

Given the following dialogues, the conversations are between two roles: the person providing explanations (**the explainer**) and the specific individual receiving these explanations (**the explaine**). At a crucial point in this dialogue, the explainer has three response options: A, B, and C. This segment may be part of a larger conversation. Please assess the effectiveness of each response in this context. For each response (A, B, C), select a ranking from the dropdown list provided. Rank them from 1 to 3, where 1 is the most effective and 3 is the least effective. Each number should be used only once.

Thank you for evaluating the dialogues. Please answer the following questions. All responses are anonymous and will only be used for statistical purposes.

Age Group:

Highest Level of Education:

Reminder: Don't forget to save your changes before closing the file.

01

Are anti-matter universe is real and if so is anti-gravity the same thing as gravity but instead of pulling it pushes?'

02

As far as we know, any dimension higher than 3 is imaginary.

03

And you contradicted yourself you are using math as a baseline example of why I am wrong and yet you're saying all of the higher dimensions that it does present are imaginary. But if the math is the baseline for the correct way and that would mean they can't be imaginary otherwise the math would be wrong?

04

Thats a false dichotomy. I could imagine the design of a new car but that doesn't mean all the math I use is wrong because it hasn't been built yet. Math literally has something called imaginary numbers which are critical to use in many applications but have no physical meaning.

05

Yeah I get all that but I don't you see the irony in claiming that I am wrong because the numbers that may or may not exist actually say that I am? Haha i mean how can you be so sure im wrong?

A

You are using a word that has a definition. You can look it up in any dictionary and it would be pretty similar. When we say "this is what a dimension is" you cannot argue or say maybe it's different. It is whatever we say it is. If I had 3 cats and then bought a fourth cat then that cat will not have wheels instead of legs. It won't photosynthesize. It won't breathe water. It will not do those things because cats don't do that. It's the definition of a cat. The same is with a dimension. It has a meaning and always behaves the same. It cannot act like something else because then it would **be** something else.

06

B

As far as we know, any dimension higher than 3 **is** imaginary. However, this doesn't mean that all higher dimensions are imaginary. Imaginary numbers are critical to use in many applications but have no physical meaning.

C

I'm not saying you're wrong, I'm just saying that the higher dimensions you're talking about don't exist in our physical universe.

01

Yeah, I think your assumption that "it's not that hard" is the flaw here. It's almost as difficult for us as 3D creatures to imagine the world of 2D creatures as it is for us to understand the world of 4D creatures.

One way to try to visualise this is to imagine "showing" a 3D cube to a flatlander. You might do this by slowly passing the cube through their 2D world. It would be a bit like slicing the cube up into thin layers, and letting them look at each shape, then try and get them to imagine the cube. But the layers they see change a lot depending on how you align the cube.

Start with the cube flat. As you lower it through their world, they'd see nothing, nothing, nothing, and then suddenly a square would appear. Then this square would stay for a while as you lower the cube, and then it would vanish. So, from their perspective, a cube is just a square.

02

Okay, now you angle it so one edge is along the ground. This time, they'd see a straight line that expands to a rectangle, maybe moves a bit depending on what angle the cube is at, then shrinks back to a line and vanishes. Okay, so a cube is also rectangular.

Now the fun one. Suppose you lower it corner first. They'd see a dot, then a triangle, which grows, until suddenly the corners vanish and it becomes a hexagon. Then this becomes a regular hexagon. Then it starts to go the other way. Corners appear again and you have a triangle, except this one is facing the other way. Then this shrinks back to a dot.

So, flatlander is trying to imagine a shape that's a square, rectangle, triangle, and hexagon all in one. That's not that easy! Besides, did you even know that a cube had a perfect hexagon hidden inside? Trying to visualise 4D is similar. A tesseract (4D version of a cube) that "falls through 3D" might look like a cube inside a cube, or a cube beside a cube, in particular orientations and position. But trying to understand how it rotates in 4D is a mental nightmare. We can do it mathematically, but trying to visualise it is nearly impossible.

03

Just to make sure I got a grip on what you're saying, you mean a tesseract is what a 4D cube would look like to us, right? Like 3D me would see a tesseract but from a 4D perspective, it'd just be a normal cube? Or something else?

Not exactly. A tesseract is a 4D cube. What you see when you look up a tesseract is sort of a 3D shadow of a tesseract, or the shadow of the wireframe model. This is like if you take a cube and use it to cast a shadow on a screen. That 2D shadow is sort of cube-like, but not exactly. Let's try this. One of the common pictures of a tesseract looks like a small cube inside a big cube, with a wire from each corner of the big one to the corner of the small one. The thing is, even though the 3D cubes appear different sizes, each one is actually the same size in 4D. Every straight line in the illustration is the same length in 4D. Plus, it looks like there's a sort of truncated pyramid stuck to each face of the small cube, and the bases of these 6 shapes form the big cube. Well, those truncated pyramids in 3D are actually cubes in 4D. Which just feels weird. The 'inside' cube looks smaller because it's further away in the 4th dimension. How does this relate to 2D/3D? Well, take a wireframe cube and take a picture of it from close up. What you'll see is a square inside a square, with diagonals connecting the corners. It looks like the lines are all different lengths, but each is the exact same in 3D. It's just that some are further away than others. And, it also looks like each edge of the small square has a trapezium attached, and these trapeziums (trapezia?) form the bigger square. But we know that each of those trapeziums is actually a square face of the 3D cube.

04

05

Okay, I get it now. So it all depends on the level of perception one is allowed depending on which dimension he's in. The tesseract is what a 4D cube's shadow would look to us, same as what a 3D cube would look to 2D. It is a mental nightmare lol. But thanks for your explanation! How far have humans understood 4D using Math and Physics compared to visuals or verbal analogies?

A

Dealing with 4D mathematically isn't much trickier than dealing with 3D. Pythagoras, for example. In 2D, we'd say the distance between 2 points is given by $d = \sqrt{(x^2 + y^2)}$. In 3D, it's just $d = \sqrt{(x^2 + y^2 + z^2)}$. Well, the 4D version where w is the length in the 4th dimension is just $d = \sqrt{(w^2 + x^2 + y^2 + z^2)}$. I could give you a game of 4D tic-tac-toe. You need a bigger grid (because 3x3 is already easy), say 4x4x4x4. And it's tricky to keep track of things, but mathematically it's relatively simple. You'd just draw a 4x4 grid of 4x4 grids. Going down each column of grids would be like going down a 3D stack. Going along each row of grids is similar but through the 4th dimension. There are other situations where 4D maths makes things easier or is even necessary. Complex numbers work in 2D. If you don't know what they are, that's a whole different discussion. But the TLDR is basically that there's what we call the real part which is like the x-axis, and then the imaginary part, which is just a number multiplied by the imaginary number i , and is like moving along the y-axis. We tried a 3D version with 2 imaginary numbers i and j at right angles, so j would be like the z axis. But the system just didn't make sense. Then, someone realised it *does* work in 4D using a third imaginary number k . This is what we call quaternions. They're relatively easy to work with and are how computers deal with rotations in 3D. But it can be really hard to visualise what the mean as 4D number

06

B

Humans have made significant progress in understanding 4D using math and physics, but visuals and verbal analogies are still limited.

C

Humans have made significant progress in understanding 4D using math and physics, but visuals and verbal analogies are still limited.

01

Why is there so much emphasis on a country's birth rate being high enough to continually increase the net population?

02

Did you post this question to force-start a debate on the flaws of Capitalism
I come on this sub to get knowledge on stuff, not see people debating on political theory

03

Not at all. There's enough pedants making the rounds on reddit I figured it'd be acceptable to correct a demonstrably incorrect post

04

People get pissy when they see pedants 😏

05

There's a difference between being didactic and pedantic

Ⓐ

I'm blocking you

06

Ⓑ

You're right, there is a difference between being didactic and pedantic. I apologize if I came across as pedantic.

Ⓒ

That's true, but I think it's important to be mindful of how our words and actions affect others.

01

Why do we see "fuzz" or "TV static" when we close our eyes, or even when we have them open in a dark room?',

02

to stare at a hobo. Most people will see that they have "nothing" when in fact, the hobo is rich with the items high society casts away as "trash"

03

I want to comprehend physical nothingness. The reason people think the hobo has nothing is because society has a separate dictionary than the real world.

04

There is no such thing as "nothing"

05

Or have we just not discovered nothing because our brains are still incapable of comprehending it? How can you observe something that you can't process? Kind of like putting an Xbox game in a Playstation, ya know?

Ⓐ

You're from Lancaster? I'm in York!

06

Ⓑ

You can't observe something you can't process. It's like putting an Xbox game in a Playstation - you can't do it.

Ⓒ

That's an interesting analogy. I think it's more like putting a Playstation game in an Xbox. We can't comprehend physical nothingness because it doesn't exist.

01

origami

02

A lot of origami is animals, birds and things. There's also a branch of origami that is, it's more abstract or geometric, called tessellations. Tessellations, like most origami, are folded from a single sheet of paper but they make patterns, whether it's woven patterns like that, or woven patterns like this. If you hold them up to the light you can see patterns

03

Wow.

04

The thing that makes them cool is they're sort of like tilings, it looks like you could put this together by cutting little pieces of paper and sliding them together, but they're still one sheet.

05

They weren't cut?

06

There's no cuts in these just folding. We can build these up from smaller building blocks of folds, learn how to fold little pieces and put them together in the same way that a tiling like this looks like it's built up of little pieces. Can you make a fold that starts at the dot that doesn't run all the way across the paper?

07

How about like that?

A

Mm-hmm. Each of these folds is peaked like a mountain and we call these mountain folds but if I made it the other way, then it's shaped this way and we call it a valley fold. In all of origami there's just mountains and valleys.

08

B

The fold that starts at the dot and doesn't run all the way across the paper is called a valley fold.

C

That's a good idea, let's try that.

01

Why do we still physically go to a doctor?

02

But they have given you valid answers, and you disregarded most of them. You say you're good at researching things yourself. Look up the Dunning-Kruger Effect and consider how it might apply to your perspective on this.

03

Saying people can't do something they clearly can or saying "but what about liars" isn't a valid answer.

04

If that's what you took from them, then once again, you didn't give much thought to why the answers were valid

05

I know about the Dunning-Kruger effect. I don't think I know more than doctors.... I feel like you and others are completely missing the point of the post. Doctors are involved in the process, and its only for simple day to day stuff. "See a doctor" would be a perfectly reasonable response.

A

Go back and read some of their replies and try to absorb what they're telling you: even the stuff that **seems** mundane, easy, and simple is not. There are all sorts of nuances to examinations that even they need to be concerned about missing. They're telling you the stuff you think is easy isn't easy. You've been dismissing those comments because you don't know what you don't know about how hard it is.

06

B

I'm not missing the point, I'm just pointing out that the Dunning-Kruger Effect doesn't apply to this situation. You're right that doctors are involved in the process, but that doesn't mean that the answers you've been given are valid.

C

I'm not sure I understand what you mean by "see a doctor". Could you elaborate?

01

Why isn't stainless steel attracted to a magnet? Stainless steel contains a high amount of iron. Isn't that enough to make it attracted to a magnet?

02

Nickel and chromium are added to make it stainless; when the level is high enough it impedes the magnetic attraction.

Holy heck, I can't wait to see one of the better explanations :-)

03

Even our blood is slightly magnetic with such little concentration of iron. So, stainless steel with more than 70% of iron should still be magnetic.

04

Completely different forces at work in the two systems.

stainless steel the molecules align differently which impedes the alignment of ferrous particles.

In blood everything can move and particles are free to align when I presence of a magnetic field.

05

So, the presence of other atoms (chromium, nickel) prevents the ferrous particles (iron atoms) from aligning with the magnetic field. Is that right?

Ⓐ

That's how i understand it.

Just watch, I'll be wrong and we both learn something :-)

06

Ⓑ

Yes, the presence of other atoms (chromium, nickel) prevents the ferrous particles (iron atoms) from aligning with the magnetic field.

Ⓒ

That's correct. The presence of other atoms (chromium, nickel) prevents the ferrous particles (iron atoms) from aligning with the magnetic field.

01

connectome

02

Maybe a wiring diagram is not sufficient to understand the brain, and it would be crazy to think that that would be sufficient, actually.'

03

If you limit the connectome to be just the wiring diagram without, you know, more information about myelination or glial cells, all types of environmental features that surround the neurons and axons then you have an incomplete picture, no doubt.

04

Sometimes when people get, they worry about connectomics, I think what they're actually worrying about is that it's the end of the that we used to do neuroscience.

05

What do you think about memory? Do you think that there's ways of resolving what the substrate of human memory is, you know, is it just LTP and LTD?

06

I'm not sure if you had a connectome of a human brain, of an adult human, I would be able to read out memories from that

07

You don't think it's just the synaptic weights, like an artificial neural network that's trained to do particular things?

08

It could absolutely be but without knowing what the weights were before the memory was made.

09

What if you had a violinist learn a piece of Bach music, could you find those notes somewhere in their brain if they didn't know before?

10

Yes

11

I'm a musician and I don't think it's possible. I think that there are too many, you know, so much of it is associative to what you already know.

A

So and a musician, how much of it do you think is in your hands versus in your brains? Meaning like, you do have connections in your muscles from the nerves that are from your spinal cord, what if some of the learning is there?

12

B

I understand that you are skeptical about the possibility of reading memories from a connectome of a human brain. However, I believe that it is possible to read out memories from a connectome of an adult human, as long as we know the synaptic weights before the memory is made

C

That's an interesting point. Do you think it's possible to train a neural network to be able to read out memories from a human brain?

Why are children viewed as more of a financial burden than they used to?

Because many of those studies heavily exaggerate the cost of children. You can furnish a nursery for \$50 from garage sales, \$200 from ikea, or \$5000 from pottery barn kids.

Clothe your child for \$0.25 a piece from a garage sale, \$3.00 a piece on sale at caters, or \$50 a piece from Kissy Kissy.

You can split childcare with another family where you watch each other's kids half the time and each family has one parent working part time and watching their kids part time, or spend \$2000 per month per child at a premium daycare.

Free public school or \$2000 per month private school.

Kid buys their own car when they turn 16 from working, or buy your child a \$20,000 car.

Have your child take out student loans vs \$200,000 sending them to a private college. Although many of these studies don't include college

:Agreed, but the calculated average of \$300k per child (in the US) is what people end up spending, whether they needed to or not '

I have seen closer to \$230,000, but regardless, much of that is disposable income that parents want to spend. Just because the average cost of a car is high doesn't mean someone poor has to buy an expensive car, it just means people who have money like to spend it on cars. I have the income to do so, so I spend a lot of money on my daughter because it makes me happy. And that increases the average but others don't have to.\n\nBasically the number is high because people want to spend money on their kids. Nobody needs a \$1000 crib.

Not saying you are wrong, but is your idea that the cost to raise a child has not increased over the years, but parent's desire to spend more on them has?

Sort of. Since people are having fewer kids they have the ability to do more for the kids they do have. Also having kids at an older age means they have more money. Also, it inflates the cost when both parents work so they have to pay child care, but rarely does someone work if they can't make more than childcare costs. So instead of staying home with their children, they earn \$40,000 per year and pay \$20,000 per year in child care. In the end they have more money than if they stayed home with their kids, but studies like these make it look like it is costing the family \$20,000 more than previous generations.

I buy a lot of stuff that would be considered for my daughter because it makes my life easier or because I get more enjoyment buying something for her than something for myself. But all those costs go into looking like it is just expensive to have kids.'

Interesting. So, slightly different question. Do you think that the buying of these "luxury" items, things that make the parents happy but of course the kids don't know any different at first (like your example of a fancy onesie)...do you think that parents buying these things influences their kids to want/need more when they grow up?

I get the feeling that the typical millennial doesn't want to want the fancy things our generation bought like mortgages and marriages, fancy clothes and big cars, etc but when they grow up with it, they don't know any better. Then they feel pressure to get the corporate job they never wanted, rather than the non college profession that makes them happy, but won't buy these things.

I wonder if this generation's parents are giving their kids the best, while sentencing them to want an unaffordable lifestyle later on.

A I think there is a difference in spoiling a child and overspending on a child. I seriously doubt my daughter is going to end up feeling like she needs expensive things because her mom wanted her to have an expensive Easter dress or an expensive crib. On the other hand, if I buy her a toy every time I took her to the supermarket, that probably will spoil her. I'm sure it is easier in theory than in practice, but I intend to make sure my children understand the value of money and that everything in life is a trade off. It is possible to make more money but there are sacrifices to do so. And while some passion projects might not earn as much, there is also a difference in making less because you choose something you love, and making less because you simply chose to be lazy.

B No, I don't think that parents buying these "luxury" items influences their kids to want/need more when they grow up. I think it is more of a case of parents wanting to give their kids the best life they can, but not realizing that the best life for them may not be the same as the best life for their kids.

C No, I don't think it influences their kids to want/need more when they grow up. I think it influences them to want/need more when they have the money to do so. I don't think it influences them to want/need more when they don't have the money to do so

01

Why do you feel sick to the stomach and loss of appetite during a breakup (or other emotional stressors)?

02

Yeah after my big breakup (guy walked out after 21 years) I lost 17 pounds in 10 days. While I don't recommend that diet, I do advise embracing positive lifestyle changes. Once single I quit drinking for good, started rock climbing and gained more confidence, better mental health, truer friends and the best body of my life. Breakups can be the catalyst for lasting change.

03

When I hear these it puts into perspective how minor some of my problems are... like I am still so young and am talking about periods of a year or 2 or periods of months... it doesn't make the feelings any less real but when I hear of these crazy life changes after almost as long as I have been alive it just.... makes my issues feel very small.

You are super strong for pushing through that and hearing this gives me motivation!

04

Like you said. Your pain is real. Don't minimize it. I only shared my experience to say all of us can grow from these experiences. I needed to grow a lot and I did. You will do what you need to do. We are all here to hold each other up as long as we need each others' support.

05

I wasn't expecting this at all but I honestly love this thread. Everybody is being so supportive and motivating and it's refreshing :)

A

That's why we're here. I get more clarity into my past pain and how far I've come when I read what everyone else is going through and when I share my experience. You all helped me address pain I didn't realize I was still lugging around almost a decade later. Feels great to let it go.

06

B

Thank you for sharing your story. It's amazing how much we can grow from these experiences. I'm glad you're finding support here.

C

That's great to hear! I'm glad this thread is helping you feel better.

01

How Going Vegan Will Save The Environment

02

Yes. Collectively, farmers choose to sell 90% of all soy grown in America to animal feed plants.

03

or repurpose it into paddies for MKD's, they taste the same

04

I haven't heard of McDonald's selling soy burgers. Could you share with me, where you learned that?

05

No they should do it

A

Yeah, I agree entirely.

06

B

That's a great idea! I'm sure it would be a huge success.

C

That's an interesting idea. Do you have any evidence to support this?

01

why do civilians in the us need military grade rifles and silencers?

02

Balance of power. The american's understand what balance of power means and what it takes to keep balance.

03

That sounds made up

04

All letters and words are made up

05

It sounds like it's not based on real observations or things which exist on our planet. It sounds like something written in a kids book

A

It sounds like something written in a kids book.
Does "Explain Like I'm Five" help to explain?

B

06

I understand your skepticism, but I assure you that balance of power is a real concept. It is based on the idea of maintaining a delicate balance between two or more powers, in order to prevent any one of them from gaining too much power.

C

That's why it's important for civilians to have access to military grade rifles and silencers - to maintain the balance of power.

01

The difference between being asleep, being unconscious and being put asleep with anaesthesia.'

02

In simple terms, sleep is surprisingly a very active process. Your brain sends millions of signals and messages when you are asleep - dreams and the like. The brain moves between phases of activity, and during REM sleep actively prevents your limb muscles from moving. Anaesthesia conversely reduces the activity of your brain. Everything slows down and high levels of anaesthesia drugs can stop all significant electrical activity in your brain (isoelectric EEG). Comas are similar and have varying levels, but in essences your brain activity is reduced when you are in a coma.

(Am an Anaesthetist (UK))

03

That clears a few things up, thanks 🙌

04

Anything unclear?

05

Some people have said that being put under anaesthesia is close to being dead, is this true?

A

No. Not really. In so much as no-one knows what being dead is like. Arguably, it's similar to brain-stem death (a type of death where the brain dies but the rest of the body carries on) but there are important differences.

First, anaesthesia is reversible. An important definition of death is its irreversibility. Second, whilst breathing is affected, volatile anesthetics (the ones you breathe in, as opposed to ones that are injected) tend not to cause complete cessation of breathing. But more importantly, anesthetics for surgery are not given at such high levels to cease brain activity. In fact, some people do sleep and do dream under anaesthesia! Very deep levels of anaesthesia are reserved for when a patient has seizures that can't stop (status epilepticus). As an aside, even deep levels of anaesthesia can't treat the rare disease of familial insomnia - a fatal disease where patients just cannot fall asleep at all. Just shows how different sleep and anaesthesia are.

However, I suspect the experience of anaesthesia is like dying. Anaesthesia removes all concept of time. I've had patients carry on a conversation with me that we were having before commencing anaesthesia, even after hours of surgery.

06

B

In simple terms, sleep is surprisingly a very active process. Your brain sends millions of signals and messages when you are asleep - dreams and the like. The brain moves between phases of activity, and during REM sleep actively prevents your limb muscles from moving. Anaesthesia conversely reduces the activity of your brain. Everything slows down and high levels of anaesthesia drugs can stop all significant electrical activity in your brain (isoelectric EEG). Comas are similar and have varying levels, but in essences your brain activity is reduced when you are in a coma.

C

No, being put under anaesthesia is not the same as being dead. Anaesthesia is a form of sedation that reduces the activity of the brain, but it does not stop the heart and lungs from working.

01

connectome?

02

Connectome

03

To be honest, I have no idea.

04

That's good, that's a great place to start. There are cells in your brain. Those brain cells are connected by wires to each other. Electricity travels down those wires and communicates from one part of the brain to the other part of the brain, and each of those brain cells makes, you know, a thousand connections, it's something like a hundred trillion connections."

05

Whoa

A

In one brain, in your brain. Could I take all of that information and put it inside a computer? Would that computer then be you?

B

The connectome is a representation of all the connections between the cells in the brain. It's like a wiring diagram of the brain. Each cell in the brain is connected to thousands of other cells, forming a network of connections. This network of connections allows electricity to travel from one part of the brain to the other, enabling communication between different parts of the brain.

06

C

That's right, and those connections are called a connectome.

01

virtual_reality

02

ou know an interesting topic is: what are the limits to what we can do with virtual reality? Where I'm pretty pleased with what we have today. What we can show people and say virtual reality, its cool. People get an amazing response from it. But we're still clearly a very, very long ways from reality.

03

That kinds of notes back to Realism in our history and how Realism was a response to Romanticism. And Realism was meant to capture the mundane, everyday lives of individuals and not idealize any of their activities in any way. And I think that that's really important for virtual reality. I think its kind of rite-of-passage for any kind of our technology to go through.

04

Mostly in VR we talk about the display and optics, the visual side of things, but we should at least tick off the other senses. And haptics is an interesting thing about virtual reality really doesn't have that aspect of touching things. You can move your hands around, you can do everything but its a disconnected experience because you know you don't have an actual solidity there. And I am pessimistic about progress in haptics technology. Almost all other areas I'm an optimist and I'm excited about what's coming up, but I don't have any brilliant vision about how we're going to revolutionize haptics and make it feel like we're touching the things in the virtual world.

05

o I've tried the demos, at VRLA there's one that has waves, like audio waves I believe, that come up and then you can put your hands through that and feel the waves whenever you're supposed to be feeling bubbles or any kind of force field or something. And those are pretty interesting. I've seen some pretty interesting things that you can do with audios, you can cut down a lot of the storage I guess and the power that you would need in order to power a huge scene, you can just mimic the sounds of those scenes actually being there and they're not actually. For example, a professor at USC would have the sound of a train drive by without actually rendering the sound. And you would feel like you're deeply immersed in this world without having to have such an expensive scene built around you. So I think those are pretty significant.

06

Yeah, that is one potential quality improvement that is still on the horizon is when we do spatialization, we use HRTF, the Head Relative Transfer Function, to make it sound like its in different places. But usually we just use this one kind of generic, here's your average human, HRTF function. Its possible, that of course, if you are right in the average then its perfect for you. But there's always people off to the extremes, that it doesn't do a very good job at. And there may be better ways to allow people to sample their own perfect HRTF which can improve the audio experience a lot. It all comes down to all these trade-offs

07

You know, with display and with resolution, its one of those things where if people have one bad experience they kind of, oh well everything else. Its really difficult to build trust again with people who haven't done VR before but its easy to break off that trust when they have a bad experience.

A

There was a huge concern about that at Oculus. And the term internally that went around was poisoning the well. They were very, very concerned. I mean for a long time there was a fight about whether gear VR should even be done, because the worry was if we let a product go out, like gear VR that didn't have those things. That if somebody saw it and it was bad, made them sick, made their eyes hurt, then they would be like I'm never going to try VR again. I tried it that time and it was terrible. And there was legitimate arguments about whether it was even a good idea to do that. And it turned out that yes, its obviously better to have all those things, but you can still do something that's valuable for the user without it. Its weird being at the beginning of a medium like this.

08

B

The limits to what we can do with virtual reality are still being explored. We are still a very long way from achieving the full potential of virtual reality. However, what we can show people and say virtual reality, its cool. People get an amazing response from it. But we're still clearly a very, very long ways from reality.

C

Yeah, that's a really good point. I think that's why it's so important to make sure that the experience is as good as it can be. And that's why I'm so excited about what's coming up in terms of display and resolution. I think we're going to see a lot of improvements in that area.

01

What exactly is a period and what happens?

02

It's close enough to the body that there isn't anything to hold. If you try to stand, it's likely to go running down your leg! They do sell "female urinating devices" which are basically funnels which help females go standing up if they're hiking or are in the military and aren't able to squat to go.

03

How come it would go down ur leg and not straight down if u stand up? It seems like maybe u could use a urinal if u just like push ur hips forward?

04

There's a chance, yes. But it's unpredictable and I sure wouldn't want to take that chance. From some of my male friends I've heard that sometimes the stream from their penis might go off in a different direction instead of straight out for no apparent reason. It's a bit like that. \n\nAlso keep in mind that once females (and males) hit puberty, they start growing pubic hair which might also get in the way.

05

Oh ya sometimes it just like goes kinda weird but it's usually easy to fix for me I guess. I didn't know that girls got it like under like that? I thought it was just like on the top ya know

06

You mean pubic hair? Yeah it usually grows in front, on down between the legs and a little bit on the butt hole area. It's just often seen as taboo, so some women shave or wax to get rid of it. But that's her decision to make and its perfectly find to keep it all or remove it all. Shaving and waxing can hurt and cause ingrown hairs which is one reason some may not want to remove the hair

07

So do boys get it not just on the top to? I thought it was just be like above everything

08

Boys definitely get it between the legs too. Again, some decide to remove the hair, and some don't

09

How come they don't tell us this in school? I haven't had puberty yet and I'm kinda scared cus i don't really know what's gonna happen.

10

Now that is a good question... I know I had some sex education in school but it wasn't very good. It's a common problem in schools because people are scared to talk about it. Some of the fear is that it will encourage kids to start having sex early but I think it's important for everyone to know how the body works. Everyone has one, so why hide it?\n\nKids need to know what is normal and what is not normal, so if there is a problem, they can talk to a doctor. Puberty is scary with everything changing and a lot of people feel shame about it when they shouldn't. I'm glad you're asking questions ahead of time so you're a little more prepared.",

11

How come things for girls are so much more complicated but for boys it's not that much

A

It's just how the human body is. ~_(\ツ)/~ Can't do much about it. Lots of religions have stories that give reasons if that's something you believe in.

Although I think it is pretty flippin awesome that women can grow a child inside of her. And then feed it with her own body too. It's like a superpower.

12

B

It's close enough to the body that there isn't anything to hold. If you try to stand, it's likely to go running down your leg! They do sell "female urinating devices" which are basically funnels which help females go standing up if they're hiking or are in the military and aren't able to squat to go..

C

That's a good question. I think it's because girls have a lot more going on in their bodies than boys do. Girls have to deal with menstruation, pregnancy, and breastfeeding. Boys don't have to worry about any of those things, so they don't have to go through the same amount of changes.

How in the hell does the 4th dimension work, visual-wise?

But I feel like I'd be able to at least get a good grip on it eventually since it's not that hard.

I think this is quite a leap of logic there, I'm not so sure you'll be able to understand it since the analogy applies to us in the 3rd one trying to understand the 4th

Thank you for the correction. So if a 3D person 'spoke' to a 2D one, would he 'hear' it? Can sound exist in the 2nd dimension?

This is pure speculation of course but its possible this people develop some kind of hearing system, at the end of the day, sound is just a wave propagating through different mediums, and that wave can propagate through a "flat" plane, same as light. Thing is, if they hear a 3rd dimension person speaking they'll probably freak out as they hear but cannot see or sense where is that noise coming from. In other words, if the 3rd dimension person speaking is, for instance, on "top" of the 2D person, then the 2D person will feel the sound coming from inside him as well, only adding to the poor guy mental issues

Okay. So far, so good. Let's say a 4D person spoke to me this time. Those mediums you mentioned, I assume the 3-dimensional space around me is included in that, right? Because sound is carried by wind, which may move in all directions?

Anyway, are there additional mediums in the 4th dimension which would, in a way, make their voice sound weird to 3D me? God I hope that question makes sense.

Sound is not carried by wind, it's technically a wave that propagates through any medium, as long as there is particles, they can propagate the wave. Air is made of a bunch of different particles (such as hydrogen or oxygen), but so does a wall, or you for that matter.

I get your question, however here we relay again on pure speculation, as we have no way of knowing what forces or characteristics may define this 4th dimension, but you can imagine a similar effect with the 2D analogy. You'll probably hear it coming from everywhere at the same time, even from inside you, already making it very weird.

This can be explained with the 2D world, if you think about a 2D person living in his little house (a flat house), from his perspective the house has walls and is closed, however, for you, from the 3rd dimension, being "on top" you can actually see the insides of the house (even if it's closed) as well as the outsides at the same time (like a flat blueprint of a building). For the 2D person this wouldn't make any sense of course. The same will happen with a 4th dimension person, that could see inside and outside closed rooms at the same time, and his voice will be propagated from that point, thus why you could hear it coming from everywhere and inside you as well. Hope that made sense

It does, actually. Thanks to your explanation and another person on here who showed me a video with Carl Sagan in it. I'm actually learning a lot from you guys, thanks! So basing on the 2D analogy, I guess there really isn't any way for us to visualize how 4D may behave. Am I right?

Haha the person of the Carl Sagan video was me as well actually, glad it helped! Carl was a true genius explaining things.

Regarding your question, analogy aside, I'm afraid the only way to perceive better the 4th dimension will be trying to understand it's behaviour through math, and physics; as our brains are simply not capable of understanding beyond our realm of reality, the closer we'll get to understand it visually is via analogies (at least for now)

Idk why I've never been good in numbers, even though I tried hard back when I was still in school lol. So the best I can do now is to come up with the right questions (or at least try to). Last question though: do we know for sure that the 4th dimension even exists, or is it all just a mathematical problem expanded by the film industry?

Well, not exactly as we are picturing it here, as this is just a mathematical extrapolation adding another physical dimension to our 3rd dimension world. However, Einstein actually conceived the 4th spatial dimension as time itself, thinking of time as just another physical dimension that helps us explain gravity. Think of time as if it was another physical dimension, like a ladder you can just go up (forward in time) or go down (back in time), the only issue is we have no way of interacting with this dimension, rendering us as merely observers "falling down" forever.

There are, though, certain particles such as electrons that can actually move through time in a non-linear way (this is something called quantum tunneling). A great analogy to understand this is by picturing the electron as a person trapped inside the bottom of a well, with a ladder outside the well. In order to escape the well, you need the ladder, which is outside, problem is, in order to get the ladder you need to be outside, so there is no possible way, right? Well, if you are an electron, there is, as you can just "pop" out of the well, and then put the ladder that "helped" you climb out afterwards.

This makes no sense for us of course, but it's just a way of looking at how crazy the world is, compared to how our brains evolved in such a way just to be able to survive in certain delimited environments. (I think I may went a little off topic here, sorry)

You're actually on track because most of the answers I received today led me to question what time actually is, outside of its conventional definition.\n\nI'm thinking maybe the 4th dimension is humanity's final frontier and not the universe because one can get from point A to point B physically, right? Whereas time — for me, at least — is infinitely more complicated. But isn't space and time directly related to each other?

A According to spatial relativity, yes, they are, in fact, the same thing (just as a fork and a knife are both cutlery).

There is a video about this topic I like that (I think) explains really well what relativity is, dealing with time being another physical dimension: <https://youtu.be/Xc4xYacTu-E> (This video is basically einstein's theory in a nutshell)

The idea is that we are all moving forward in time, parallel to each other, with no way of "driving" or controlling the direction, thus we'll never met or collide with other objects.

Matter, however, has this property that allows it to actually affect the time dimension, and curve it (proportionally to the ammount of matter), thus curving our pathways "forward" into collision trajectories between one another (breaking the parallel path we were following), or as we call it, creating "gravity".

B Yes, space and time are directly related to each other. In Einstein's theory of relativity, space and time are combined into a single four-dimensional continuum called spacetime.

C No, space and time are not directly related to each other. Space refers to the three dimensions of length, width, and height, while time refers to the fourth dimension of duration.

01

Halting Problem and the Self-Referential Proof

02

Im not really sure where you are getting this oracle example from, but in this case; the oracle already knows that you will make the opposite of their prediction happen before they make a prediction, but they still have to make a prediction, and that prediciton will be wrong. The question isn't should we ask the question if we can control the answer, the question is, is the oracle always right regardless of the situation, to which the answer is no

03

This seems to be simply shifting the definition, not a "proof." There are one more fundamental things I\m missing, but I can\'t put my finger on what they might be.As I wrote below in response to another attempt at an explanation, there seems to be some funny business in permitting the "trickster" program to change its behavior in response to the oracle program\'s output. I have always thought, perhaps incorrectly, that computers behave deterministically

04

The program isn't changing it's behaviour, it's already been written definitively. Which of these predefined behaviours is followed depends on a variable made in the code. This is extremely common in all kinds of programming and computing, and not unique to this proof in any way

05

:But how can the oracle be making a meaningful prediction if another program is simply hard-coded to do the opposite of what the oracle says?

06

it can't, hence a perfect oracle doesn't exist

07

But if the proof is phrased in those terms, then it doesn't seem to be doing much work.In other words, if I told you the following, then the result (that the oracle can't exist) wouldn't strike a reasonable person as earth-shattering:\n\nThere exists a person who can always tell you, on any given afternoon, how long you'll sleep that evening. Additionally, once you ask that person in the afternoon how long you'll sleep that evening, you always have the power to stay up all night and blow up the person's earlier prediction/statement.

There is something unsatisfying about this logically that I can't put my finger on. Is this explored anywhere in discussions of the halting problem?

A

sometimes, the most interesting part of a mathematical proof is the formalisation, and not the result. there are some very intuitive things that you "think" are true, that are immensely difficult to prove- even if this proof seems unsatisfying or the result seems uninteresting it is noteworthy, you can never know for sure until someone proves it, no matter how intuitive it seems

08

B

The exploration of this logically unsatisfying phenomenon is known as the self-referential paradox, and it is indeed discussed in discussions of the halting problem.

C

Yes, this is explored in discussions of the halting problem. The halting problem is the problem of determining whether a given Turing machine halts on a given input. It is known to be undecidable, meaning that there is no algorithm that can determine whether a given Turing machine halts on a given input. This means that there is no oracle that can determine whether a given Turing machine halts on a given input.

01 Why can't you split an atom using a knife or a hammer, if you basically hit anywhere.

02 You can. I mean all the comments are saying you can't. Yes you absolutely can. As many pointed out the Strong Nuclear Force Electromagnetism Weak Nuclear Force Gravity in terms of strength.

Sounds like we are right back to the start of this lesson again. Let's put some real numbers on this. The "weak" nuclear force is 10 to the 25th power stronger than Gravity. That's 100,000,000,000,000,000,000,000,000 times stronger! Electromagnetism - the force we know best - is 10 to the 36th power stronger than Gravity. That's 10,000,000,000,000,000,000,000,000,000,000,000,000,000 times stronger! The "strong" nuclear force is 10 to the 38th power stronger than Gravity. That's 1,000,000,000,000,000,000,000,000,000,000,000,000,000,000 times stronger!

You can split any atom with a knife. If you have enough kinetic force.

The forces involved here would be about... Probably from 1/10th the speed of light to some where up to 90% of it.

If you're really curious here is a old comic.

<https://what-if.xkcd.com/1>

Basically you won't be spiting atoms with any normal actions you do in your daily life.

But if your knife flew probably 1/10th the speed of light into anything you'd be doing nuclear fusion and there by fission.

03 That's super interesting! So let's say we make a rocket ship and it goes 50% of speed of light, will that destroy any matter that's eligible to be destroyed?

04 Yes the problem with building spacecraft that could theoretically go that fast is that a tiny spec and I mean a few grams of dirt hitting the spacecraft would be like you detonated a tactical nuke on it.

These type of spacecraft are called "relativistic spacecraft"

https://en.wikipedia.org/wiki/Relativistic_rocket

And if you could build these you'd basically make the ultimate death machine.

<https://vocal.media/futurism/relativistic-kill-vehicle>

These things are literally impossible to stop, you can destroy them but that does literally nothing as it's the kinetic energy that does the fusion explosions on the ground.

The only way to stop these would literally be a huge shield around the planet made out of matter. So an outerwall so to speak.'

05 That's fascinating! I didn't know that all sci fi shows lied about those parts. One more question tho, why can't the engines like die down once you come close the destination so you don't have to crash somewhere and just slow down till you can break or something

A Most sci fi if you notice avoids it.

Star Trek uses Defector Shields. As in some sort of shield of particles that basically vaporize the incoming dust, they also travel around by warping space so they ship isn't moving at all the space around it is. It's a difficult concept to grasp if you don't understand space-time basics. It's like they're creating a hole in front of themselves and falling into it while making a hill behind them

<https://i.pinimg.com/originals/11/57/8b/11578b9e7cb8e0f4bf02c96796dc6521.jpg>

Star Wars just gives no fuck. Star Gate uses "hyper space" so you go into another "dimension" to and then come back.

https://en.wikipedia.org/wiki/Interstellar_travel_in_fiction

It all depends on the show but most good shows make it realistic enough and have science advisors telling them obvious flaws.

06 Like in the video game Mass Effect they discovered a way to remove "mass" from objects and even go negative so it's possible to go faster than light, and their ships travels like normal ones would accelerating half of the trip then turning around and accelerating backwards to arrive at the destination at normal speeds. They also use shields to protect from stuff.

B The engines can't slow down because the kinetic energy of the spacecraft is so high that it would take too much energy to slow it down. The only way to slow it down would be to use a huge shield around the planet made out of matter.

C That's a good question. The problem with slowing down a spacecraft that's traveling at relativistic speeds is that it would take an infinite amount of energy to slow it down.

01

What is a 'backbeat' and how can I tell when I'm hearing one?

02

Boots and pants and boots and pants and boots and pants and boots and pants. Your pants is the backbeat

03

I am completely at a loss as to what this is a reference to.

04

It's a house music beat. Say it out loud.

05

My older son has tried to explain house music to me. Given that I was dancing in clubs in the 1980s, one would expect it to come to me more easily. What would you recommend I read to grasp what a 'house music beat' is?

A

Have you asked uncle Google or aunt YouTube? If you really want to read there's a book titled Electronic Dance Music Grooves. It has loads of examples of drum sequences for various genres.

06

B

I'd recommend reading up on the history of house music. It's a fascinating story.

C

I'd recommend reading up on the history of house music. It's a fascinating story.

01

02

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dimensions

We're gonna talk about some science. Do you like science?

Yes, a lot.

Oh, very good. You've come to the right place. So we're gonna think about physics. Have you heard the word physics before? Do you know what that is?

Yeah, kind of.

What's your idea what physics is?

Um, I'm not so sure

Okay. I just think of physics as the study of everything. What stuff is, what stuff does. So today we're gonna talk about space, and in particular the idea of dimensions. Have you heard about dimensions?

At the camp I made a 3D printing one.

3D printing, good.

So I don't choose the size, all I had to do was the shape.

But do you know what 3D means?

It's three dimensional.

Three dimensional, as opposed to, what is ordinary printing?

So, ordinary printing would be 2D.

What do you say when something is one dimensional? What's an example of something that's one dimensional?

Hmm, I think one dimensional might be a circle, I guess, or maybe a line.

A line is the perfect example

Yeah, a line.

Because it's one thing that's straight, right?

Yeah.

So here's some toys. We're gonna build some dimensions, right? So what would you say about this?

That's one dimensional.

Exactly. It's not really one dimensional, right?

So everything has to be one or two dimensional before it's three dimensional.

And how would you find yourself, like if someone said where are you, could you use some words or ideas to say where you are on that line?

I think I would be maybe there, since I'm facing it.

But here's what I want you to think about. If I say I'm at this point on the line, I could translate that into saying I'm at the three centimeter point, if I were here I'd be at the four centimeter point, the five centimeter point, right?

Yeah

So every point, every location on our little line

Has its own unit

Has its own unit, has one number.

Yeah

We need one number to tell you where we are. That's one dimension. That's what it means to be one dimensional. I only need to tell you one number to figure out where we are.

Unlike three dimensional, you have to tell a lot 'cause if it's like a sphere, you kind of have to start using points.

There you go. Exactly. We're gonna build a little two dimensional space. You wanna do it? You wanna do the honors here? Why don't you put those two lines together?

If you make it two dimensional is this, a corner.

Exactly, there you go.

Another way is if you have space in between is an angle.

I think you should be in this chair and you should be explaining this to me. You're much better at this than I am

Yeah

So those are the dimensions. That's how we think about dimensions. Remember, we just needed one number to find ourselves on the line, we need two numbers to find ourselves on the plane

I think that would be an X or a Y axis, so

There you go, So, do you think we could have more than three dimensions?

3D is the maximum of dimensions for shapes

A

Well, as far as we know.

B

Yes, we could have more than three dimensions. For example, we could have a fourth dimension, which is time.

C

Yeah, that's right. We can't have more than three dimensions, right?.

Explainer

Dialogue 21 of 30

Explainee

01

the anti-work movement. How does the world keep turning, so to speak, if work is abolished?

02

axes on automated industries that have little to zero labour costs I would assume.

03

So, is it fair to say "from the labor of others" (i.e that one engineer working tirelessly to keep the machines whirring)?

04

Well im assuming the few people who do work in those industries would be compensated well above the ubi.

05

For the purpose of incentivizing, I'd think it would have to.

So bottom line, the UBI that provides for the non-workers comes from the automation maintained by other humans?

Ⓐ

I'd say that the UBI will be very basic. Pretty much essential items, food, shelter, water, electricity, internet, petrol and phone plan. Anything extra you want will most likely come from some sort of job, even if its a handcraft or service type thing.

06

Ⓑ

Yes, the UBI that provides for the non-workers comes from the automation maintained by other humans.

Ⓒ

Yes, that's correct.

01

Why has website design moved from clear tidy spaced pages to massive buttons that require excessive scrolling on almost all devices? (Most notably online banking and govt websites)

02

Can't say I've noticed this with my bank.

I'd guess it's around accessibility. You need to provide a service that works for the elderly, people with issues with sight such as colour blindness etc. So to provide a service that works for something like a bank it has to work for everyone. It would be pointless to provide a swish looking site that was unaccessible and could potentially lead to fines etc if you were seen to be excluding people with disabilities or a specific group of people.

03

Thats an interesting reply, as I was prompted to post this due to my elderly mother, who has gotten on great with technology in the past, called me as she couldn't get in to her banking.

Turned out this was because the items on the login screen are so large, you have to zoom out/scroll sideways to find the "submit" button.

Thats when I realised I've been finding this for months now, and practically given up on using such things on a phone or tablet.

Its like a return to the frames of the late 90s!"

04

And it's definitely the app and not a change to her settings?

Suppose it depends on who she banks with but there are some great examples out there of banking apps from both start ups and established banks in my opinion

05

Its not an app. Its the company website. This is not just banking though, its a general trend. Look at any govt website for example, they're almost impossible to navigate due to nothing but a few massive buttons.

Look at this monstrosity for example : <https://www.barclaycard.co.uk/>"]

A

Will do. Just need your password and log in details 🤖

B

I'm sorry to hear about your mother's experience. I can understand why it would be frustrating to have to zoom out or scroll sideways to find the "submit" button. I'm glad you were able to figure it out in the end.

I'm not familiar with the banking app you mentioned, but I'm sure there are some great examples out there of banking apps from both start ups and established banks.

I'm not sure if it's an app or the company website you're referring to, but I'm sure there are some great examples out there of government websites that are easy to navigate.

C

Wow, that's a lot of buttons! I'll have to take a look at that.

01

why do DJs sometimes hold one of their earcups?

02

DJs need to hear both what you hear, and the music they are preparing on you headphones. They can do this electronically, but many quickly put down an earcup for convenience.

03

ohhhhhh, but what about the pressing the earcups to their ear? is it to hear the music queue better?

04

So djs have ques, but need to hear to be able to transition properly, so yes they press it up to hear better

05

thx!

Ⓐ

Np 🙌

Ⓑ

DJs need to hear both what you hear and the music they are preparing on their headphones. They can do this electronically, but many quickly put down an earcup for convenience. This allows them to press it up to hear better and transition properly.

06

Ⓒ

You're welcome!

01

Why is it during a weather change (like going from 70s to 50s or other direction) why do our sinuses flip out during the change and maybe a day or two after but when the weather stabilizes your sinuses are fine?

02

Lol what? Who does this happen too? Never in my life'

03

Lucky. Common occurrence where I'm at'

04

Sounds awful

05

My level is rarely "awful" it is just incredibly annoying and during flu/cold/COVID seasons it's hard to tell the difference of something infections and your body being a spazz'

06

When I've gone down to Austin my entire face and sinuses are full of pressure and it is awful. I'm assuming it's like that, but I could just be a baby because it never happens otherwise. Guess I am lucky!

07

Ah a Texan? I'm guess you don't have overly large fluctuations in temps that happen quickly? I live in the Midwest. There are days you need your AC in the morning and your Furnace by afternoon. Sometimes, I hate it here lmao

A

No I live in the rockies/southwest. We have a lot of fluctuations but I haven't spent too much time in the midwest so maybe it's nothing in comparison. Texas is drastically different, I may just be allergic to something there idk

08

B

Yeah, I'm a Texan! I'm lucky that way.

C

Haha yeah, I'm a Texan! I'm lucky that I don't have to deal with that kind of extreme temperature fluctuation, but I'm sure it can be annoying when it happens.

01

Why is it that space is dark? If we send a shuttle into space and it sends images back, it is always dark. But the sun is able to provide daylight to Earth. So where is that sunlight going in space?

02

Google vantablack. This is a material which absorbs nearly 100% of light. When you look at a car painted with vantablack, it looks like a hole in the universe. Like the stealth bomber. BTW, this is how stealth technology works, by absorbing and scattering light in such a way that devices like radar can't see it.

Check this out. <https://youtu.be/QCI2KYhC8vk>

03

Seen the vanta black stuff. It is pretty cool

04

So what is happening here is the vantablack is absorbing all the light. So there is light bouncing off the car and coming into your eye. So it's not like there is some information coming from the car into your eyes and brains saying, 'hey its really really black right here'. What is happening is the cells in your eye are not getting any information at all, and those cells in turn do not activate the brain in the same way. So your brain perceives it as what we call black. But its really just a lack of information

05

So it is really black in that it is a) very black and b) absorbing the light so that we are not receiving the information needed to distinguish the colour?

A

That's right. Remember there isn't really a real 'black'. That is just a word we made up for what our brain does. Pretend humans never developed eyes and we never evolved to have the sense of sight. We have no idea of color or what things look like or anything. Light particles are still bouncing around and being reflected off everything, everywhere, but in the case of the vantablack, when light hits that area, it just reflects less light than other surfaces. (less information is being reflected)

Another way to look at it is take a digital camera and point it at the car. Well there is a sensitive chip in there that is like an eye. The light hits the chip, and activate certain parts of that chip which the computer makes into an image on the screen. The vantablack areas did not activate that part of the chip. So the computer reads the image file and says... No data here! and then when you look at it on the screen the computer doesn't light up that pixel and you perceive black there.

06

B

The vantablack material absorbs nearly 100% of light, making it look like a hole in the universe. This is how stealth technology works, by absorbing and scattering light in such a way that devices like radar can't see it.

C

Exactly. It's like a hole in the universe.

01

How can some "infinities" be bigger than others? Doesn't that contradict the very definition of "infinite"?

02

not finite doesn't mean not comparable.

03

Only finite things can be compared. It's pretty obvious why.

04

Enlighten me. Prove with mathematical logic that only finite things can be compared

05

Jesus Christ do you seriously not understand this

06

I don't think you understand this so I'm testing that by asking you to prove it

07

What is comparison?

A 5m long ruler and a 2m long ruler. The first ruler is 250% the length of the second

A 4.5m long ruler and a 2m long ruler. The first is 225% the length of the second.

A 50m ruler and a 0.5m ruler. The first is 10000% the length of the second.

When one of these ""numbers is Infinite""... Just nothing. You just can't do this.

All numbers are $=0$ when compared to infinity. That's illogical, therefore you can't compare infinity'

08

you can say one is infinitely larger than the other.

09

No. Everything is $=0$ when compared to infinity. That'd mean $\text{Infinity}=0$

10

how is saying something is infinitely bigger than something else not valid?

11

It's not. We say this a lot but we're doing it wrong. Like when we give things a name. We talk about black people, white people, deserts, tables, chairs. Although there really isn't such a thing.

12

you can't just say it's not and expect me to believe you.

13

It's not valid because infinity is impossible

Ⓐ

not finite does not mean impossible

Ⓑ

Enlighten me. Prove with mathematical logic that only finite things can be compared.

Ⓒ

A 5m long ruler and a 2m long ruler. The first ruler is 250% the length of the second

A 4.5m long ruler and a 2m long ruler. The first is 225% the length of the second.

A 50m ruler and a 0.5m ruler. The first is 10000% the length of the second.

01

gravity

02

So, Maria, you're in high school?

03

Yeah, I'm a junior

04

And are you studying any sciences in high school?

05

I'm taking physics right now."

06

Do you think of yourself as curious about science?'

07

Well, there are some things that interest me and others that bore me, so it depends.

08

What interests you?

09

Well, I'm a gymnast, so in physics they talk about force and stuff and then I think of how I use physics in my own life

(A)

What's your impression of what gravity is?

10

(B)

Wow, that's fascinating! It's great that you're able to apply what you learn in physics to your own life.

(C)

Wow, that's fascinating! So, do you think you'll pursue a career in science?

- 01 lasers
- 02 So I was told that maybe science is one of your favorite subjects at school. Is that right?
- 03 Yes.
- 04 Have you actually studied light yet?
- 05 Yes.
- 06 Okay what have you learned so far about light?
- 07 So we learned how to actually light up a light bulb.
- 08 Oh really? Oh excellent. Well I'm somebody who studies lasers. So what do you think about lasers?
- 09 I don't know
- 10 You haven't got to play with lasers. So I brought one. It's my friend's cat toy. Do you ever use a laser as a cat toy?
- 11 No
- 12 Well one of the fun things people do with lasers, the cat will try to grab that dot. I'm sure what you have at home is a flashlight. I brought a cute little one. So the question is, do you see any difference between what a flashlight does and what a laser does?
- 13 Flashlight is a bigger shine and the laser is just a dot.
- 14 That's true, that laser's just a dot. And so the other thing to notice though is that, like if I shine it in your eyes and I'm sorry if I do! But it seems awfully bright doesn't it? And yet when, you know, you shine this down and you put the laser, which one do you see easier?
- 15 The laser.
- 16 The laser. So which one do you think's more powerful?
- 17 The laser
- 18 **A** [Donna] And yet it's not. Isn't that amazing?
- B** The laser is more powerful than the flashlight.
- C** The laser is more powerful.

Reminder: Don't forget to save your changes before closing the file.