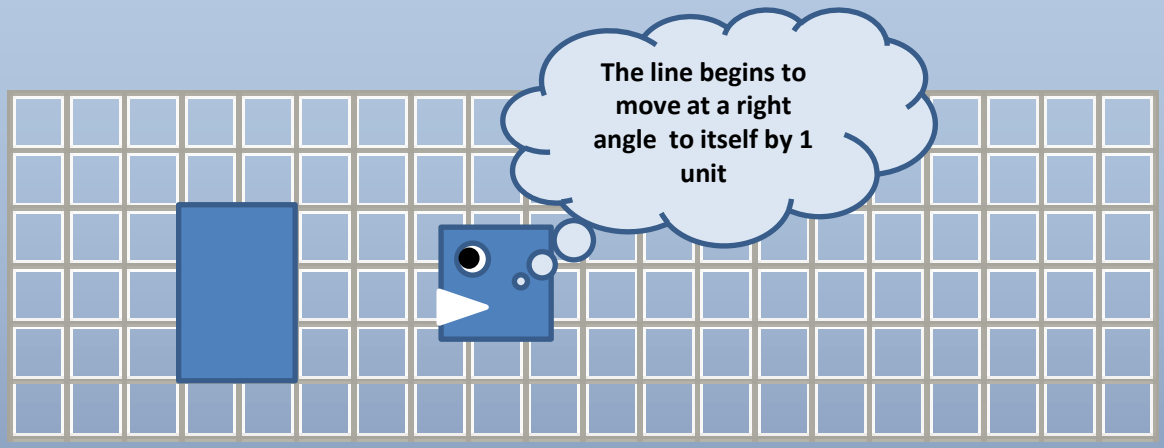
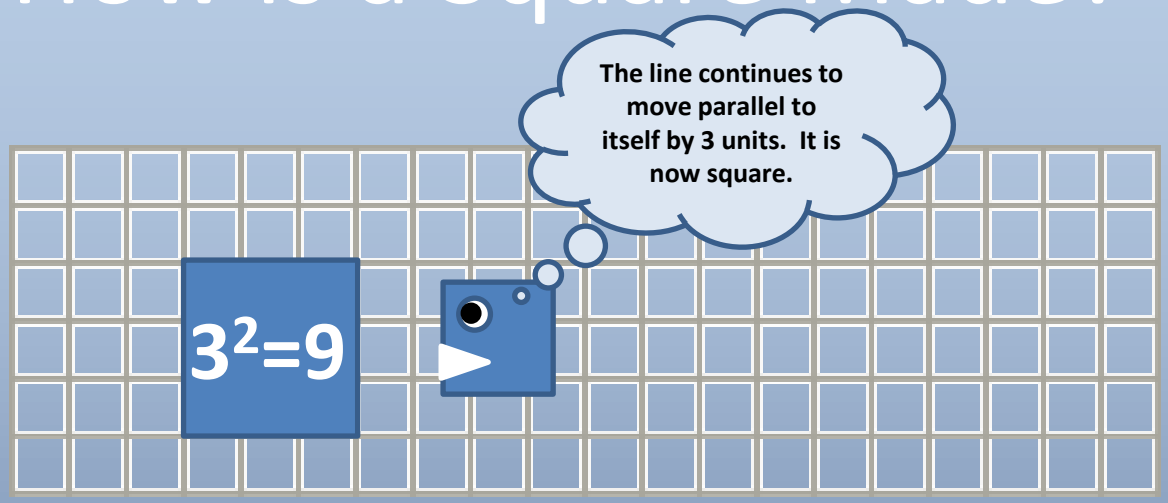


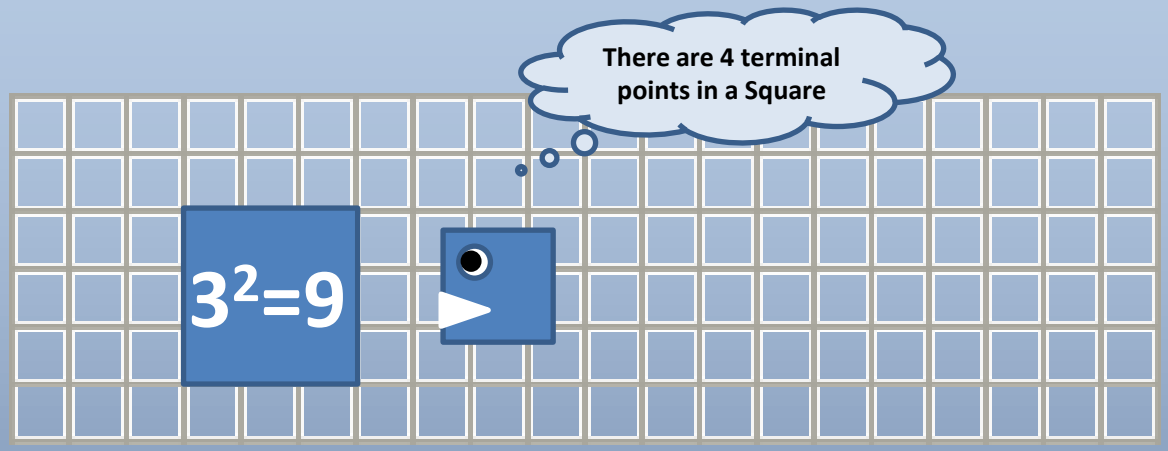
- A point moves in one of the two dimensions by one unit to produce a line
- Then, it proceeds to move by another unit…
- And another, until the line reaches three units in height.
- The line moves perpendicular to itself by one unit…
- Then by two units…

How is a Square Made?

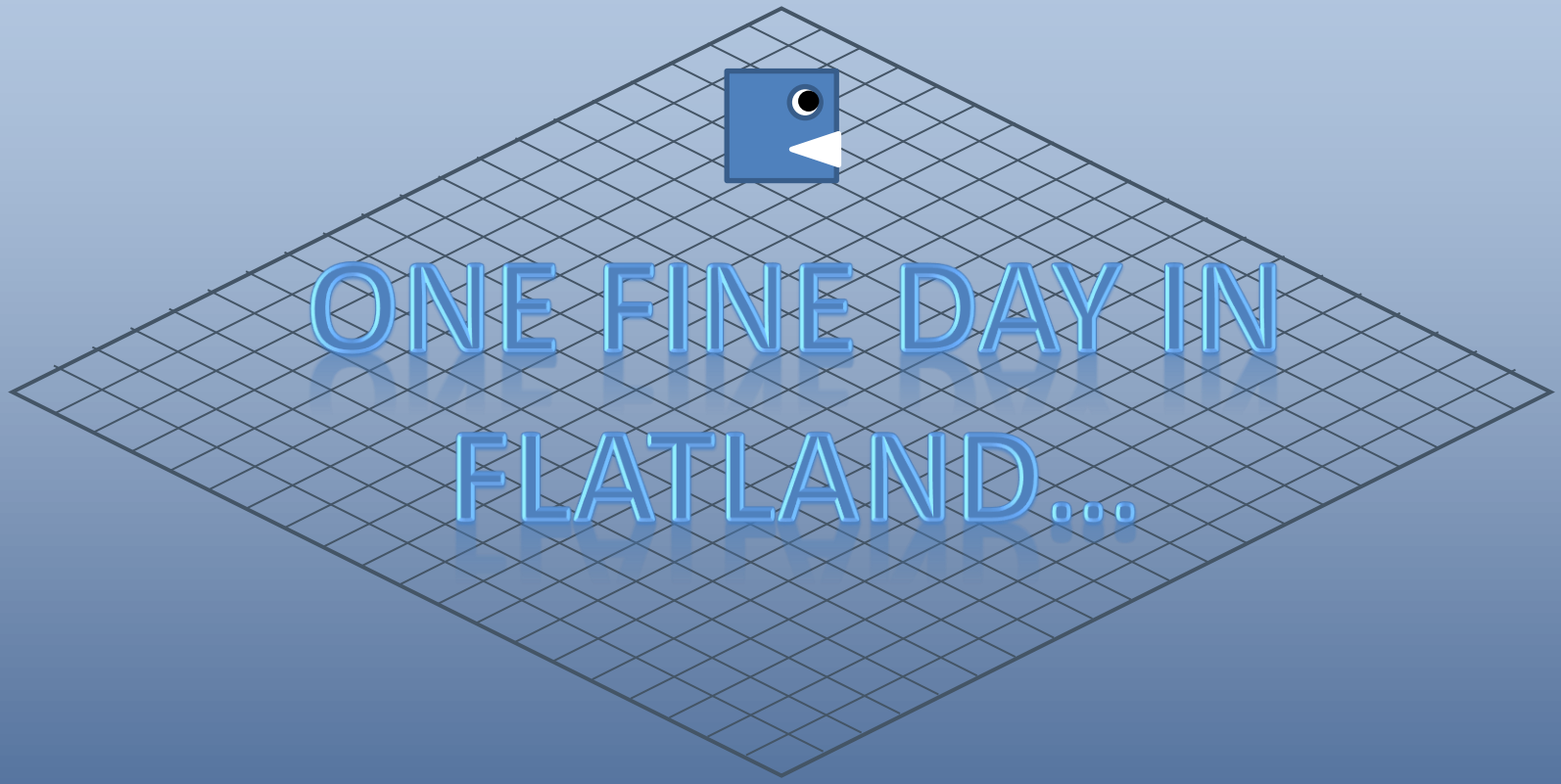


- A point moves in one of the two dimensions by one unit to produce a line
- Then, it proceeds to move by another unit…
- And another, until the line reaches three units in height. Then…
- The line moves parallel to itself by one unit…
- Then by two units…
- Until it reaches its square configuration

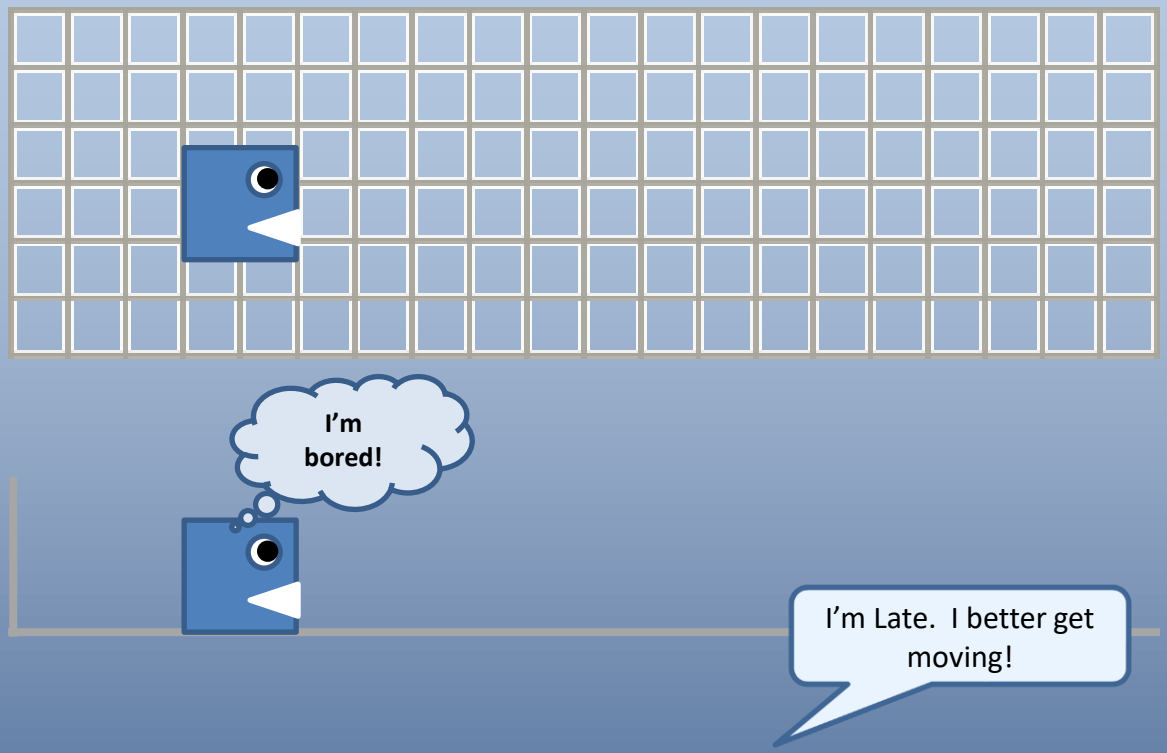
How is a Square Made?



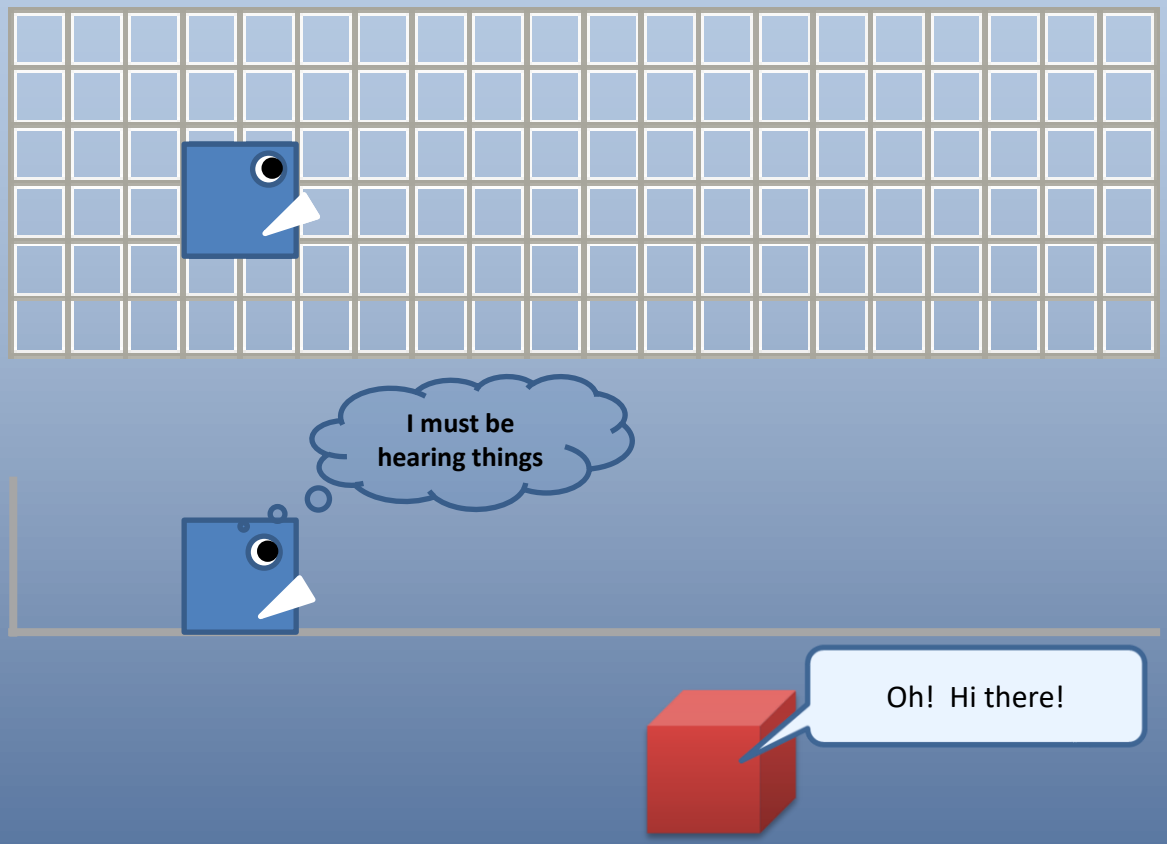
- The point had 0 terminal points, but when it moved by 1 unit, it became a line.
- A line is a 1D object. It only has length…no width or height
- A line has 2 terminal points.
- When the line became a rectangle and then a square, it had 4 terminal points
- 0, 2, 4…that's the arithmetic progression we know and understand in 2D land!
- The next logical progression assumes there would be 8 terminal points, but that is a mathematical ***impossibility*** in the land of two dimensions!


ONE FINE DAY IN
FLATLAND…

The Big Day!



Toody Meets the Cube



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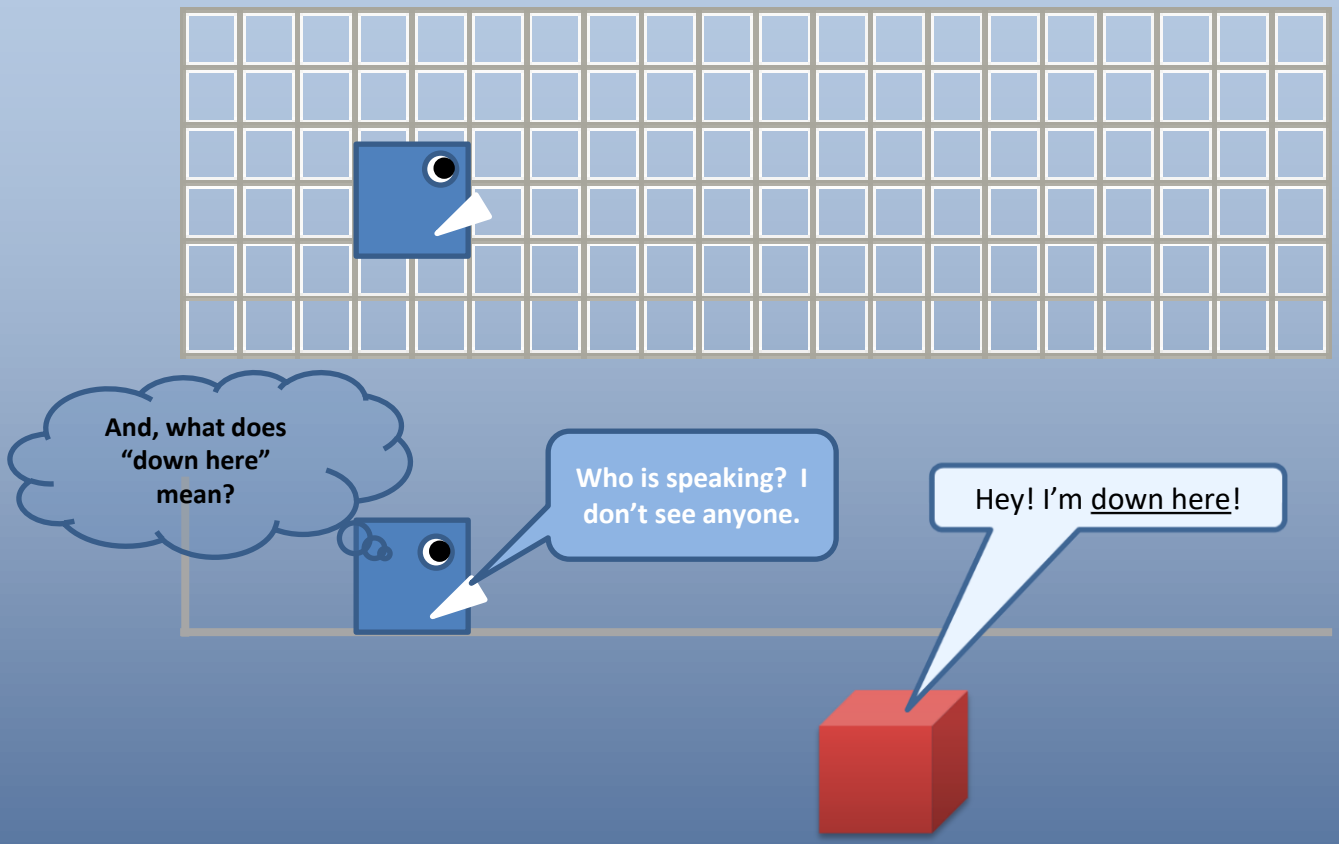

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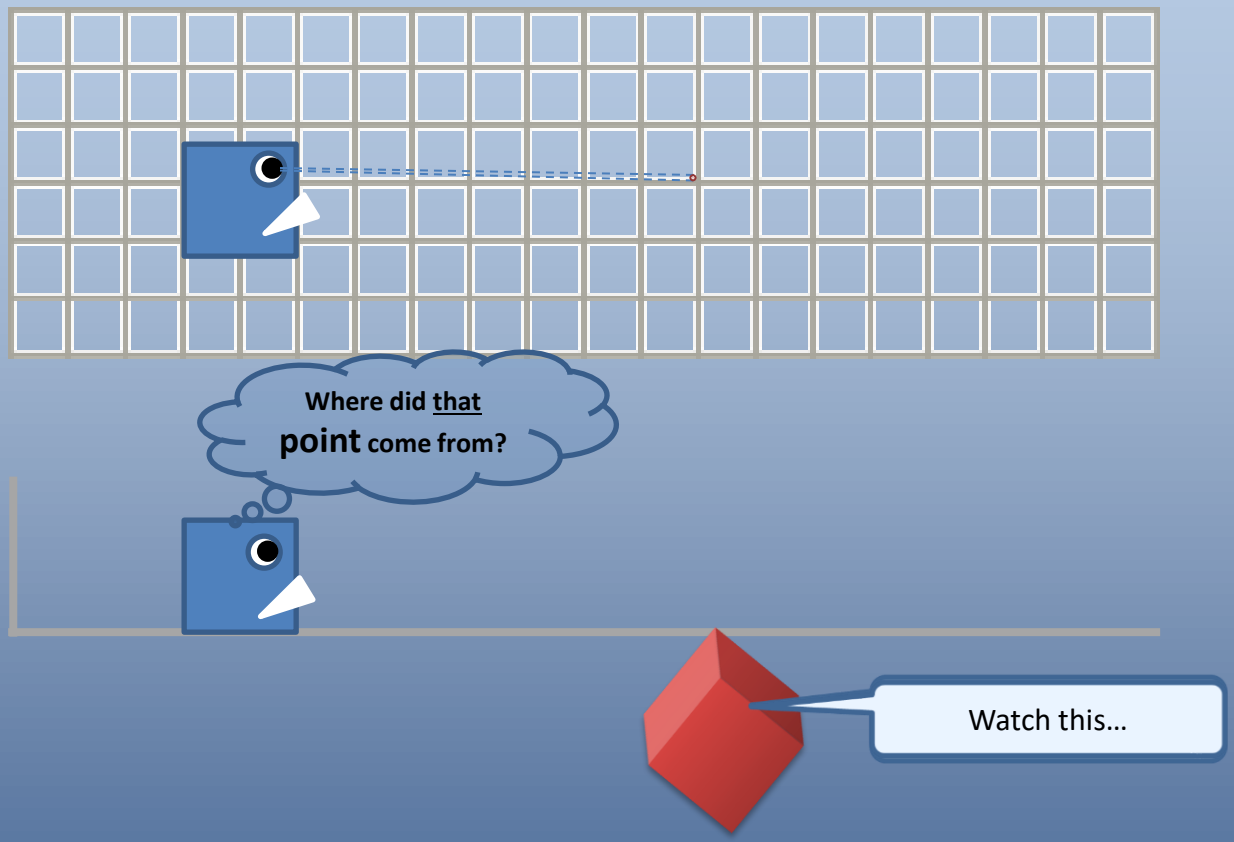

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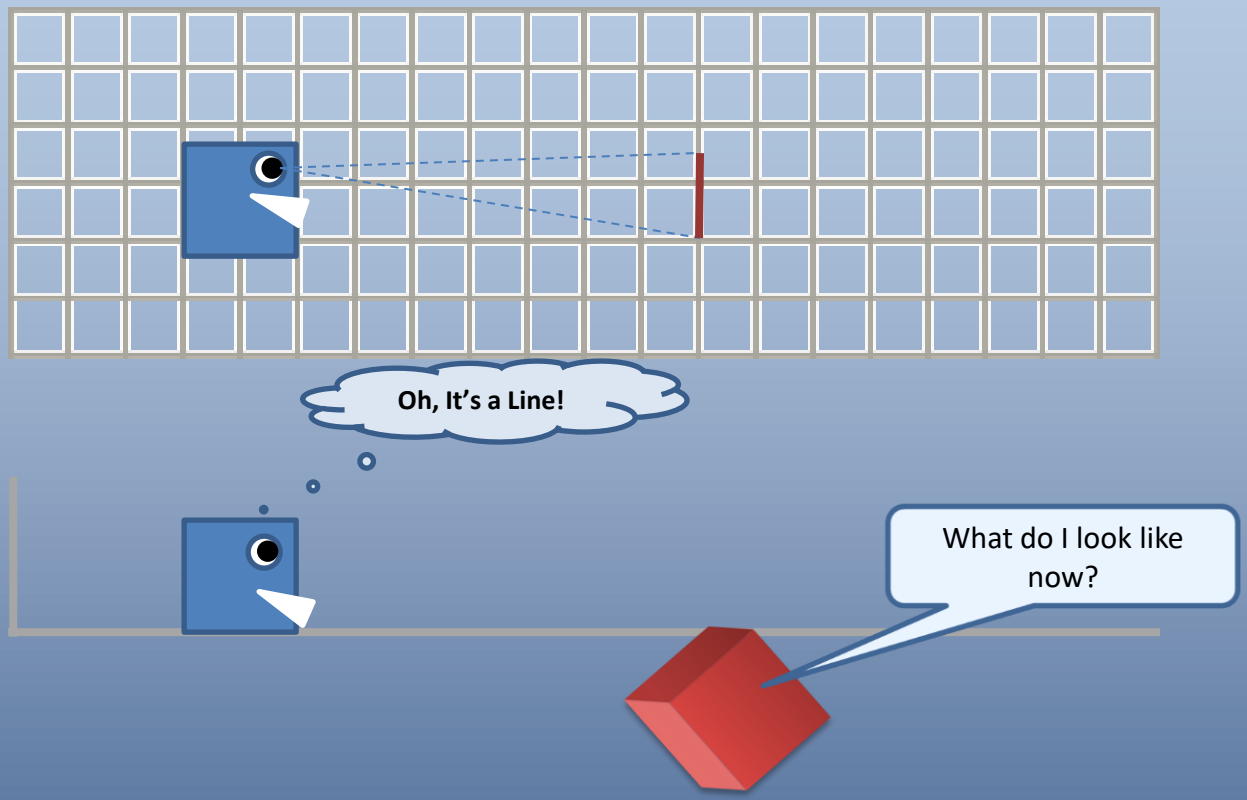

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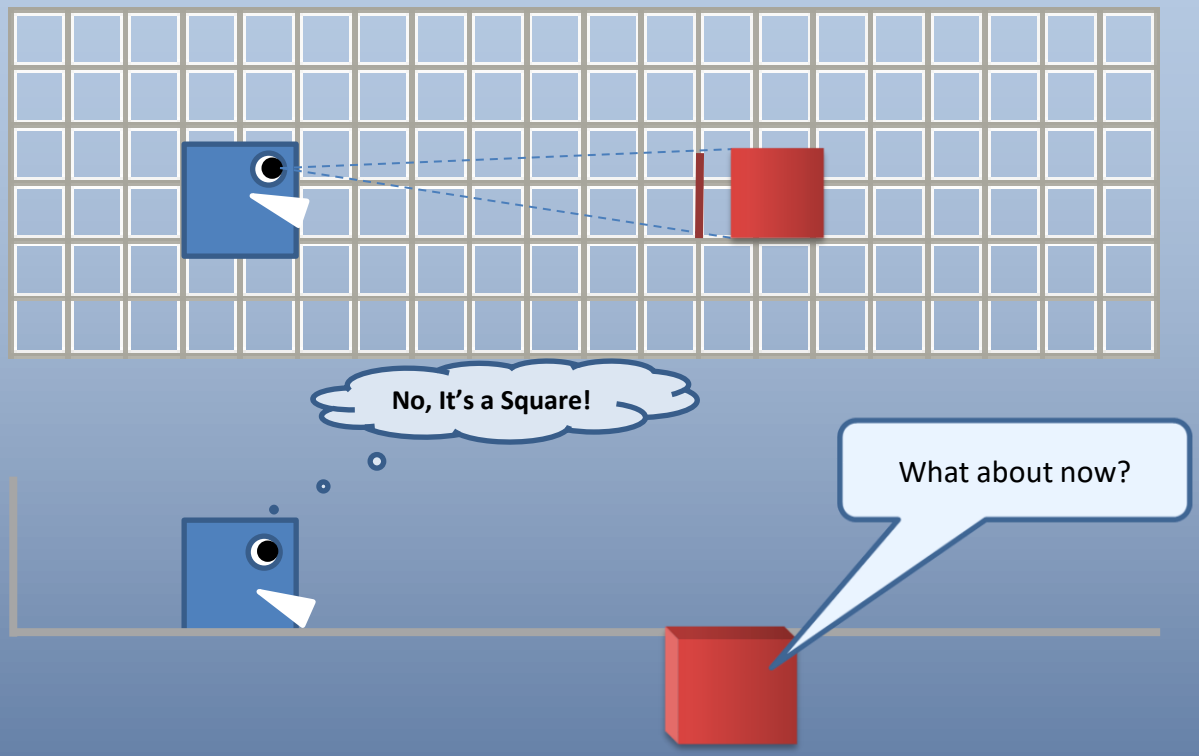

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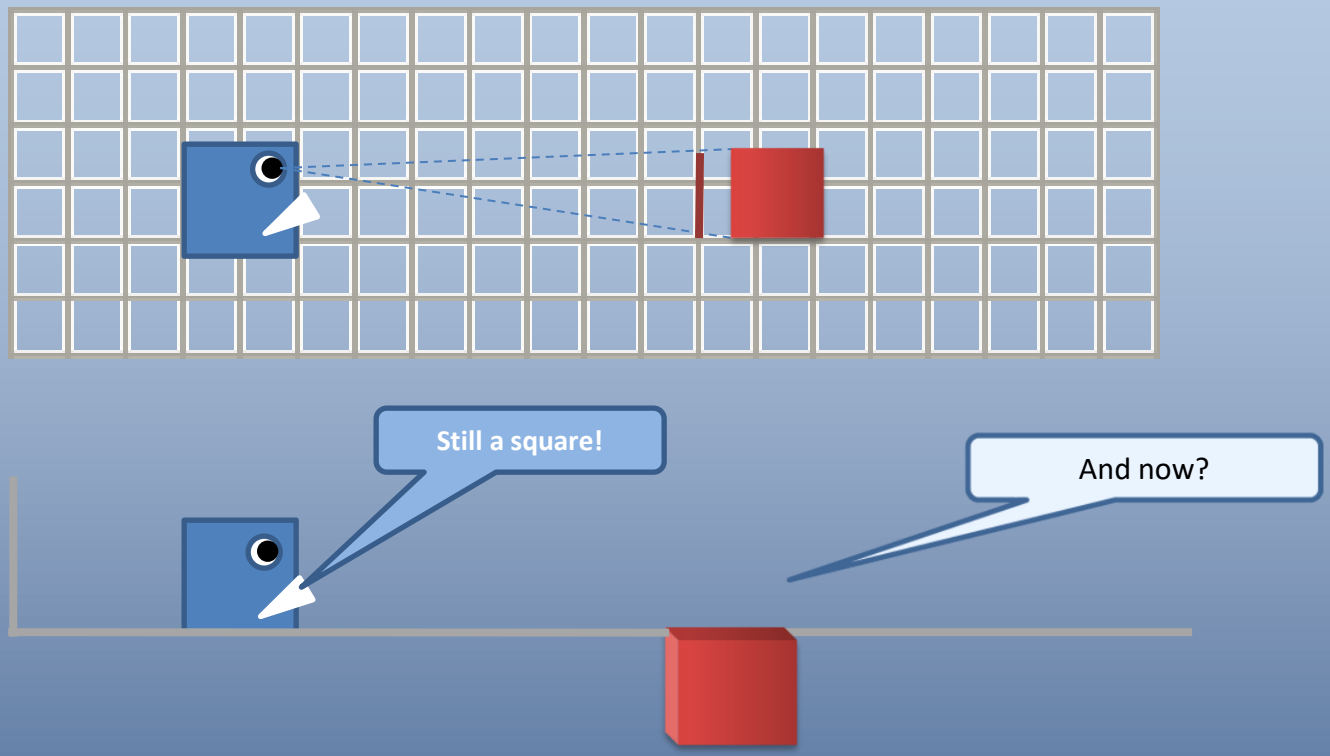

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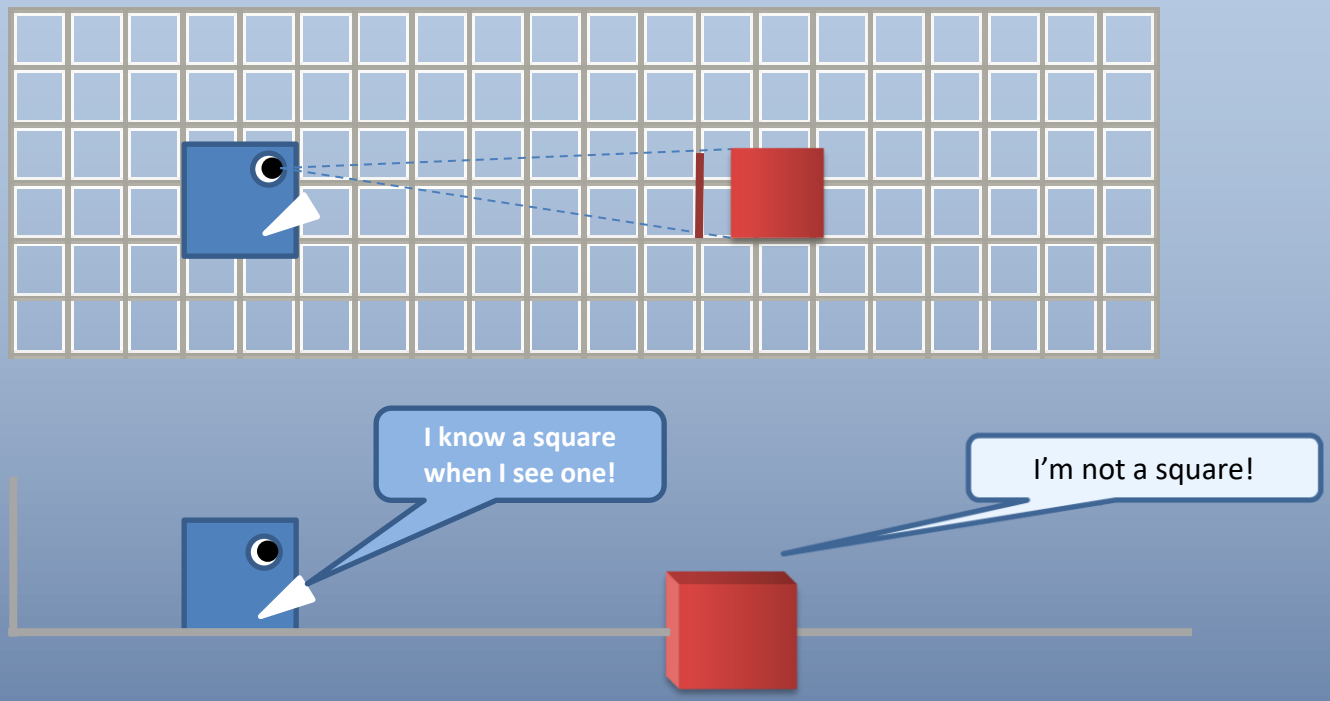

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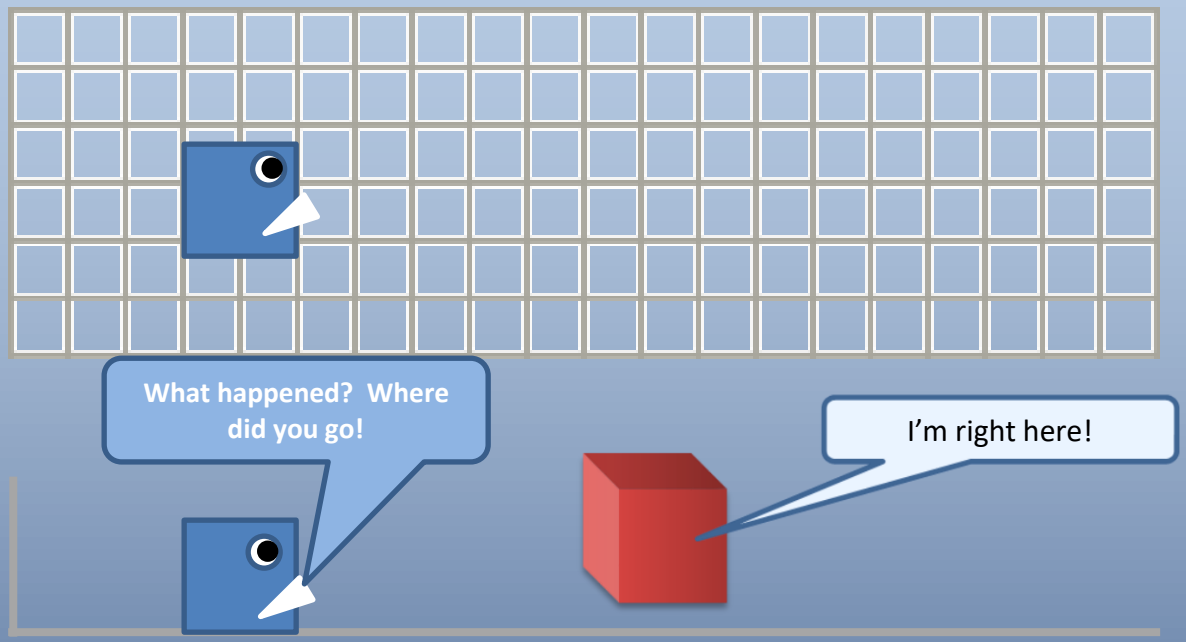

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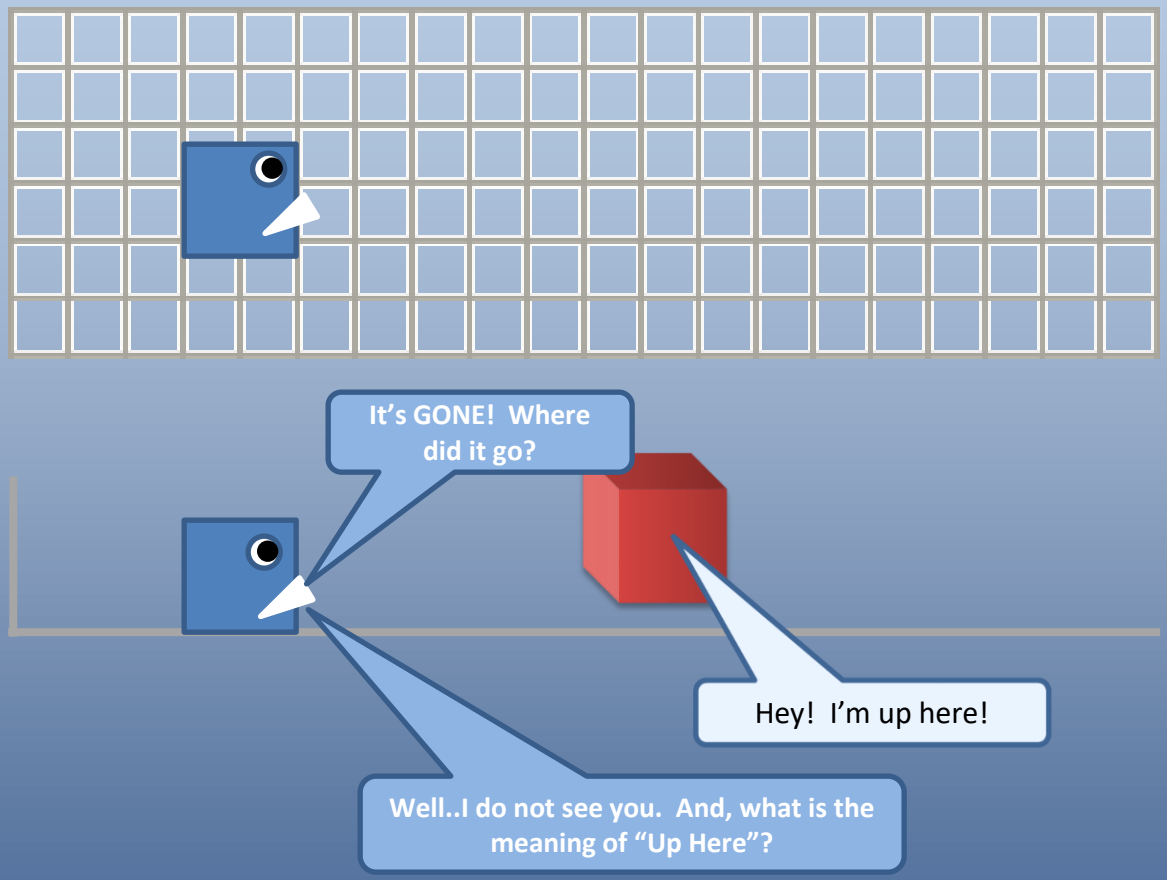

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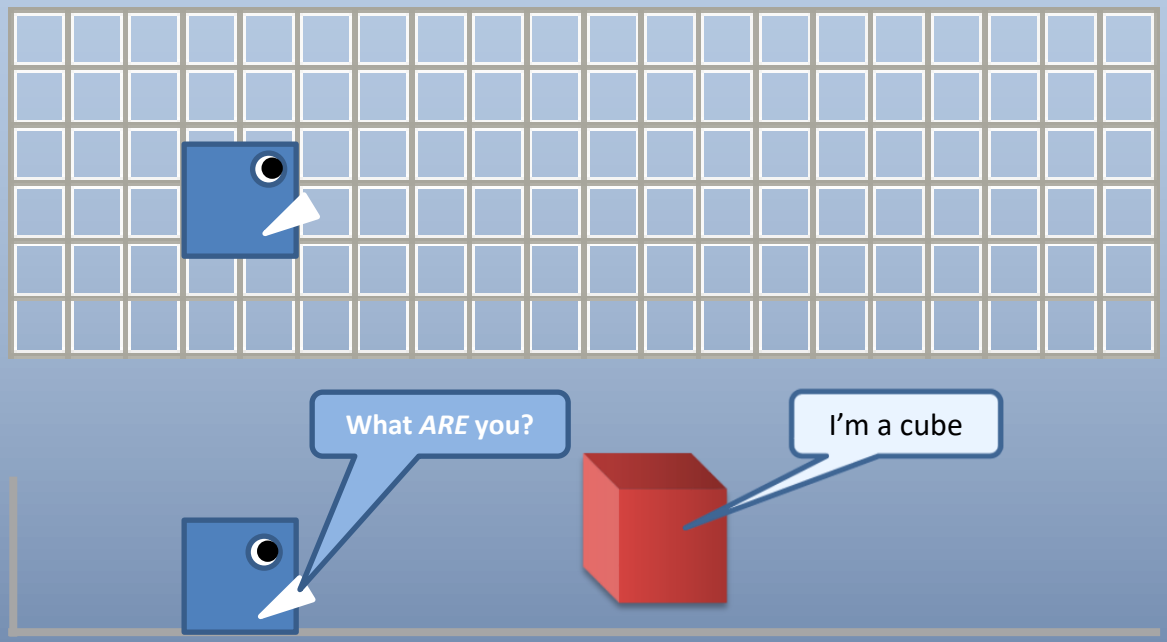
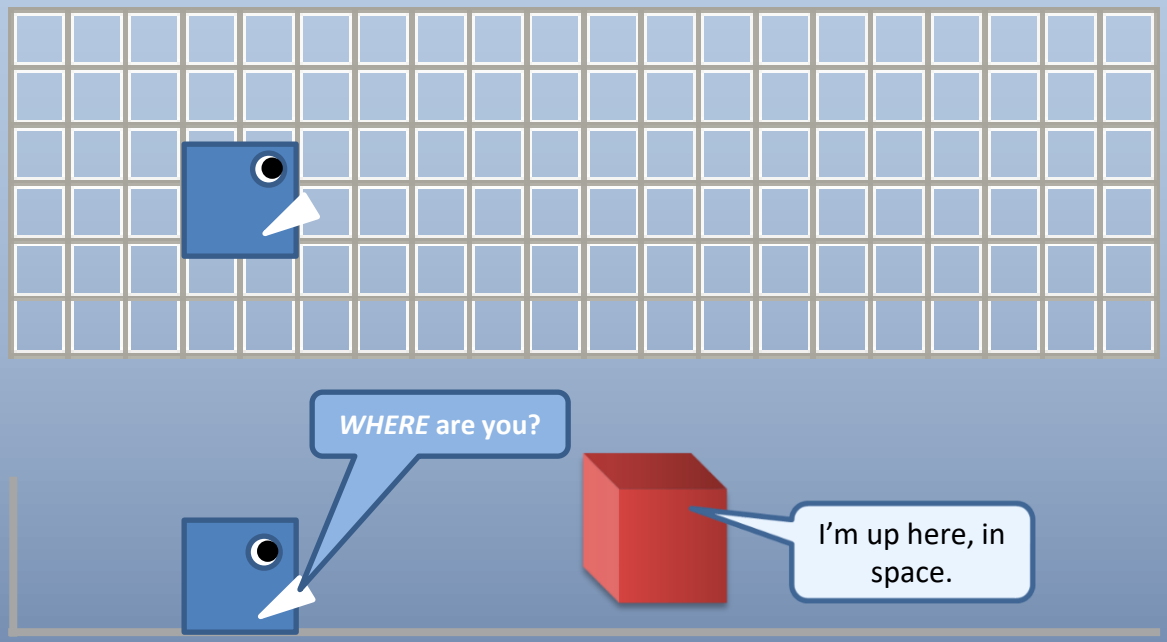
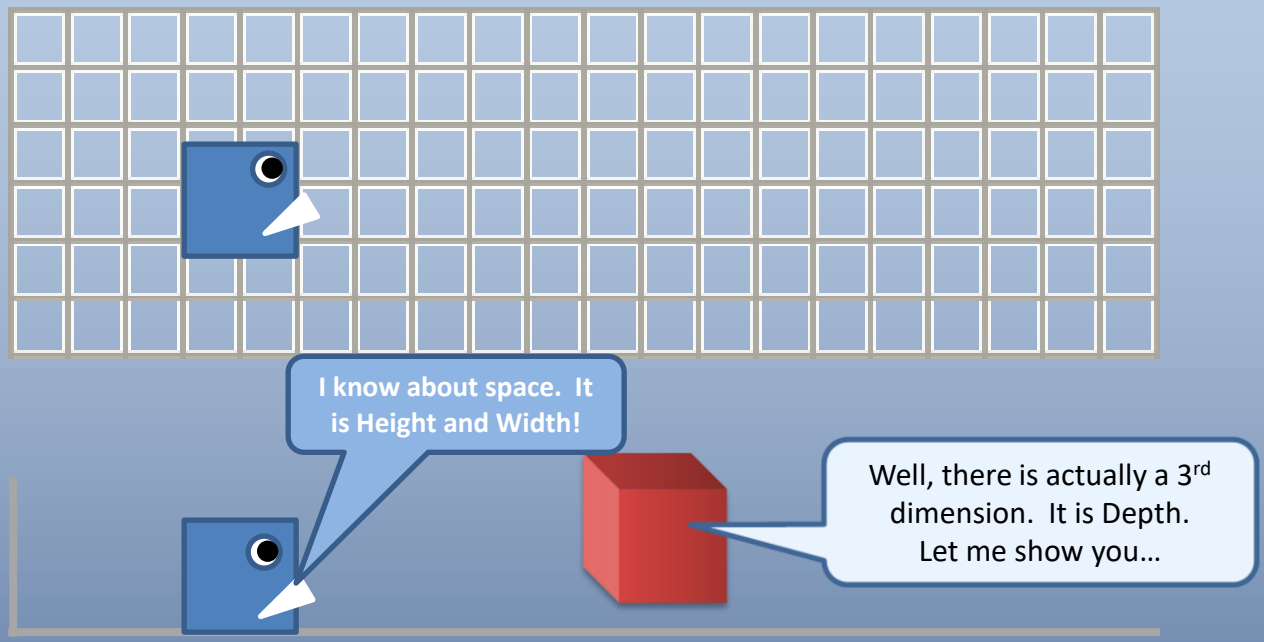


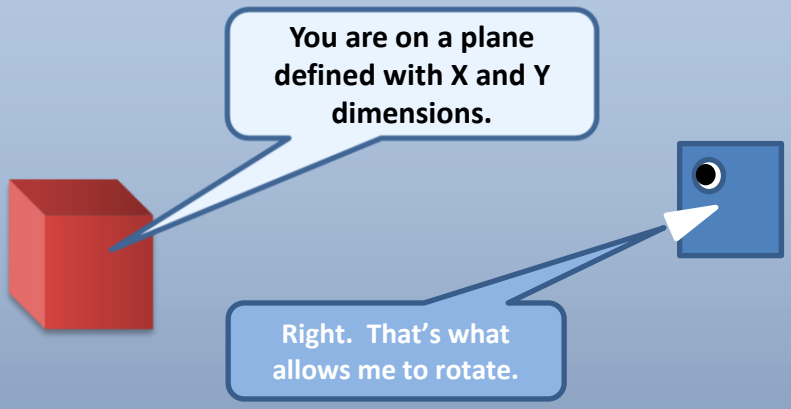
Toody Meets the Sphere

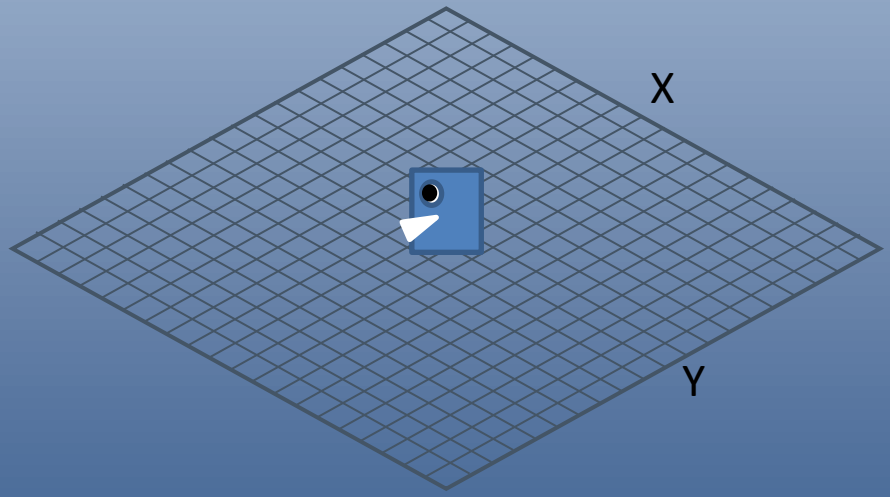


Toody Meets the Sphere

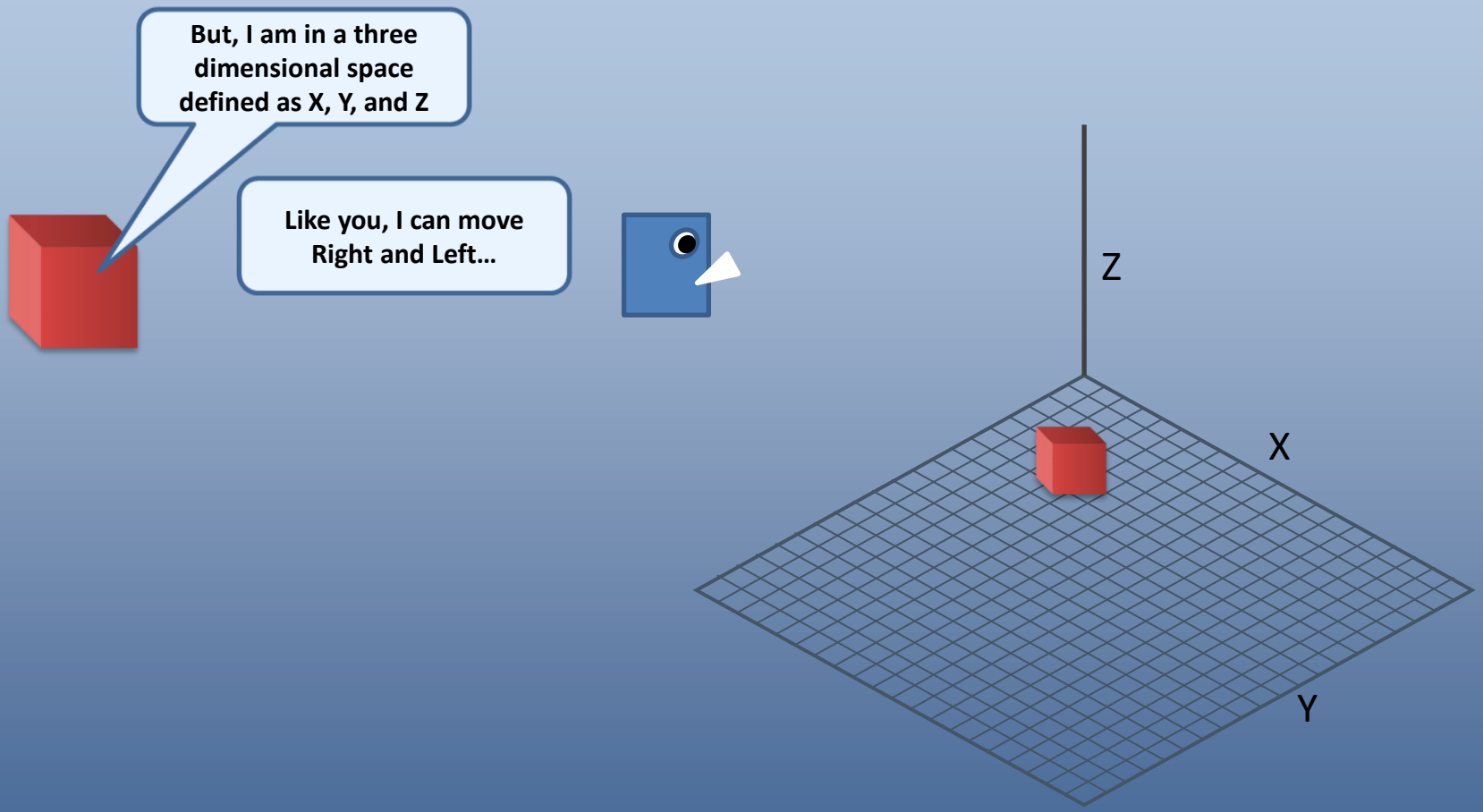


Rotation in Two Planes X and Y





The 3rd Dimension



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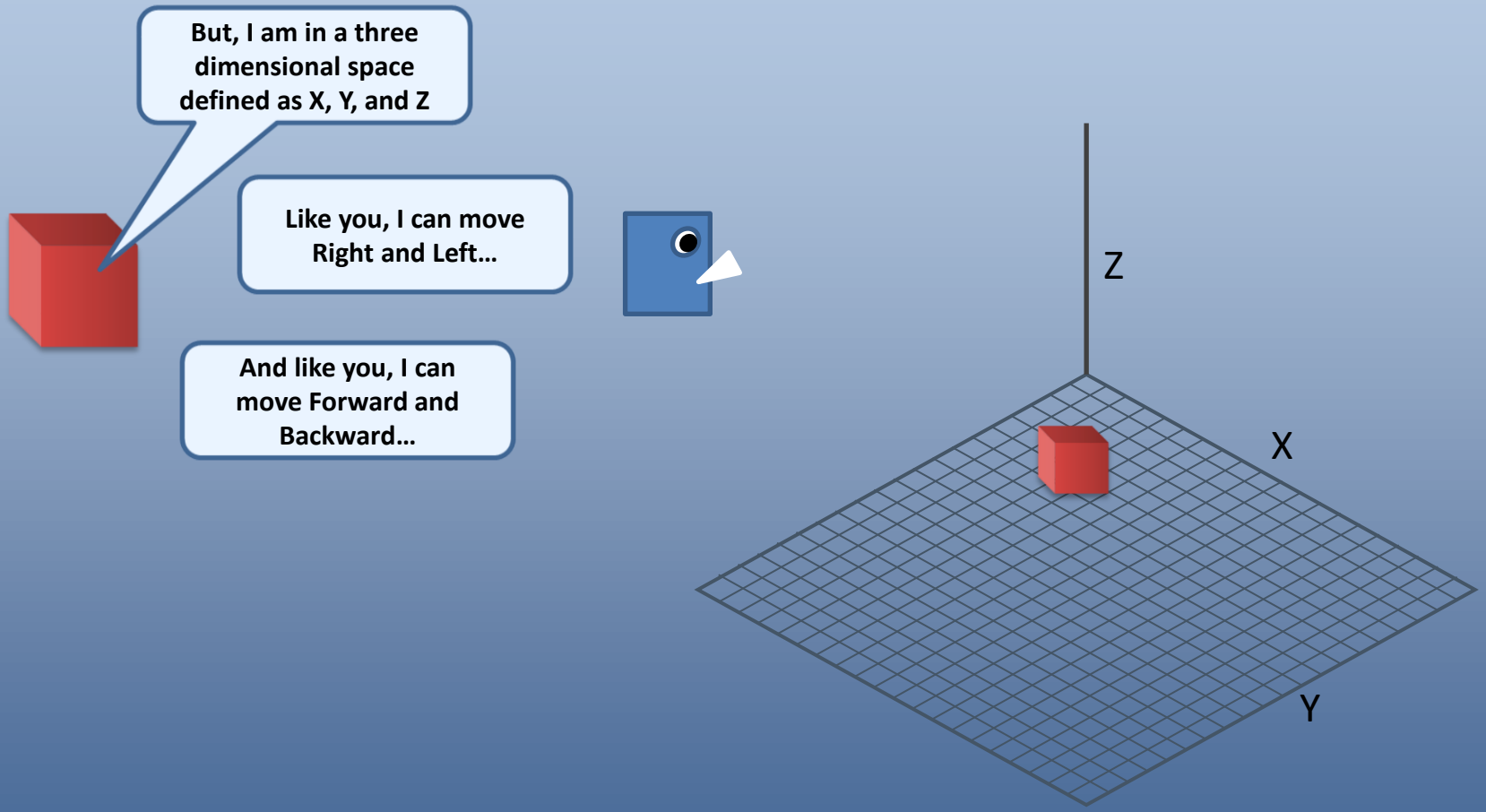

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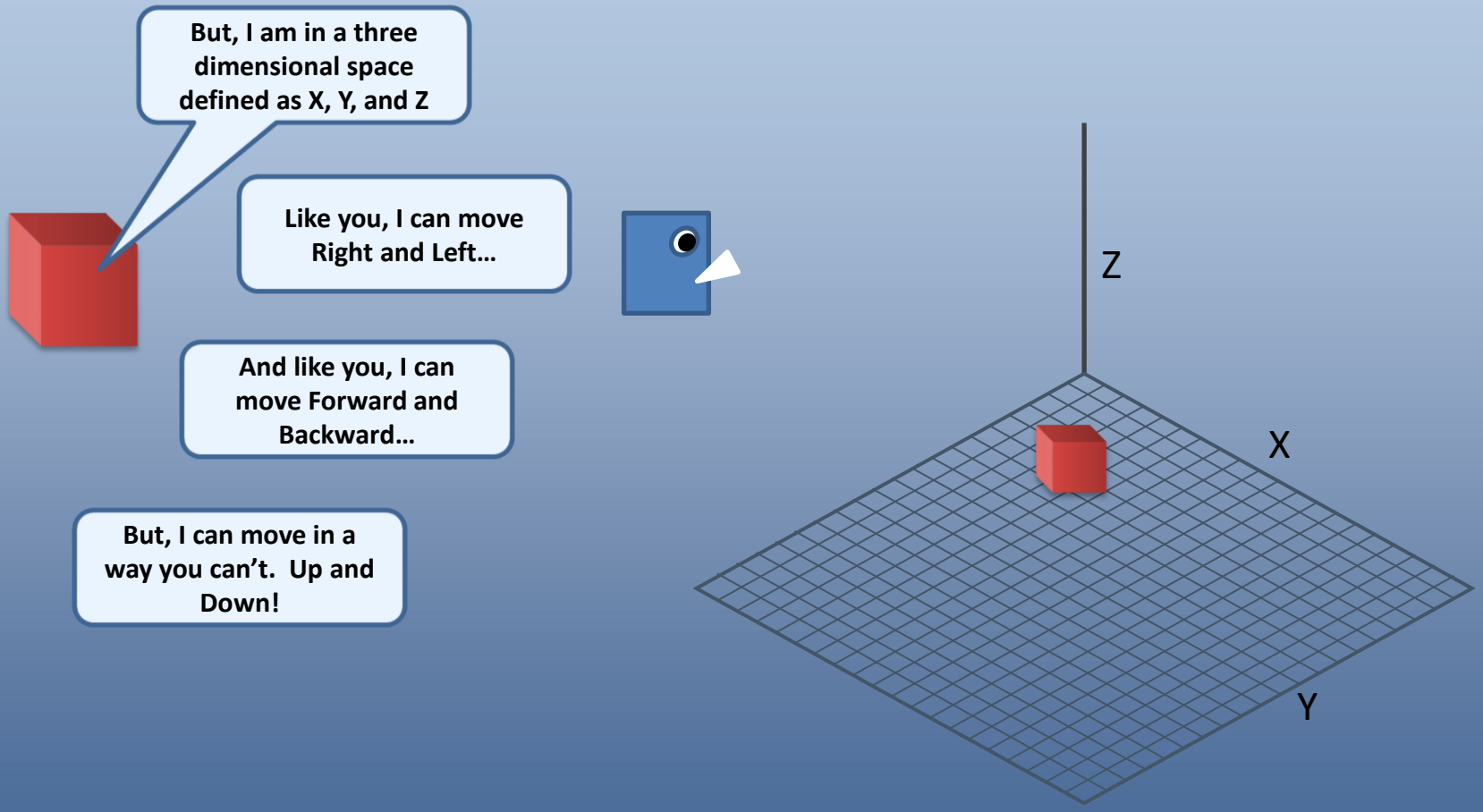

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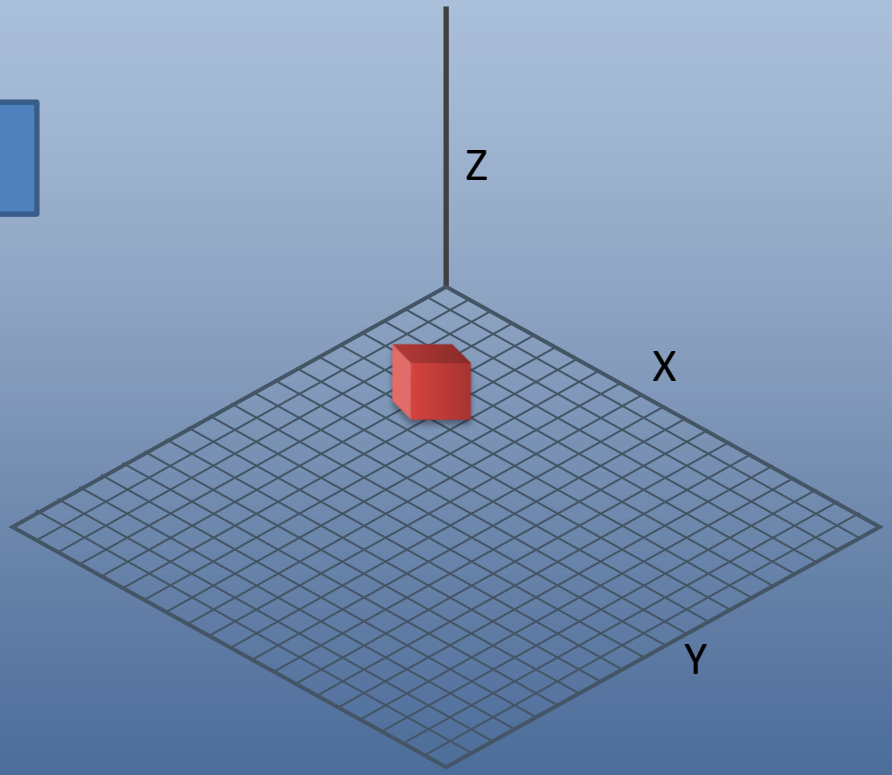

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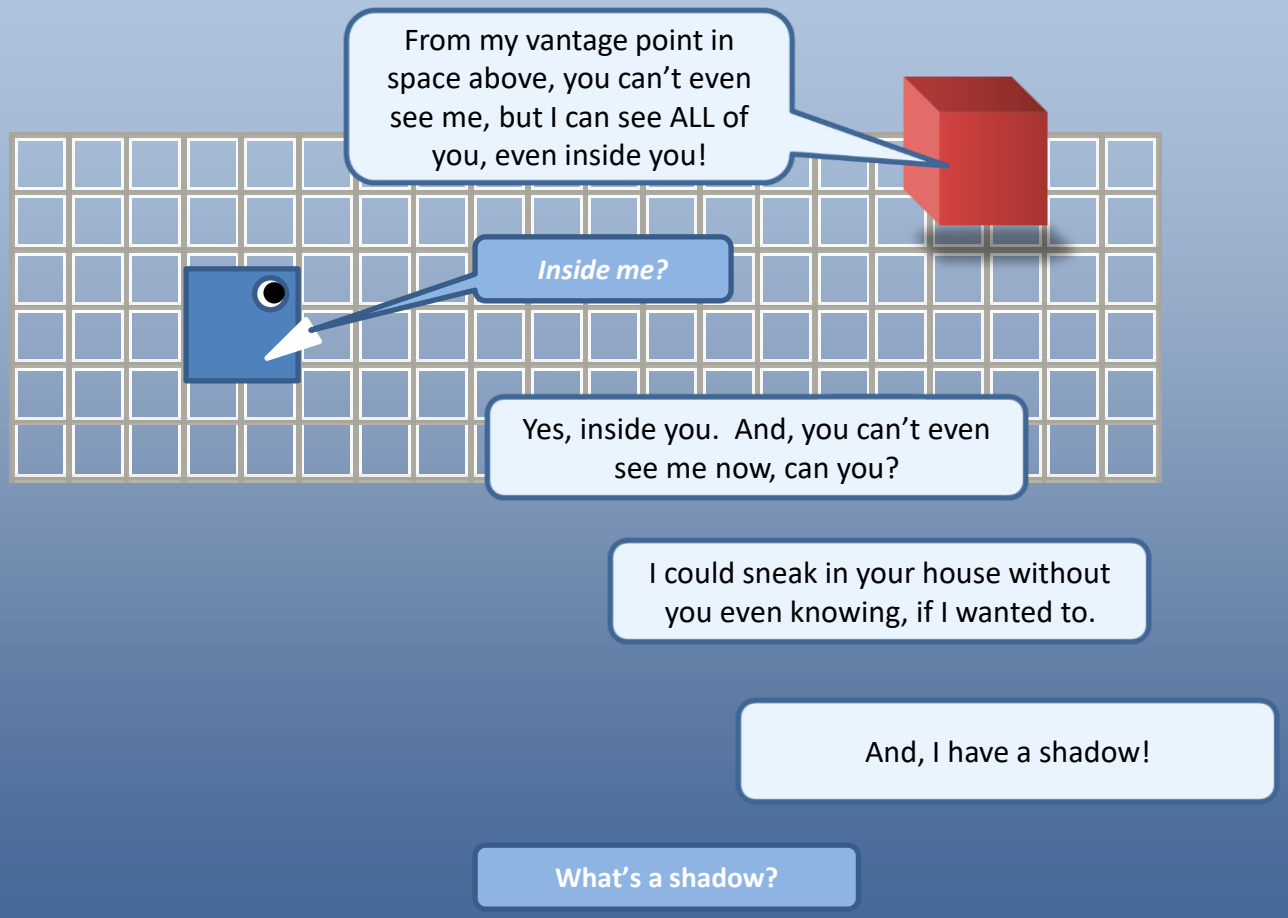

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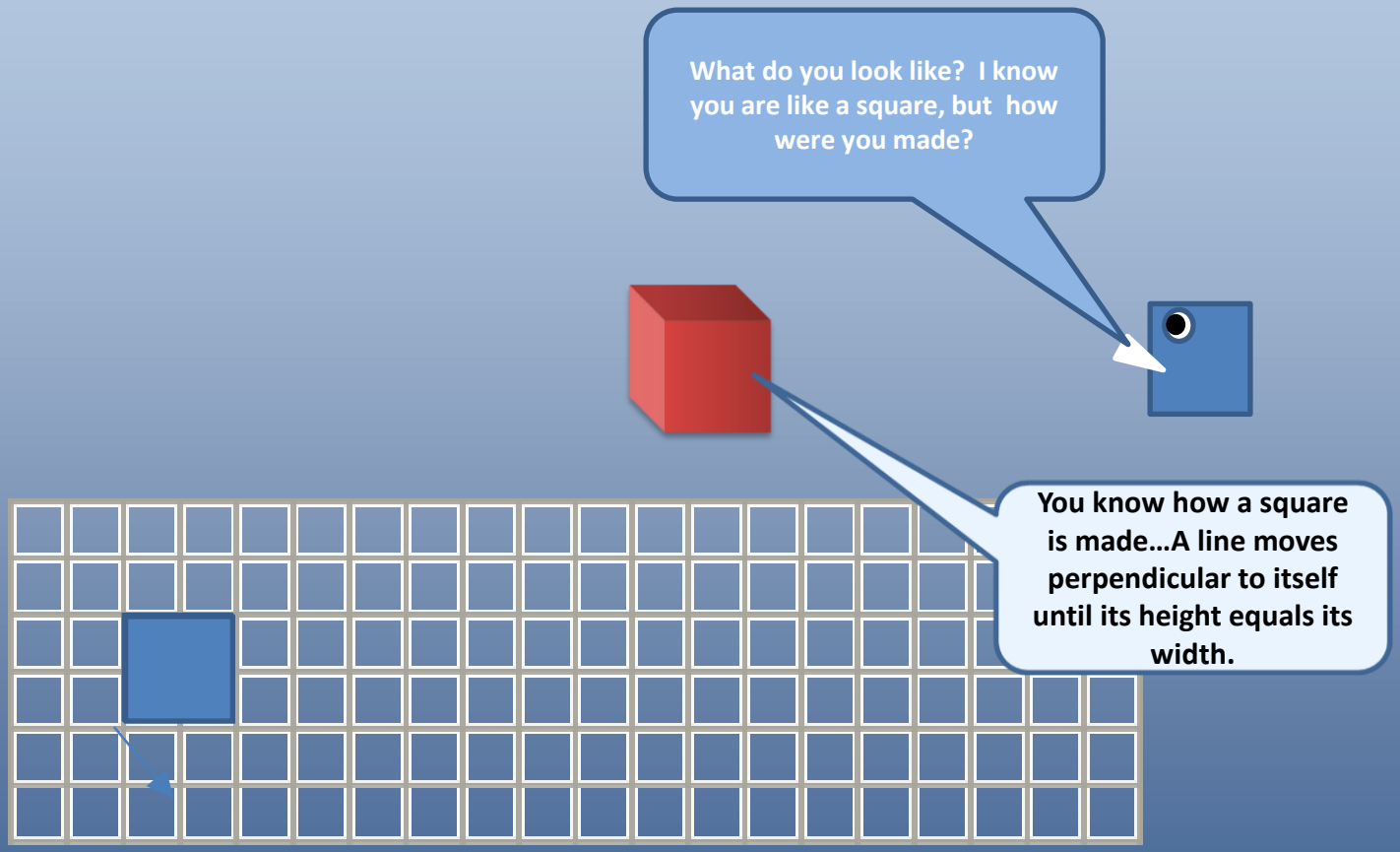

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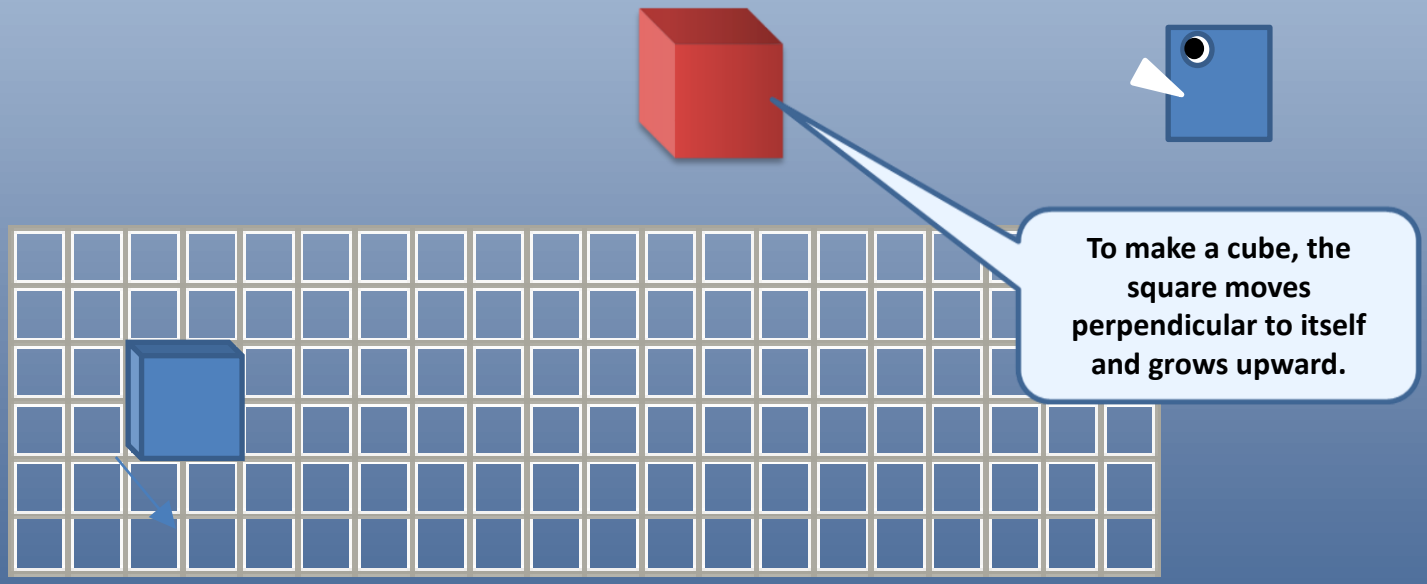

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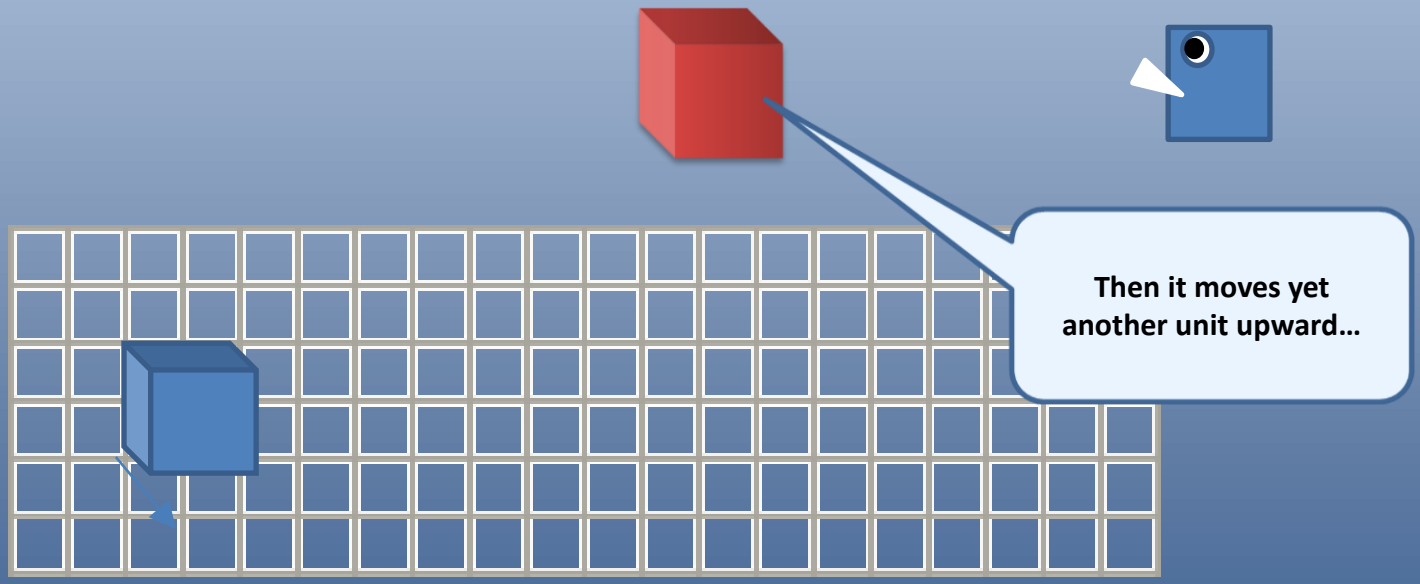

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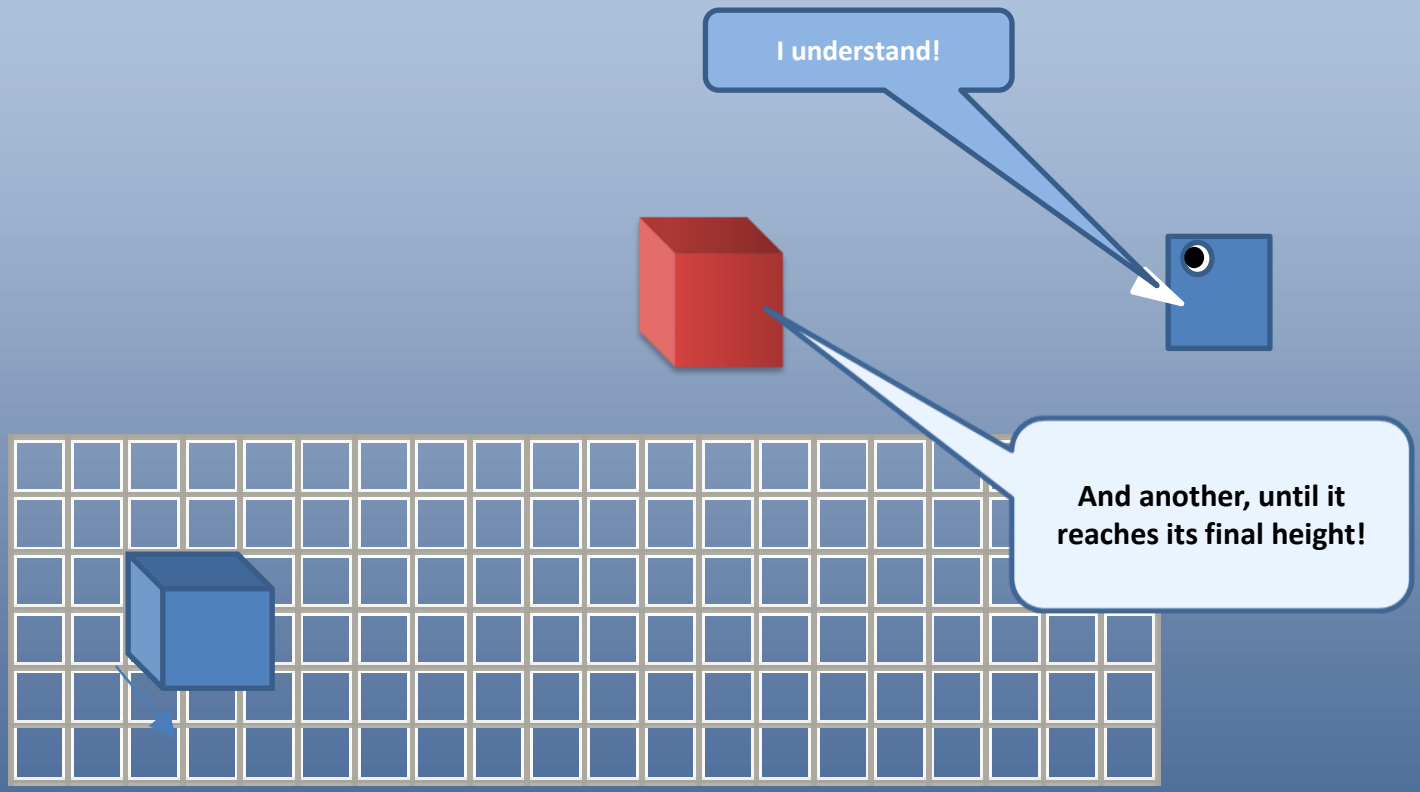

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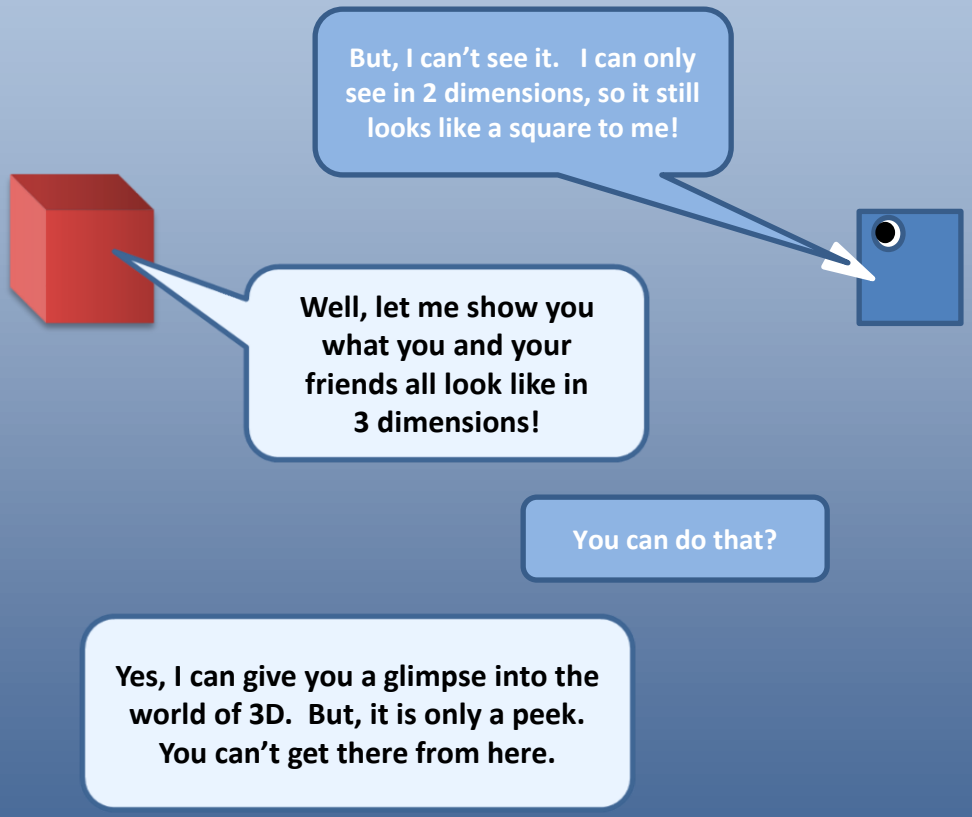
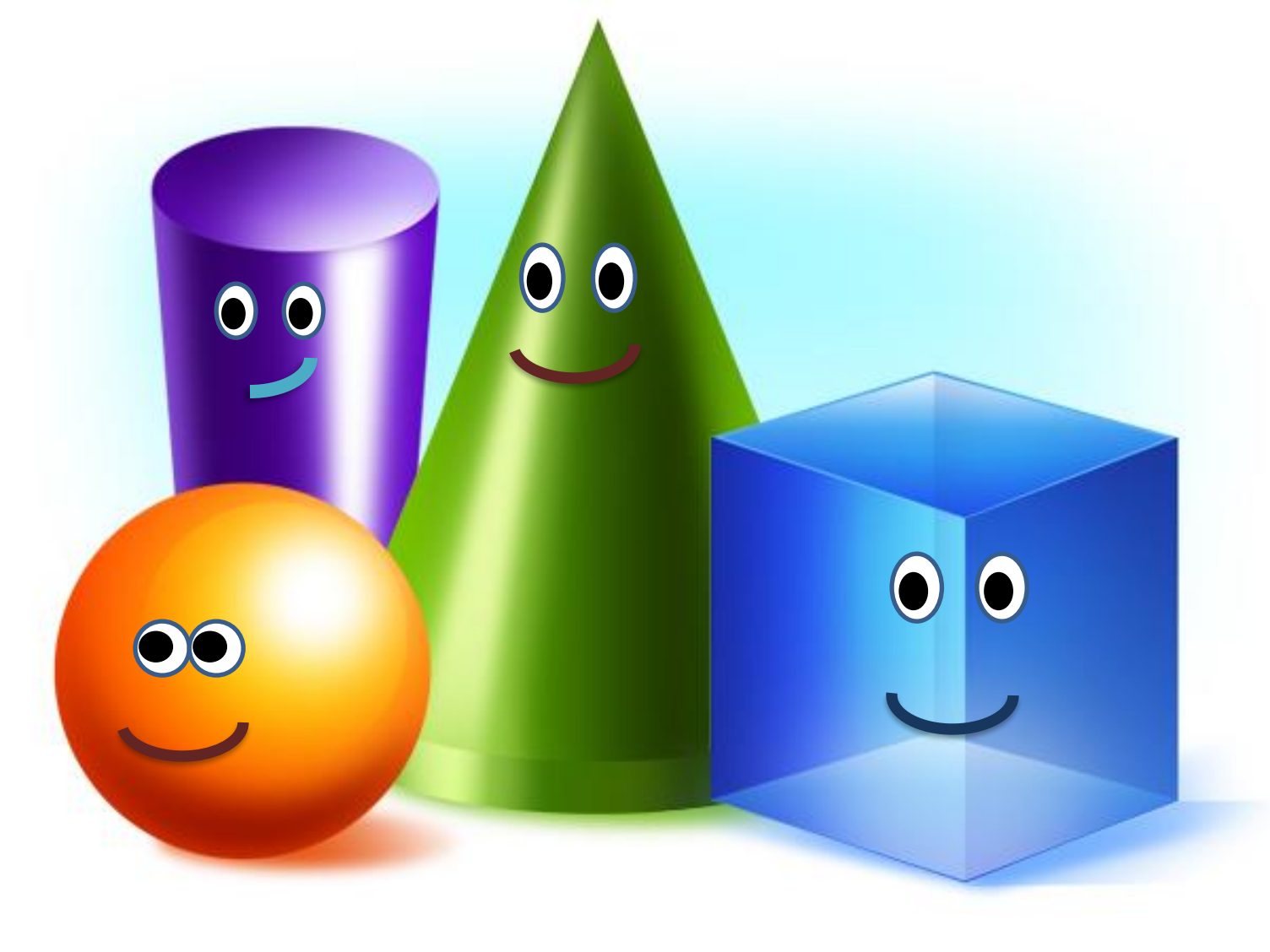
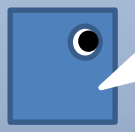


Toody and his Friends in 3D!



A 4th Dimension?



Surely, if there are 3 dimensions, then there could be a 4th?

When a point moves into a 1 dimensional plane, it creates a line, right?

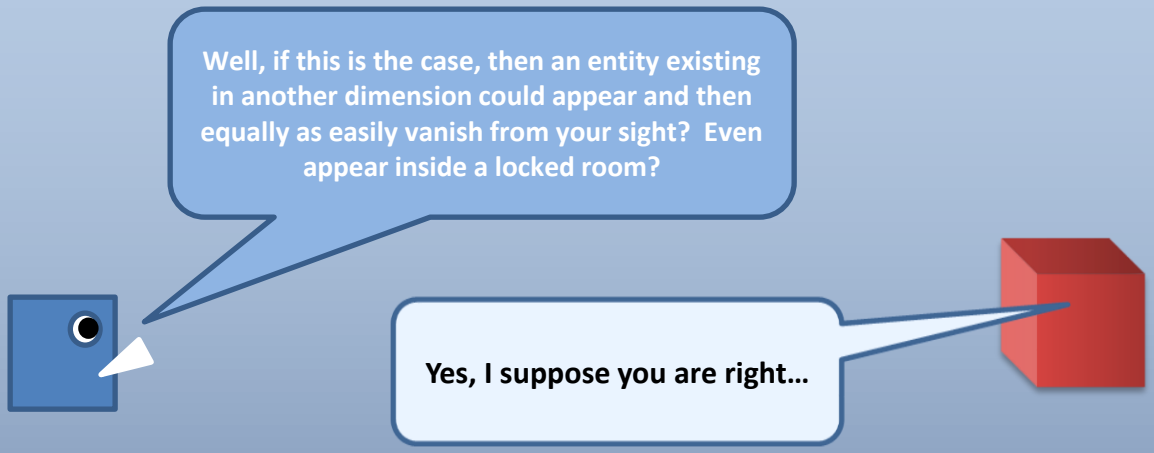
When a line moves parallel to itself, it creates a 2D square.

And, if a square moves upward , it produces a 3D cube.

You got it! If there were a 4th dimension, we in the dimension of three would be able to see a 4D object only if it passed through one of our planes. And, we'd probably only see parts of it, not the whole.

What would happen if a 3D cube moved in a 4th dimension? Would you, in the dimension of three, be able to see it unless it crossed one of your X,Y, or Z planes?

What if?

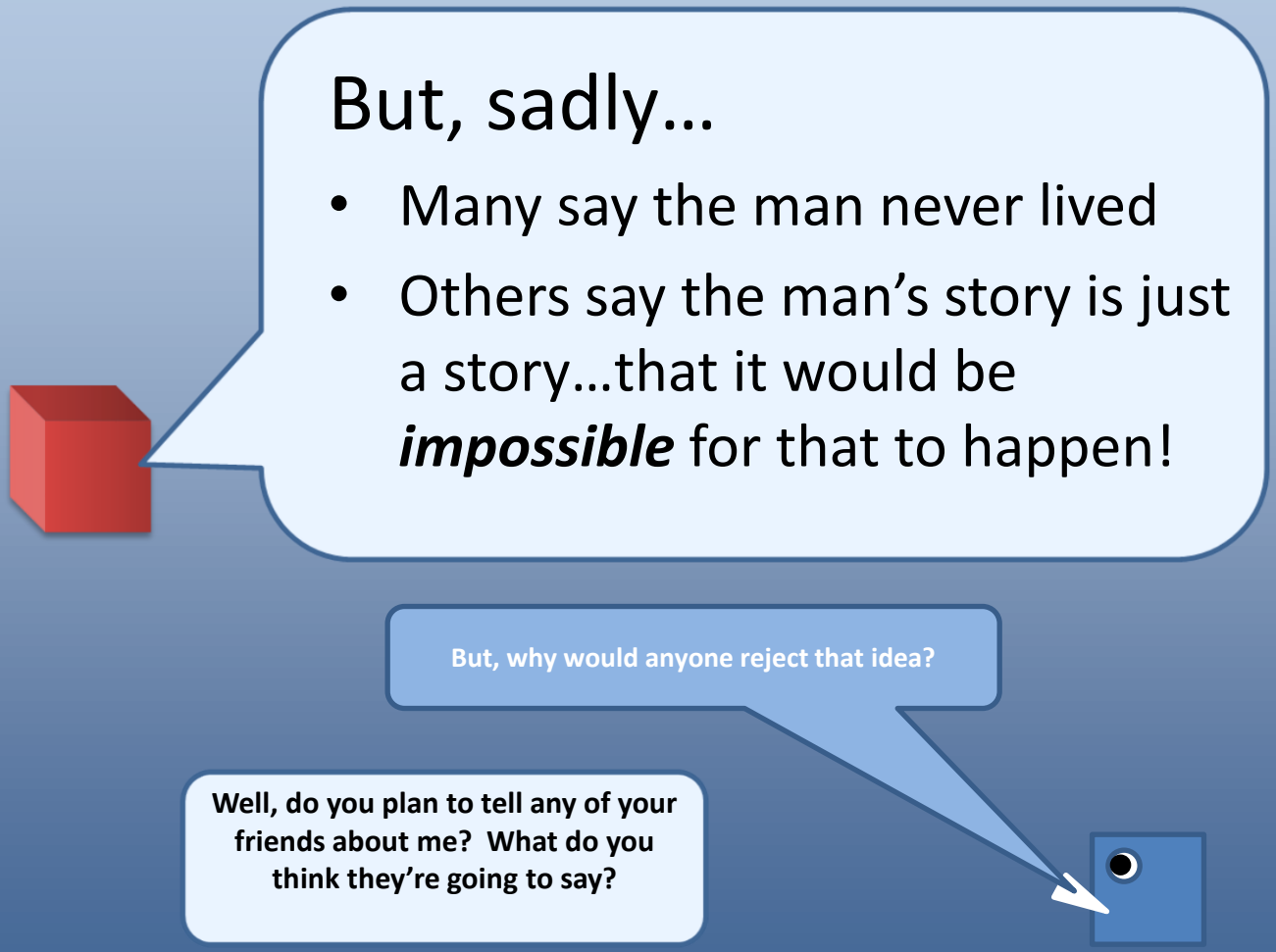

Well, if this is the case, then an entity existing in another dimension could appear and then equally as easily vanish from your sight? Even appear inside a locked room?
Yes, I suppose you are right…

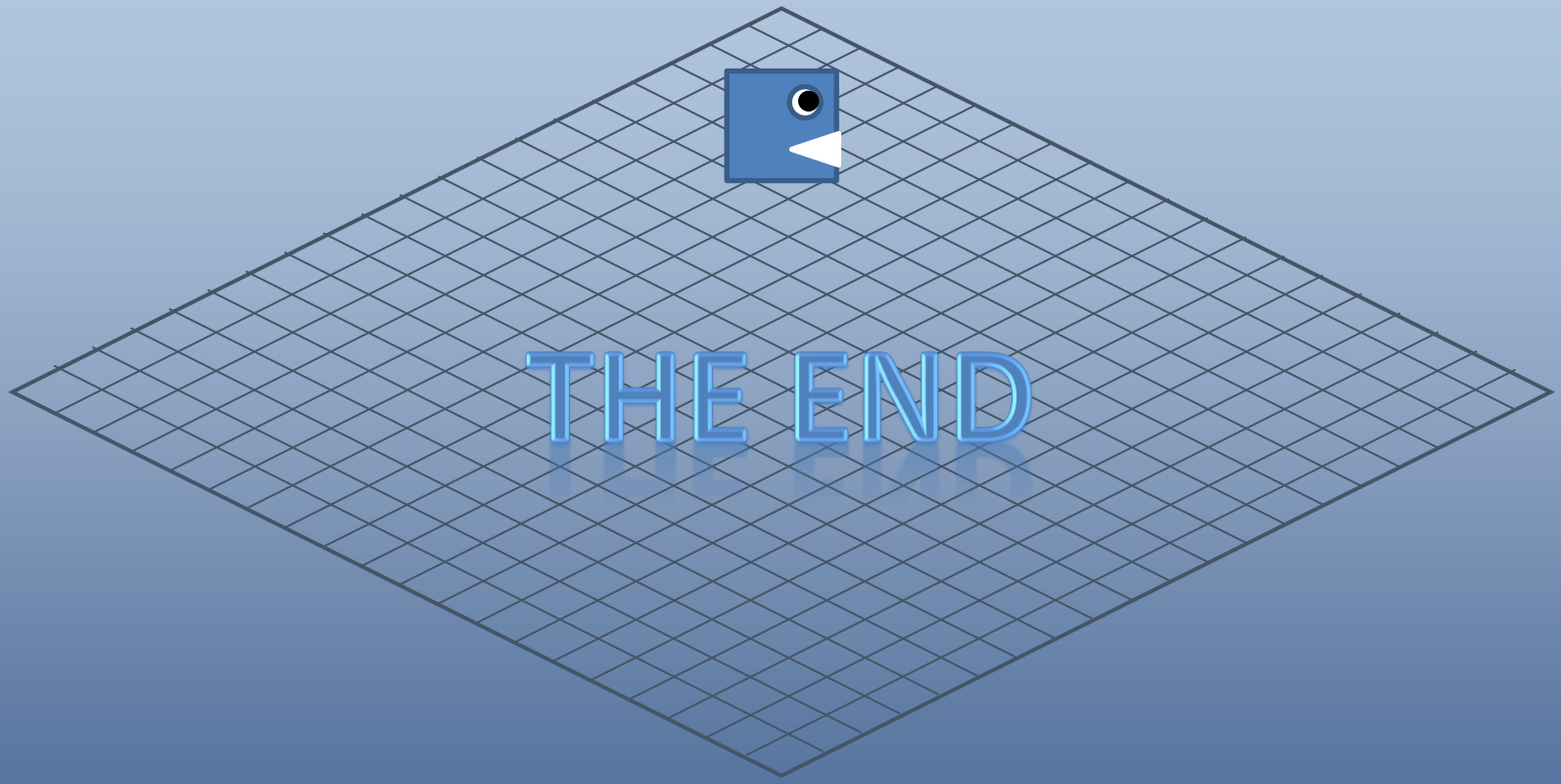
What if?

In fact, in the land of 3 Dimensions…

- A man died, but his body vanished from inside a sealed tomb
- He then appeared and walked and talked with his friends
- He even appeared to many people inside a locked room
- Eventually, he left the land of 3 Dimensions and ascended up into the sky
- He has written to his believers that they will one day join him in a place called “heaven” which is unreachable from the land of 3 Dimensions

What if?


But, sadly…
• Many say the man never lived
• Others say the man's story is just a story…that it would be ***impossible*** for that to happen!
But, why would anyone reject that idea?
Well, do you plan to tell any of your friends about me? What do you think they're going to say?


THE END

What Can We Learn?

- We are constrained to live in a 3-dimensional world
- The probability that higher dimensions exist seems to be mathematically plausible
- Yet, the acceptance of such notions is still frowned upon today as in 1884 because it is not observable by 3D people
- If a higher being is able to transcend the 3rd dimension into the 4th, he/she would be able to…
  - Appear as if by magic to anyone anywhere in our dimension
  - Be visible only to us where he/she intersected one of our three dimensions
  - Exist quite apart from our world yet could interact with us if so desired
  - Would be difficult for us to imagine or conceptualize since we are so bound by our configuration in a three-dimensional world

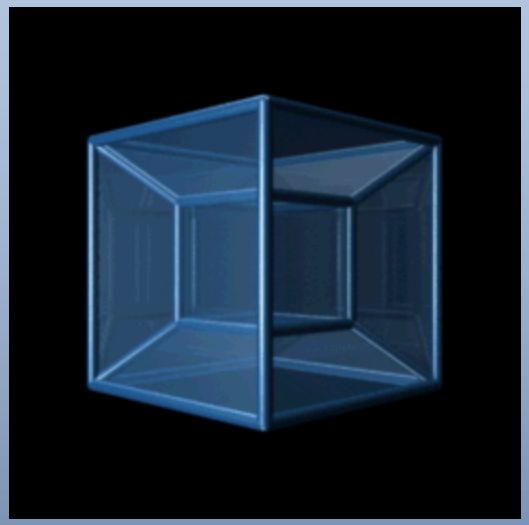
4th Dimension: Time?

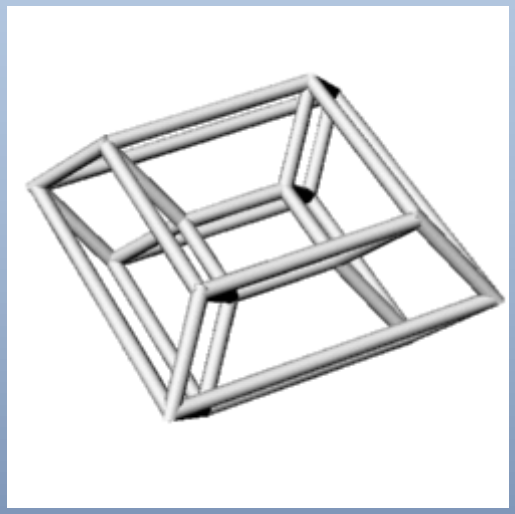
- Since the middle 1800s, the thought was there could be a 4th (or more) dimension. Prior to that, Euclidean math did not allow for this possibility.
- In 1905, Einstein was among the first to suggest that we already know the 4th dimension, and that is time.
- People exist in a certain place (X,Y,Z) in a 3D spatial world.
- But, they also exist at a certain point in time at that place.
- We can never go backward in time, we can only go forward. So as a dimension, it is different than the three space dimensions.
- Some say, we never really experience the present. It is always past by the time we experience it!
- The person you and I were, and so it is thought, the entire universe where you and I were just a second ago is not the same as the universe where we are now, a few seconds later.
- String theory and its variants suggest that there are infinite numbers of universes existing each spawned by a particular point in time.

3 Dimensional Objects

- We can create 3 dimensional objects such as these and can hold them in our hands
- When we print pictures of them on a piece of paper, we are representing the 3rd dimension on a two dimensional plane.

4 Dimensional Objects

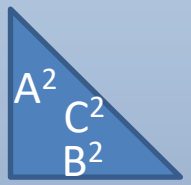


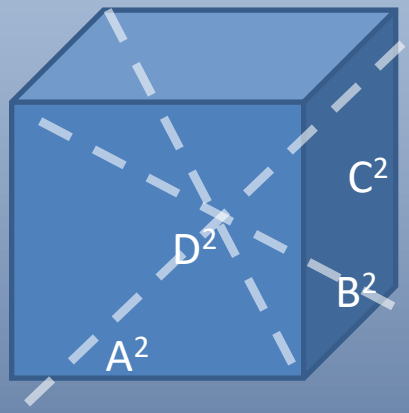


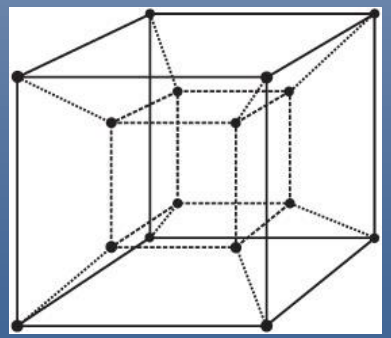
- No one can create a 4D object like we can create 1D, 2D, and 3D objects.
- We can, however, show what a 4D object might look like on a 2D plane.
- The above examples show our best guess as to what a 4D object would look like.
- It is hard for us to imagine what a 4D object would be since we can't see it at all.
- We could probably only see the shadow of a 4D object (a shadow is 2D, by the way).

A (very little) Math Suggesting there are More than 3 Dimensions

- Spatial Relationships
  - Triangle: $A^2 + B^2 = C^2$
  - Cube:
    - $A^2 + B^2 + C^2 = D^2$
  - Multi-dimensional Object:
    - $A^2 + B^2 + C^2 + \ldots + Z_N{}^2 = W^2$







Envisioning a 4th Dimension

- Image you are a tiny sphere in the exact center of a larger empty sphere. You are equidistant from every point in the sphere's surface.
- Which way would you go if I were to tell you to move in a direction that would allow you to move away from every point and still maintain your equidistance?
- We cannot imagine how to do that! That would be movement in the 4th dimension.

Multi-Dimensions? How many?

- We theorize that 1, 2, and 3 dimensions exist.
- If there is a 4^{th}, it could exist right here with us in time/space, but we cannot perceive it.
- String theory originally proposed 10 dimensions (with time being the 4th dimension), but advances in physics over the past 20 years now suggest there are a total of 11 dimensions.

What if: Seeing the Unseen

- Could someone be allowed, like Toody, to have a glimpse into the 4th or greater dimension? What would they see?
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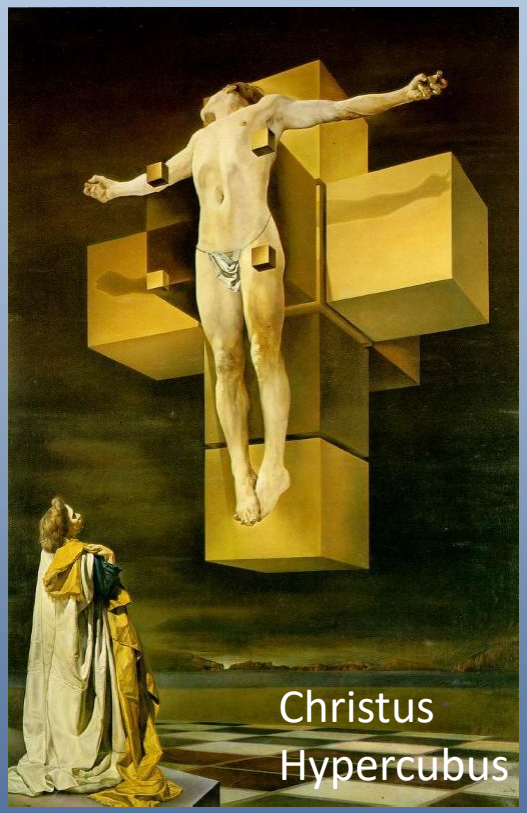
  - Angels and a flaming sword protecting the Garden of Eden? (Gen 3:24)

Salvador Dali



- This painting shows Christ on an unfolded tesseract.
- There are 261 possible unfoldings, this is just one.