



Cogito



Discover what it means to know !

Acknowledgements

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Cogito

(कोगितो)

We have heard the word "Know" several times in our lives, but what does it truly mean to know something? We have a natural instinct to understand what we and others "know" or "don't know". For example, we may know that it is true that earth is round and that it revolves around the sun.

But how do we know if this is the truth? What is the difference between knowing that something is true from just thinking that it is true. We often encounter claims made by people for which we may or may not have evidence for; how do we differentiate between what is true and what is not in these cases.

Cogito is our journey where I and Ankit end up writing this book on our conversations when we were exploring how do we know the truth of something.

- Ankit and Ankita

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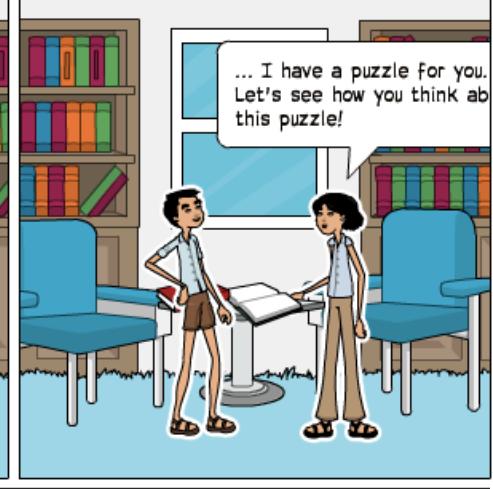
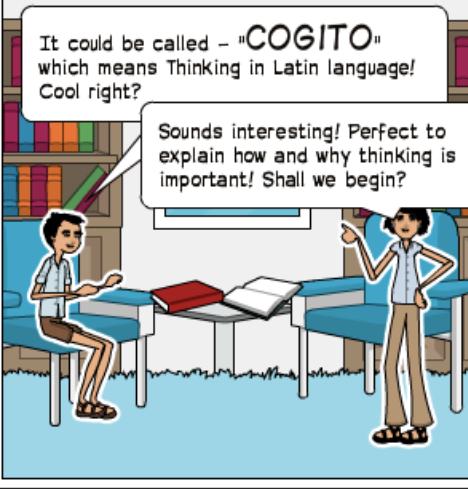
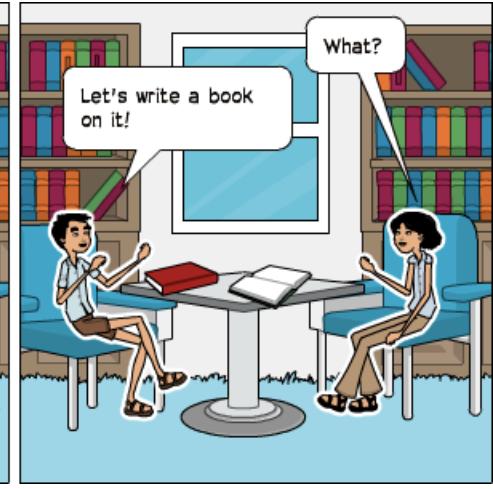
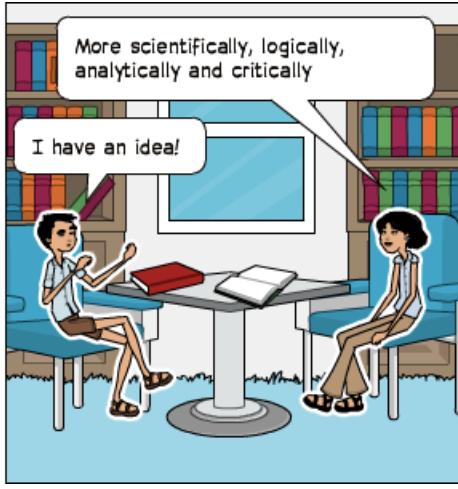
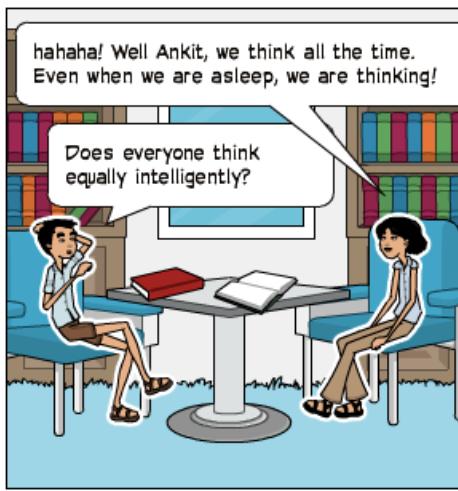
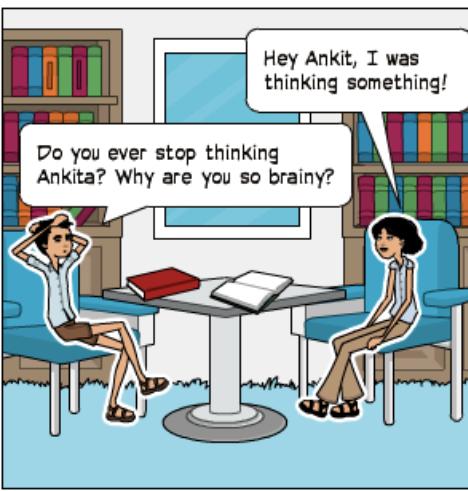
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Cogito





If all of the statements are true, where is the gold?

Chest 1



The gold is
not in 2

Chest 2



The gold is
in 1 or 3

Chest 3



The gold is
not in here

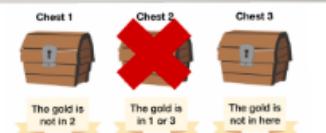
hmm....



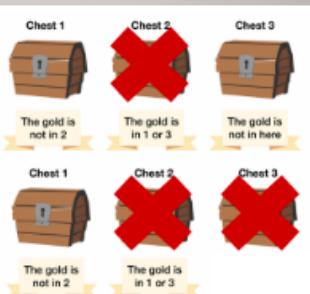
Is the gold in
chest no 1 ??

Yes! But how did you
come to this answer?

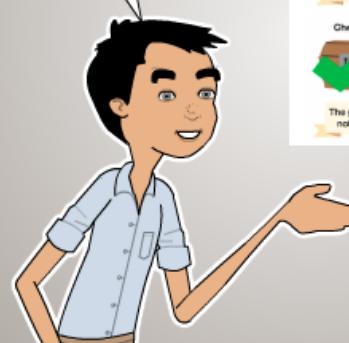
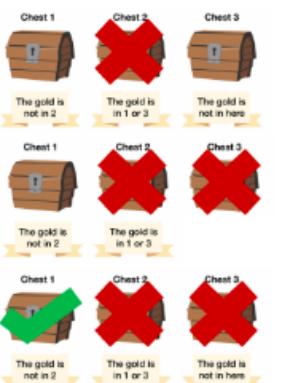
See! If statement 1
is true, then gold can
not be in chest 2.

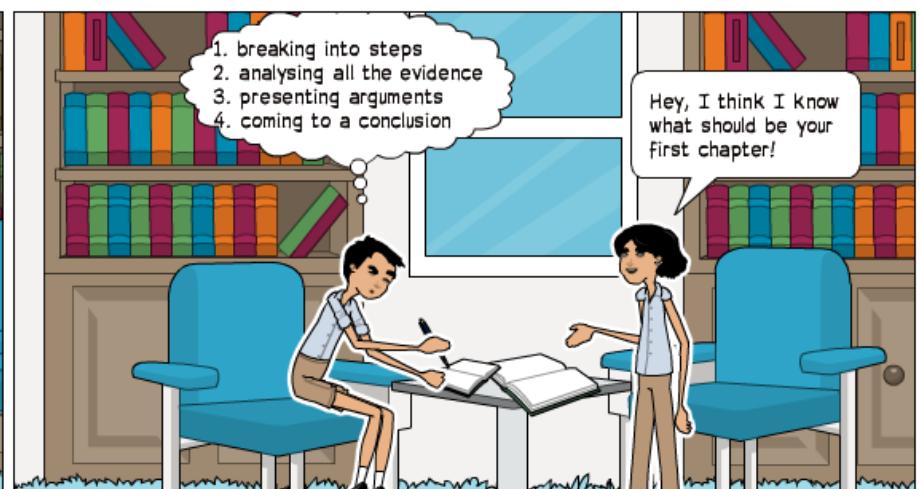
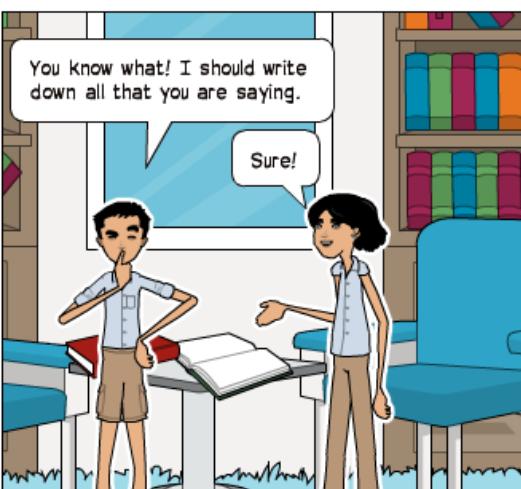
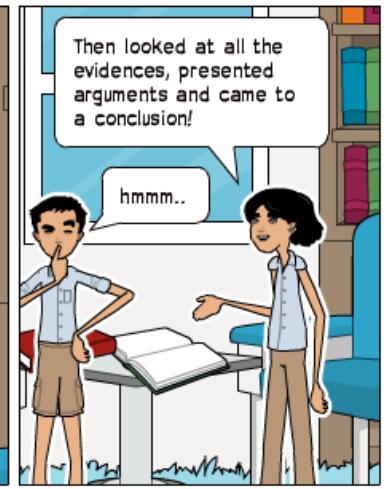
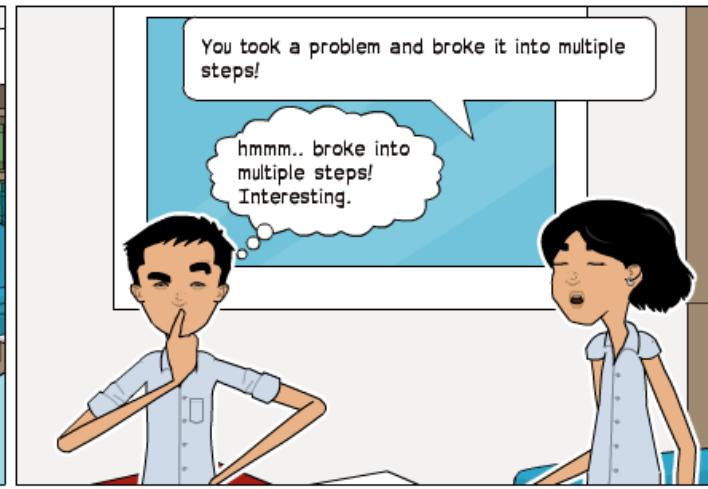


Similarly, if the
statement 2 is right,
the gold can not be in
chest 3!

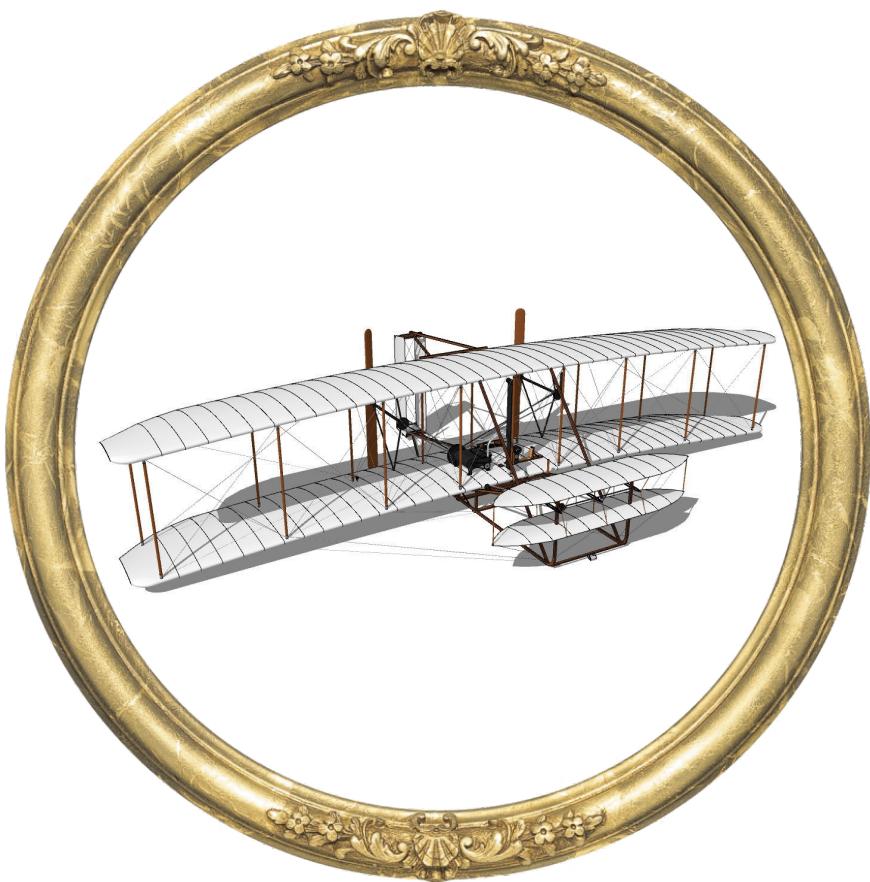


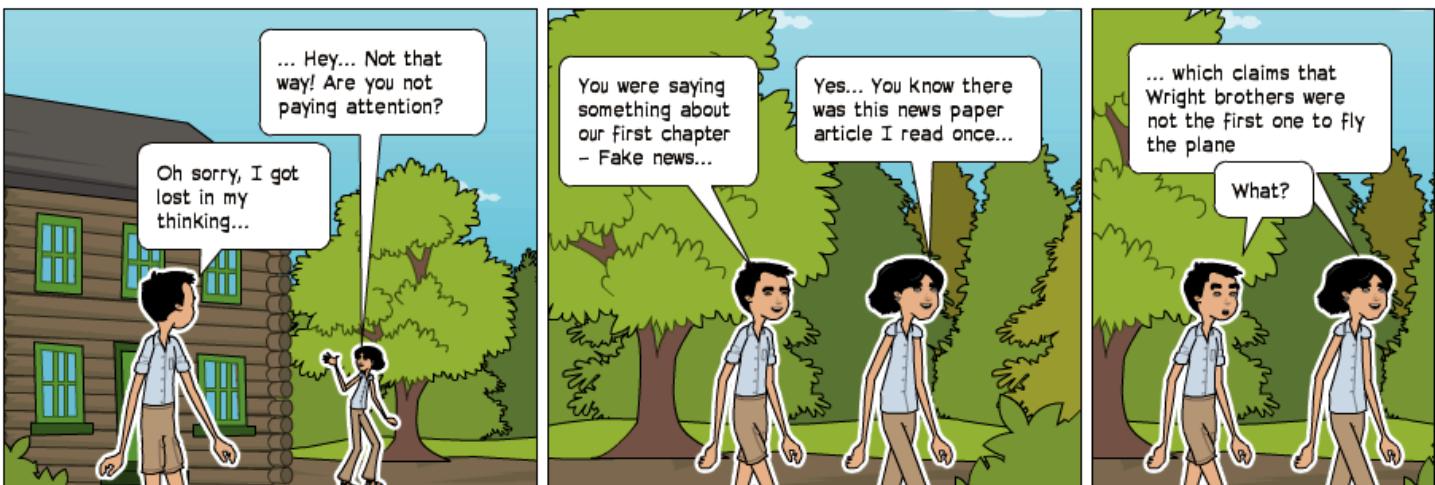
Hence, the gold
must be in
chest 1!





The walk





WRIGHT BROS NOT FIRST TO FLY



Wilbur and Orville Wright make history at Kitty Hawk, USA, December 1903. Or did they?

Many aviation experts and historians now believe that German-born Gustave Whitehead – seen here with his aeroplane 'No. 21' – beat the Wright brothers into the sky by as much as two or even three years.

In a 1935 article in the magazine *Popular Aviation*, and a book published two years later, author and historian Stella Randolph tells of a steam-powered flight made by Whitehead in 1899,

in Pittsburgh, and of signed affidavits from 20 witnesses. One was Louis Daravich, stating that he was present and accompanied Whitehead on his flight. Randolph tells of two more flights, in 1901 in a plane that Whitehead named 'No. 21', and another in the following year in 'No. 22'.

A headline from the *New York Herald*, dated August 19, 1901 read: 'Gustave Whitehead travels half a mile in flying

machine . . .', and quoted a witness who affirmed: 'The machine worked perfectly, and the operator had no problem handling it.'

Whitehead was a poor German immigrant to the United States, whose voice was easy to drown out in the debates that followed. The Wrights, by comparison, had influential friends and supporters. The prestigious Smithsonian Institute for Science, in return for ownership of the *Flyer*, agreed not to publish or exhibit anything referring to flights before 1903. The question we should be asking is: Why?

The jury is not so much out. The jury has gone home, and the case is closed. History suggests it is time to reopen it.

Jacey Dare



Gustave Whitehead, pictured with his aeroplane 'No. 21', and his daughter and assistants

You asked what a claim is?

You see, newspaper articles, WhatsApp messages and news are all created by Authors.

The case that Author is building is called - **Claim**

For example, in the article about Wright brothers ... Author claims that - "Wright Brothers were not the first humans to fly an aeroplane, someone else was!"

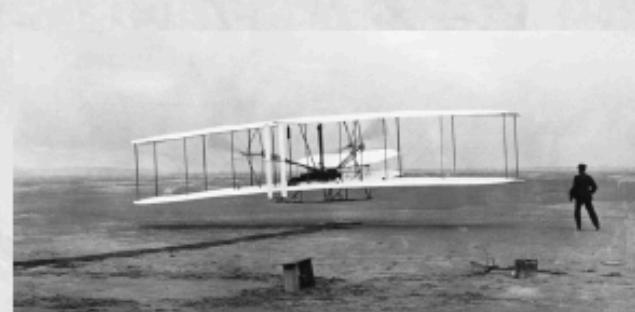
Exactly! Now to analyse if the article, text message or any other material is a claim....

...You first need to find what the author is saying!

And then look for evidence, supporting arguments and data if there are any!

For example, in this article...

WRIGHT BROS NOT FIRST TO F



Wilbur and Orville Wright make history at Kitty Hawk, USA, December 1903. Or did they?

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Ja

For example,...



First argument: there are people who believe that Whitehead flew planes successfully before 1903

German-born Gustave Whitehead – seen here with his aeroplane 'No. 21' – beat the Wright brothers into the sky by as much as two or even three years.

In a 1935 article in the magazine *Popular Aviation*, and a book published two years later, author and historian Stella Randolph tells of a steam-powered flight made by Whitehead in 1899.

Second argument: It is also true that Stella Randolph wrote books and articles in which she refers to numerous witnesses giving signed statements that they saw Whitehead flying

Many aviation experts and historians now believe that German-born Gustave Whitehead – seen here with his aeroplane 'No. 21' – beat the Wright brothers into the sky by as much as two or even three years.

In a 1935 article in the magazine *Popular Aviation*, and a book published two years later, author and historian Stella Randolph tells of a steam-powered flight made by Whitehead in 1899,



Third argument: There is another magazine article which mentions a steam powered flight by him

In Pittsburg, and of signed affidavits from 20 witnesses. One was Louis Daravich, stating that he was present and accompanied Whitehead on his flight. Randolph tells of two more flights, in 1901 in a plane that Whitehead named 'No. 21', and another in the following year in 'No. 22'.

Fourth argument: There really was a story in the New York Herald in 1901, reporting a half-mile flight by Whitehead, and quoting a witness as saying that the plane 'worked perfectly'



Gustave Whitehead, pictured with his aeroplane 'No. 21', and his daughter and assistants.

three years.

In a 1935 article in the magazine *Popular Aviation*, and a book published two years later, author and historian Stella Randolph tells of a steam-powered flight made by Whitehead in 1899,

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Gustave Whitehead, pictured with his aeroplane 'No. 21', and his daughter and assistants.

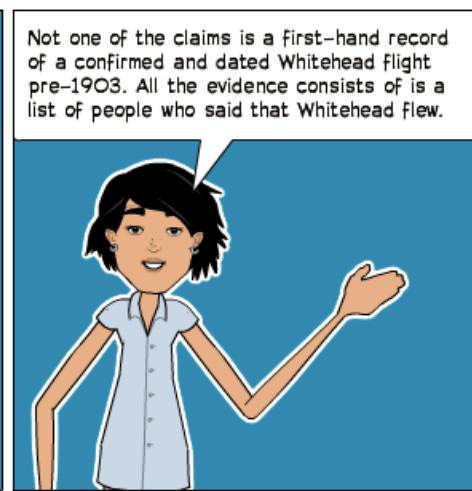
IF all these claims are so believable, is the headline believable too?



Umm... Yes?!



Fifth argument: The photograph of Whitehead with his 'No. 21' is understood to be genuine; and no one disputes that Whitehead built this aircraft



And how did you think about that?

I read the claim... analysed the arguments... looked at all the evidences and formed a conclusion

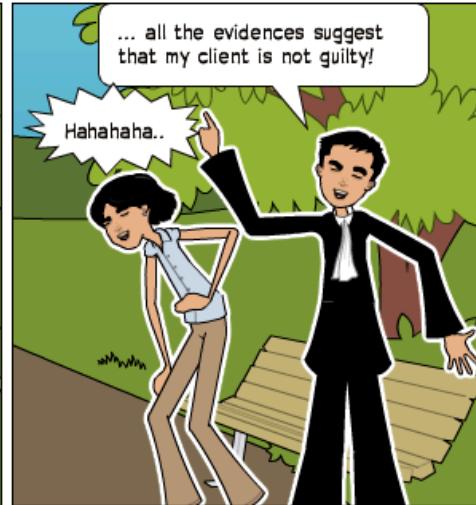
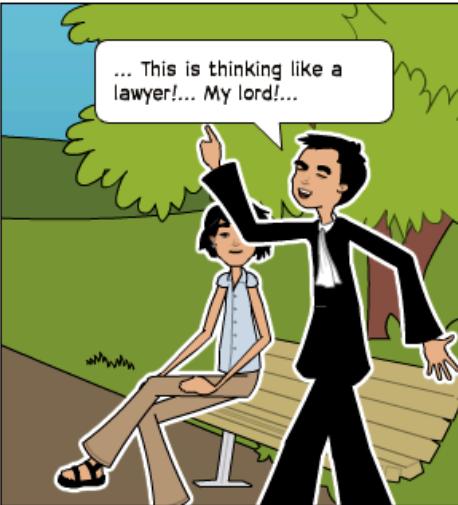
Yes. You just learned how to think critically... at least a little bit of it!

You see! once you start thinking critically, you just cannot think any other way!!

I am sure!...

... This is thinking like a lawyer!... My lord!...

... all the evidences suggest that my client is not guilty!

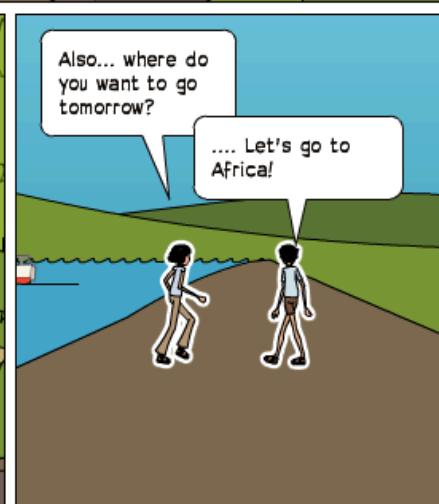
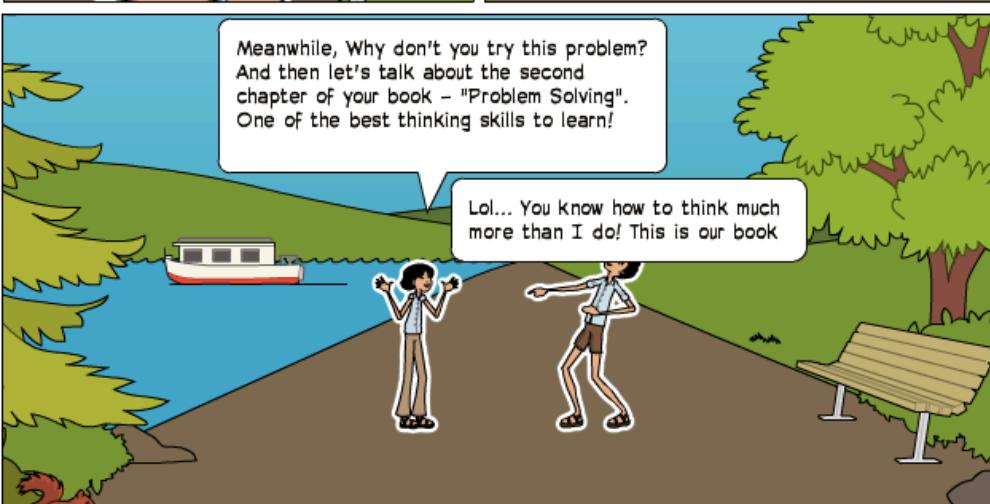


Meanwhile, Why don't you try this problem? And then let's talk about the second chapter of your book - "Problem Solving". One of the best thinking skills to learn!

Lol... You know how to think much more than I do! This is our book

Also... where do you want to go tomorrow?

.... Let's go to Africa!



Let's go anywhere



You Know who is the best teacher? Experience !

How so?

My Father travels a lot for work. I go to new places, meet a lot of people and these experiences have taught me so much!

Let me take you to the park in Africa where my Father took me to, once this plane lands

This is the park in Africa that my father took me to!

That is so cool !

He once told me that, *A mind that is stretched by a new experience...*

... can never go back to its old dimensions

Coming back to our discussion, What you just said about mind is called a *claim*

Claim?

Yes! a claim or assertion is an expression that is supposedly true

Supposedly true?

Yes! Supposedly true because not all claims or assertions are true!

I am a little confused...

Yes! a claim or assertion is an expression that is supposedly true

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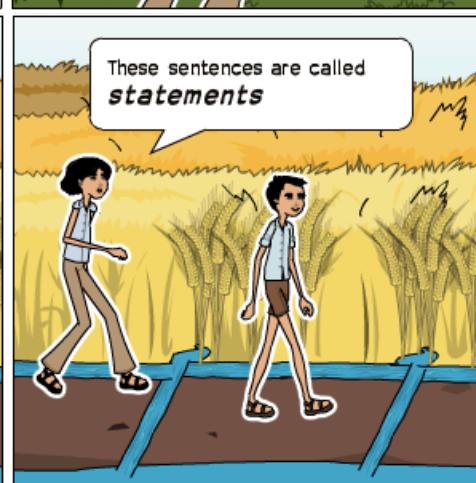
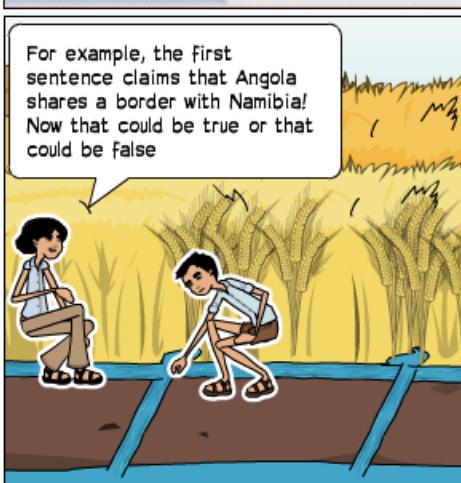
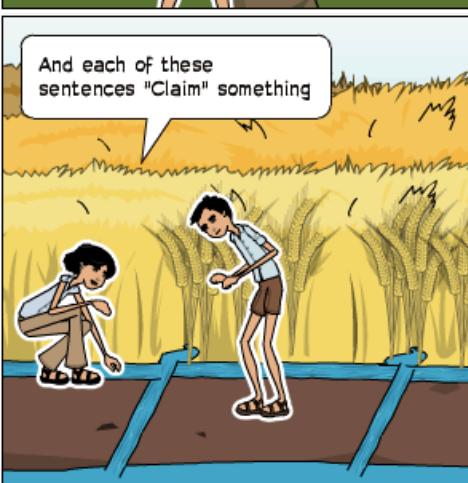
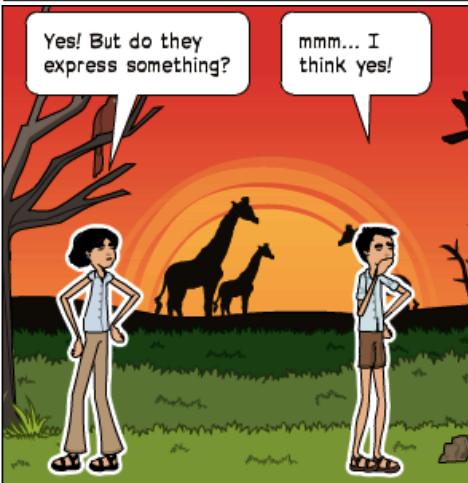
I am a little confused...

Okay! Let's think about this problem

!

All the three sentences below are claims. How are they different?

1. Angola shares a border with Namibia
2. The dinosaurs were cold-blooded
3. Top bankers earn too much money



But how do you know if a statement is true or not?

If you just look at this map you can see that Angola shares a border with Namibia

Which means that first statement is - **True**

And such statements are called facts

Like earth is round!

Yes! Hence, you can say that: Angola shares a border with Namibia... is a fact

Now look at the other sentence!

Do you mean statement?

Good catch! I mean **Statements**

Now look at other statements and think what do they claim?

Well.. this statement that: "**Angola shares a border with Namibia**" claims that both the countries are immediate neighbours

Correct... What about: The dinosaurs were cold-blooded!

I think it claims that dinosaurs couldn't control their body temperature?

I dont know! I guess I will read some books?

Yes! But how do we check if this is true or not?

Yes! That's a good start.. But let me end the surprise for you

You see, dinosaurs lived thousands of years ago on earth...

... it is not possible to conduct any experiment and find if dinosaurs were cold-blooded animal or not....

... So there are some scientists who claim that dinosaurs were cold-blooded

Some scientists say that dinosaurs were not cold-blooded...

Huh!! Since, there is no way to really know what is the truth...

the best we can say about claim is that it is a belief (or judgement or opinion)

A belief ?

Yes! Let's talk about belief judgements and opinions in sometime

What about statement 3 ?

To me it looks like a fact!

My uncle is a bank manager...

...and he is **very rich!**

click to edit

That might be true!
But read the
sentence carefully...

Answer is always in the
question itself!

Statement 3 says that top
bankers earn "TOO MUCH
MONEY"



It can be "true" in your
opinion at the same time
as being "false" in
someone else's

Interesting!

There is another kind of
claim called **Prediction**

Oh yes! I have seen some people
on TV and in real life who claim to
predict your future.



Yes. Now if I say –
"There's going to be a
storm in the next 24
hours"...

I don't know for sure if it will
happen... but I am predicting it...

So how do we know
if a prediction is
true or not before it
happens?

You cannot. For example, if we wait for
24 hours and there is a storm, then you
can say that prediction was right!

So should I believe in
the prediction or not?



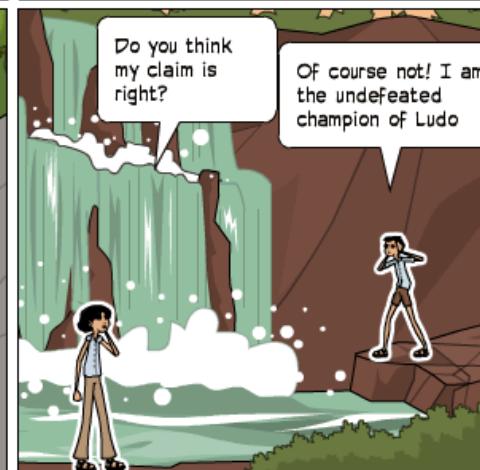
You see even when a claim cannot
be made with 100% guarantee you
can always calculate its chance

I am confused!

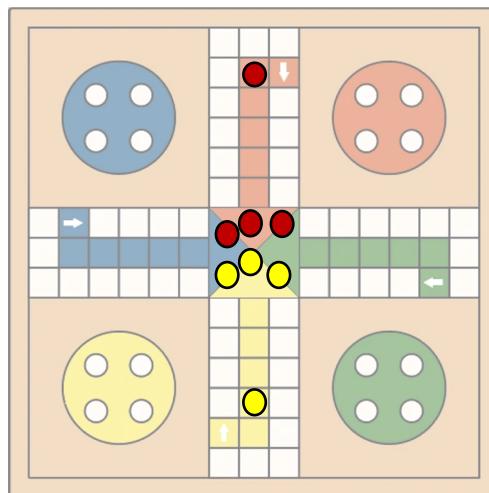
Okay, let's take a simple example...
Suppose we both are playing ludo
and I say – "I am going to win"...

Do you think
my claim is
right?

Of course not! I am
the undefeated
champion of Ludo

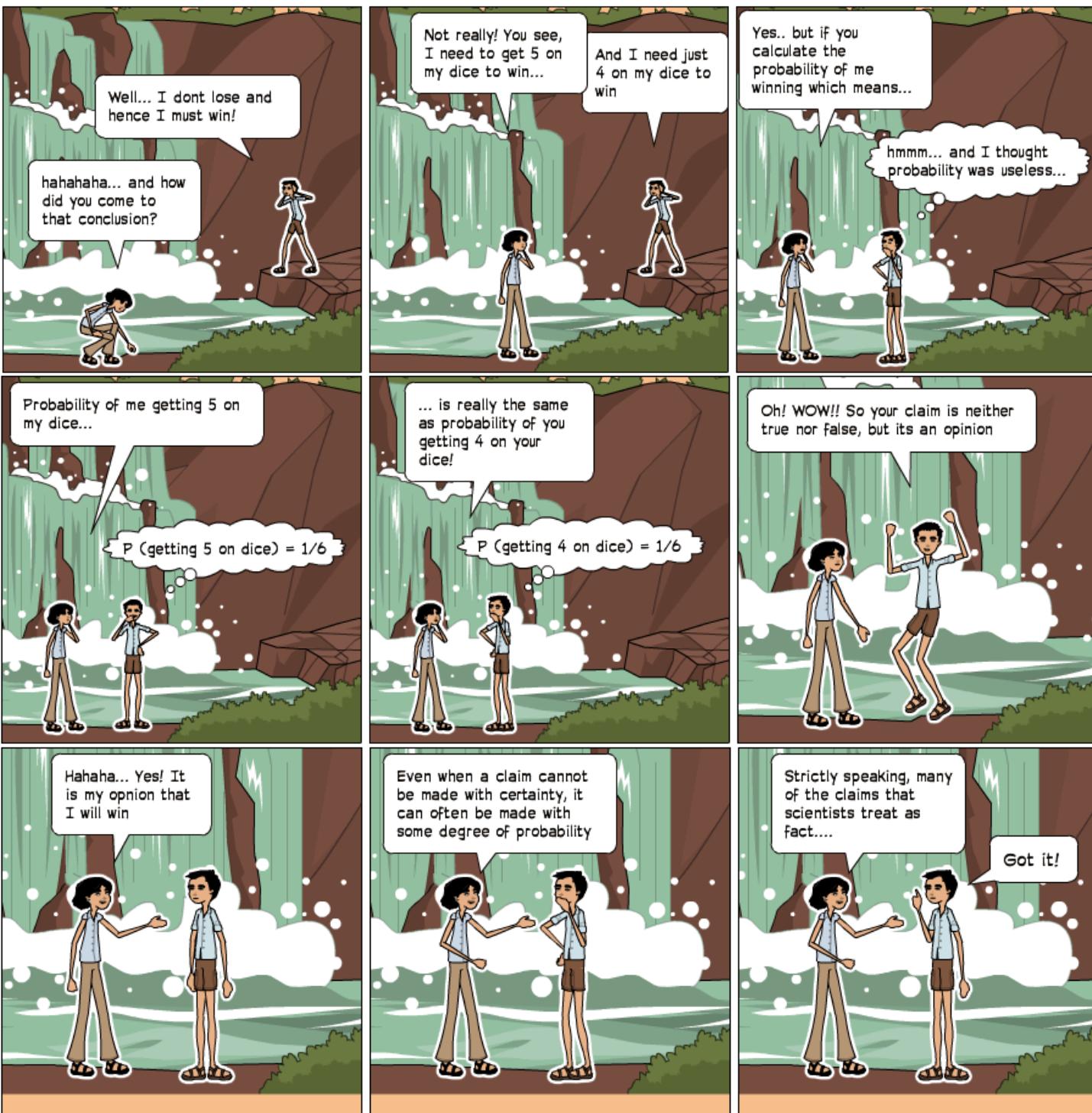


Who do you think will win the game?



○ Ankit

● Ankita



But even if these claims sound very accurate predictions...

they should be treated as probabilities...

Such claims are called hypotheses...

For example, think about a dart and a can...



I claim that if dart and a soda can are dropped simultaneously from an equal height...

the dart will land first!!

But gravity??

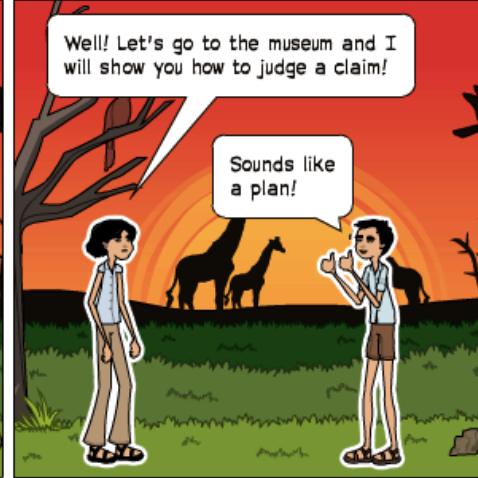
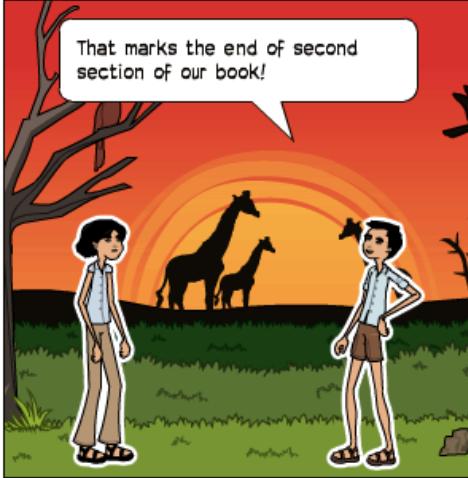
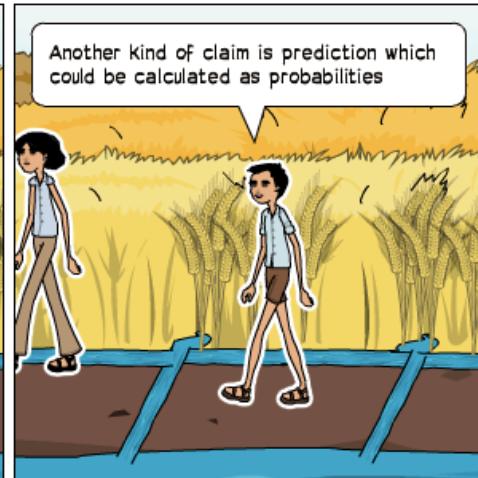
We know that air resistance will be lower on the dart and hence it will land first...

Now this experiment has been repeated so many times that we know the outcome for sure....

Even then it is more accurate to say that it is a hypothesis and not a fact!

Okay, so you are saying that....

A sentence, could be a statement...



Hold your judgement



Ankita, why do people not believe in the correct claims all the time?



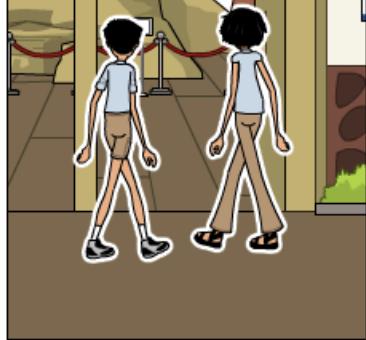
Do you remember the story where a wolf comes to a village and a boy shouts that there is a wolf?



But no one comes to his help and he dies! No question that he lied a few times earlier by shouting "Wolf! Wolf!" to scare the villagers but this time he was right!



You see, the boy lost his credibility and hence no one believed him!



Credibility?

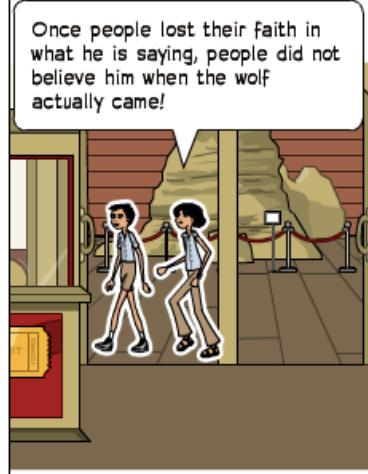
Yes... How much you can trust something or someone is called credibility...



The boy would cry "Wolf!" everyday when there was no Wolf...



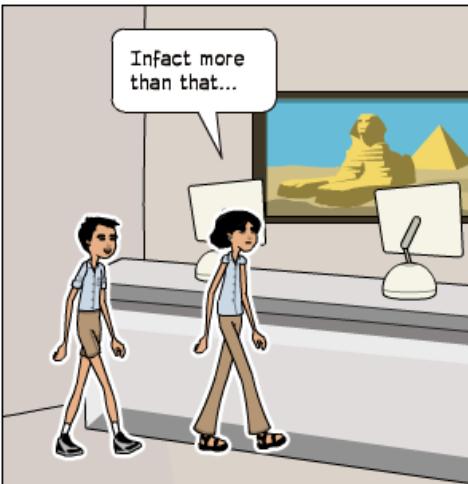
Once people lost their faith in what he is saying, people did not believe him when the wolf actually came!



So moral of the story is that we should speak the truth



Infact more than that...



You see, people need to be able to rely on what they are told most of the time...



...and people who speak the truth need others to believe them most of the time.



But that does not mean we should accept everything we read and hear blindly!



Are you saying people are generally bad?



That they want to lie to people?



No! See, sometimes we make wrong claims out of carelessness in our thinking nothing else...

If I should neither doubt, nor rely blindly, I will have to judge all the claims!

So how do I judge arguments?

Okay, let's take an example...

There are two facts that is often cited in support of the claim that...

...pre-historic dinosaurs were cold-blooded...

One, that dinosaurs were reptiles

Second, modern day reptiles e.g. snakes and lizards are all cold-blooded.

But doesn't that seem logical?

Dinosaurs were reptiles and modern day reptiles are cold blooded. Hence, dinosaurs must be cold blooded!

Well, if you knew nothing about dinosaurs, or reptiles or evolution, this may look fine... but this is at best a *hypothesis*.

For example, if you say this statement is true, it would mean, what is true for reptiles must be true of reptiles **70 million** years ago, and earlier.

It is not impossible that there actually were some warm blooded dinosaurs...

... and they existed with cold blooded dinosaurs

and that these reptiles became extinct, leaving only the cold blooded species surviving today...

Because this is a possibility, we can not assume that it is false! and we must question the assumptions of the claim. Although, that would not make it necessarily false!

What!! But weren't we supposed to find the truth?

Yes yes! But when you can't know for sure what the truth is, you must judge the claim and see if it is *justified or not*.

Now think about this...

Let us suppose that Ketan just returned from a training run of 42 km and announced to his friends:

"I just ran a marathon"

Do you think his claim is justified given that it is so close to the truth?

Strictly speaking, it is untrue...

But isn't 42Km the length of a marathon run? So he must be true!

Strictly speaking, a marathon is 42.2 Km so Ketan wasn't right!

Will you call someone a liar for 0.2 Km?

Of course not! See we sometimes claim wrong things purely out of carelessness...

But it is important to understand that we are just trying to understand what is a justified claim and what is not!

Why don't you analyse these few claims...

What do you think about these claims?

1. Ketan just ran a marathon and completed the distance in under four hours.
2. The dinosaurs were reptiles, yet they were warm-blooded.
3. Sea levels are rising around the world because global warming is melting the polar ice caps.
4. Many parts of the world will soon be submerged if nothing is done to reverse climate change.

What do you think?

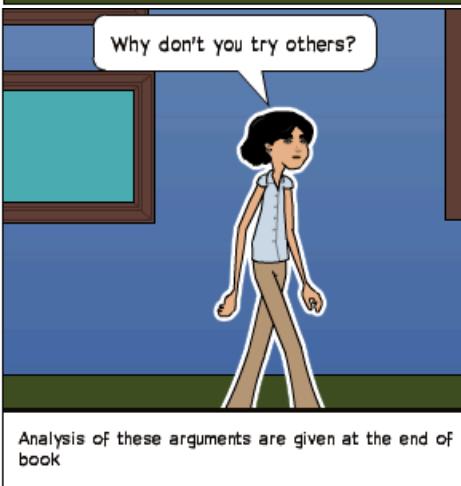
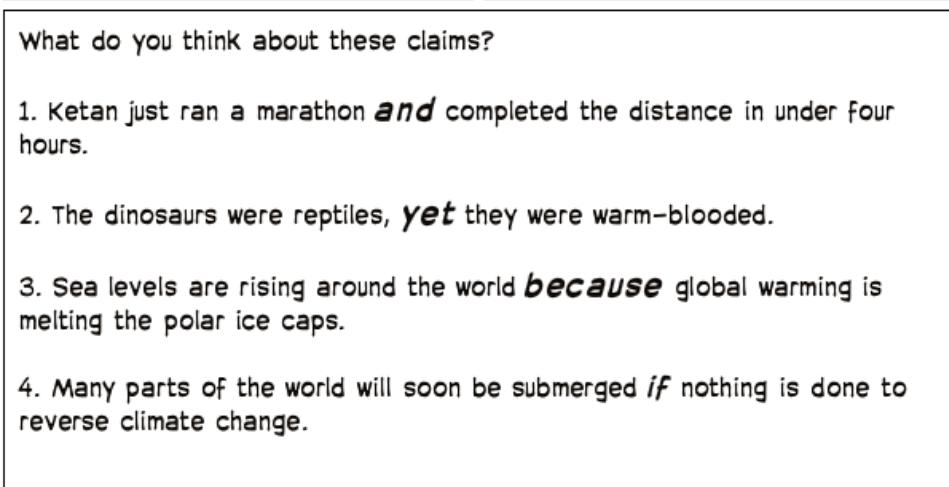
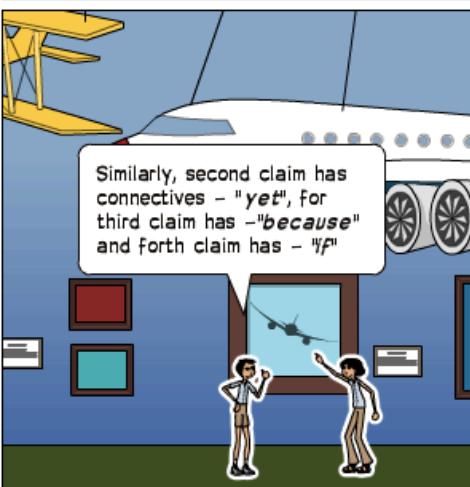
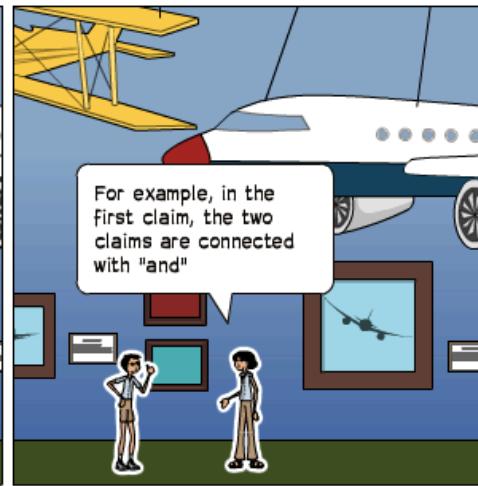
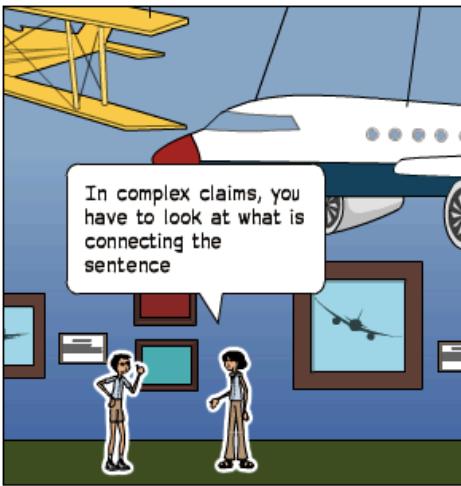
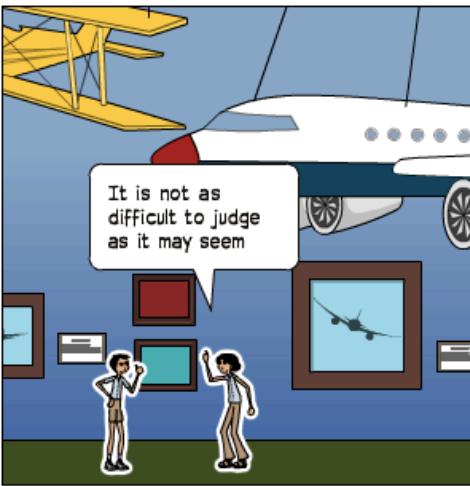
For one! I think there are two claims in each claim... they are a little complicated!

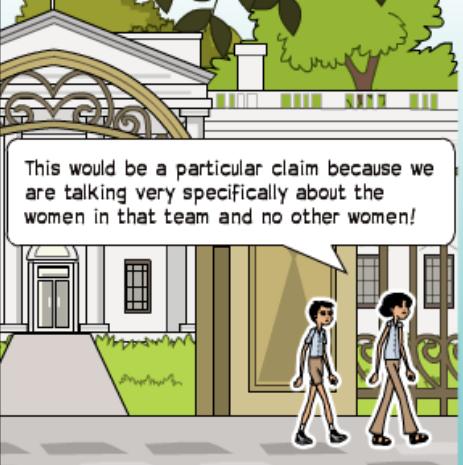
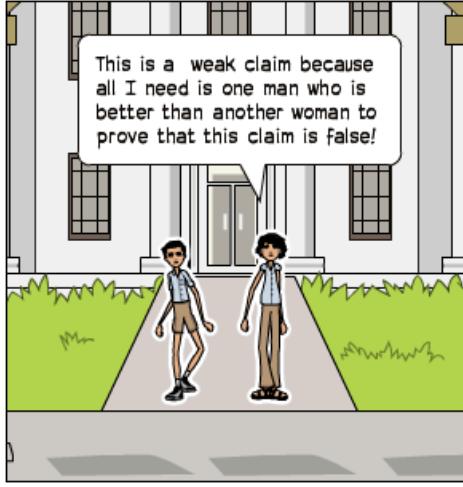
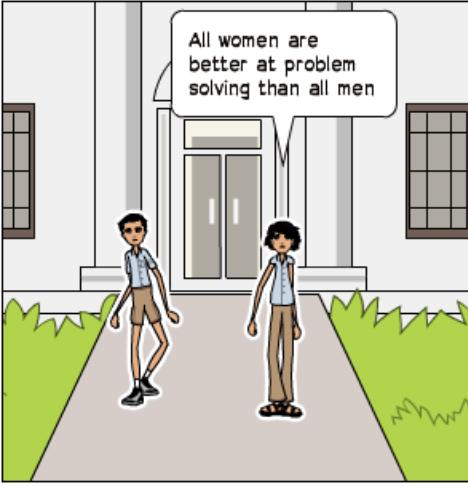
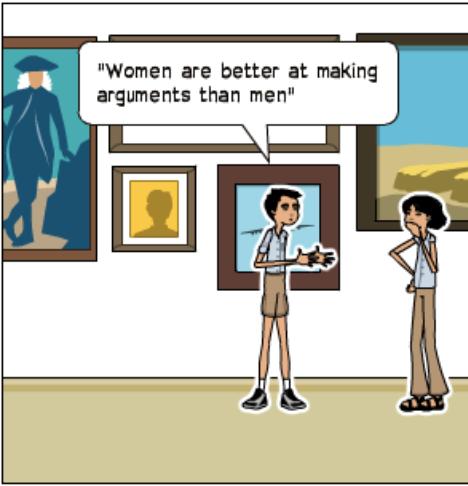
Lol...These are actually called complex claims

I think the first one is true, second one is false...

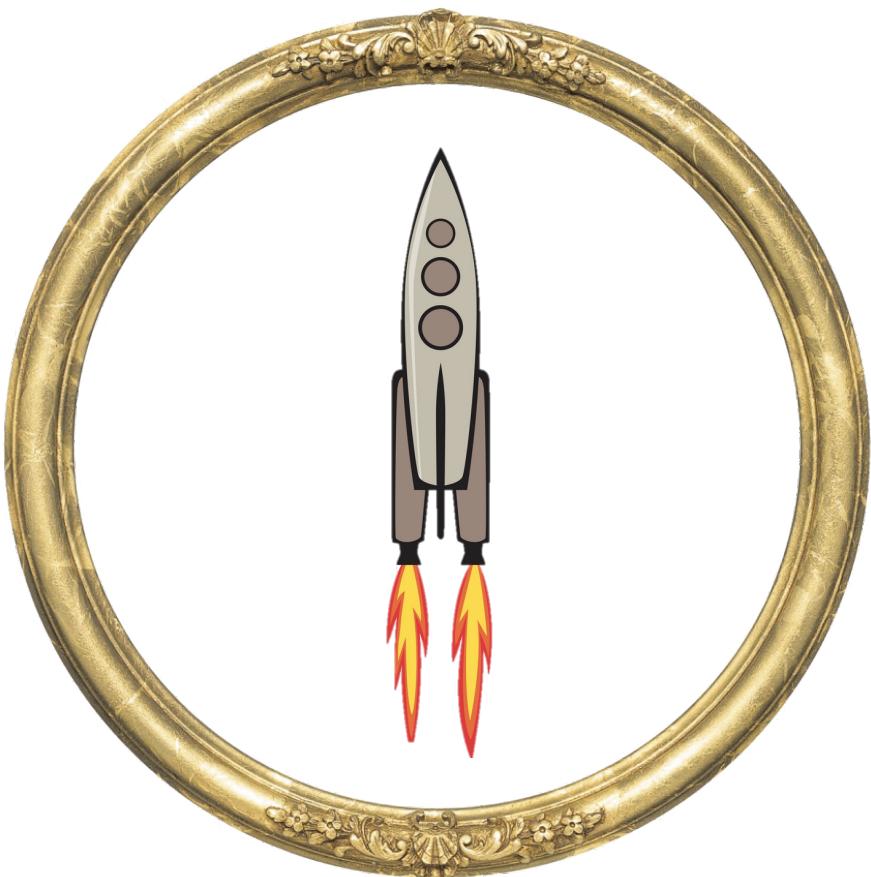
Wait a second, are you just taking a guess?

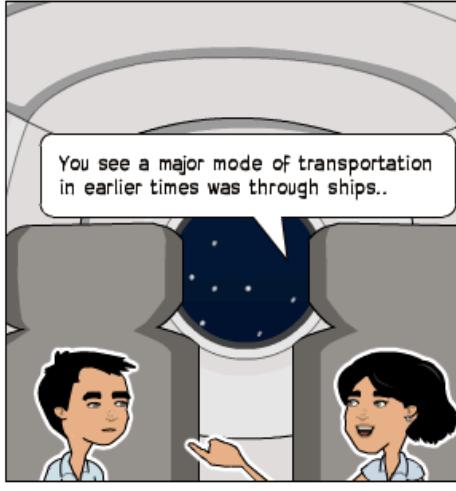
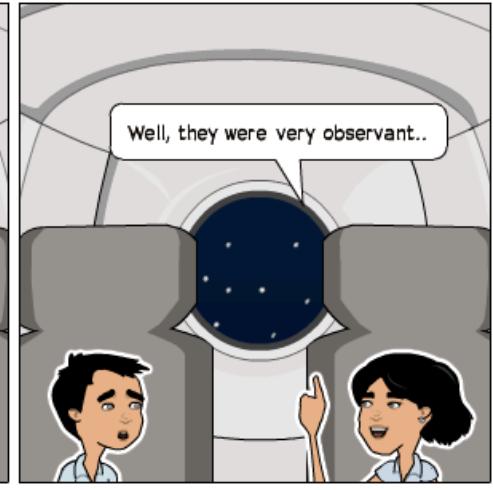
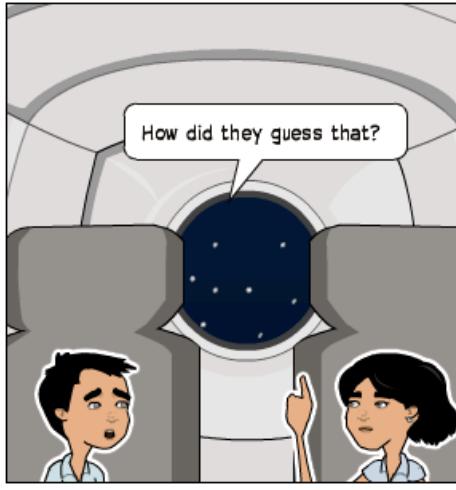
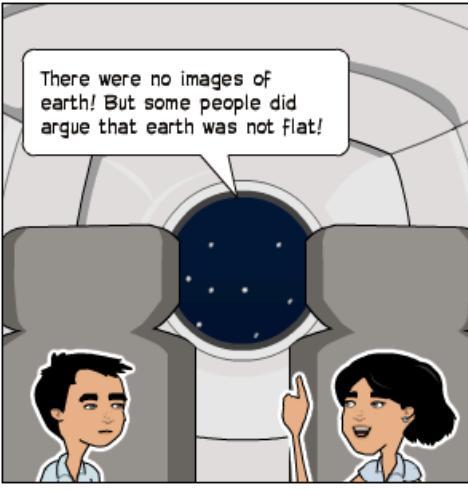
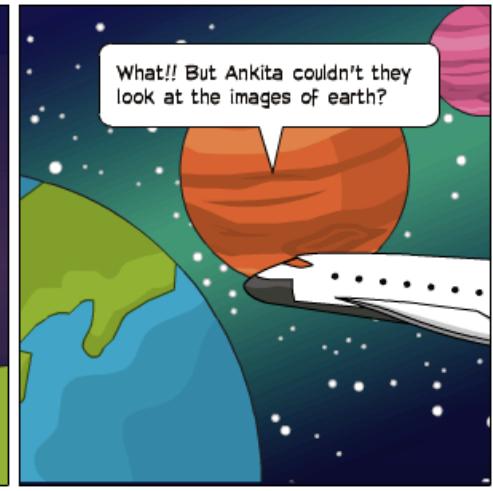
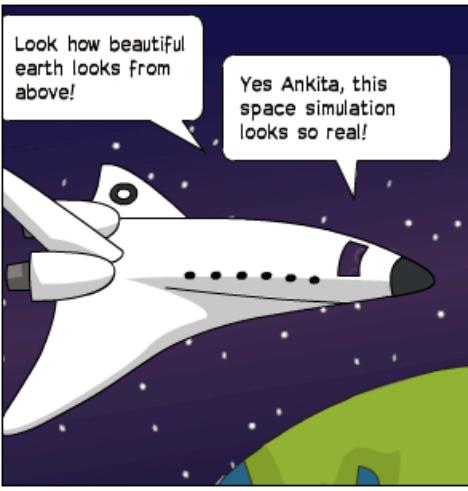
Hey! wait! She caught me!

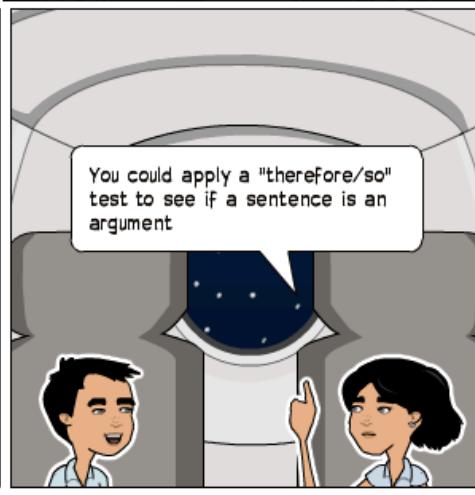
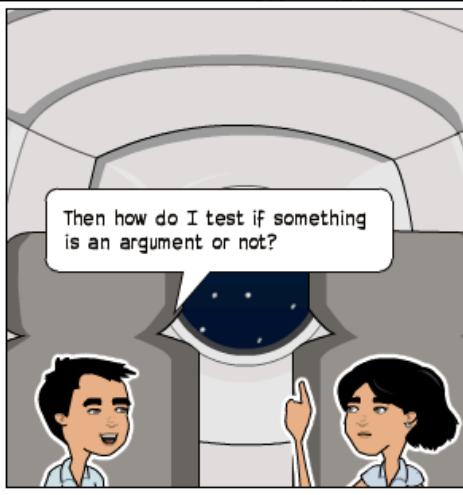
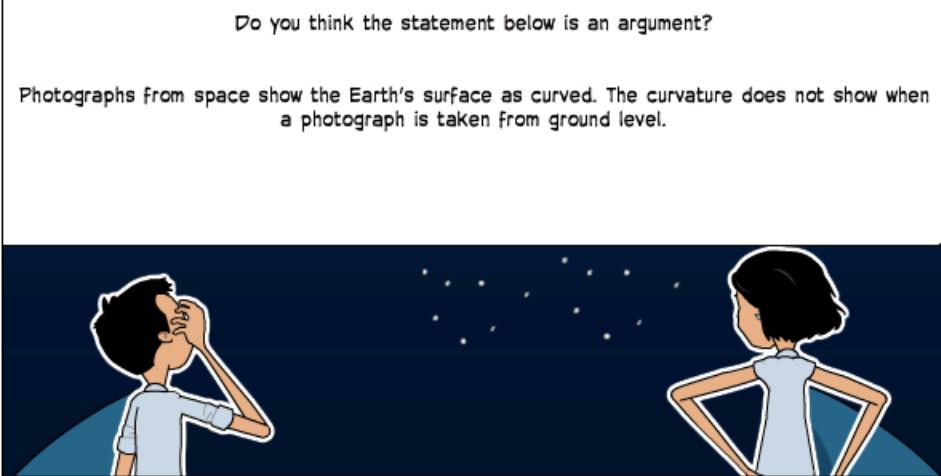




Out of the world







and see if that sentence is actually an argument or not

it is called "therefore/so" test...

You can put a 'therefore' or 'so' between the two claims in the sentence and see if it makes sense

If I apply the test, photographs from space show the Earth's surface as curved. **Therefore** the curvature does not show when a



You could also apply it like this:

The curvature does not show when a photograph is taken from ground level, **so** photographs from space show the Earth's surface as curved.

Neither of the two makes sense!

Yes, and hence, it is not an argument!

We can apply the same method as many logicians have applied for centuries

For example, look at this argument...

...and we will try to analyse this

Analyse this argument and see if this is justified?

The train doesn't leave until 4.24, but it can take up to 40 minutes to get to the station, if the traffic's bad. It's 3.30 now. We need to leave for the station within ten minutes to be sure of catching the train

If you read this carefully, you can break this into multiple arguments

Here there are two reasons mentioned

the time of the train's departure and the possibility of a 40-min journey to the station

If they both are true then clearly they justify the conclusion



The structure of the argument look like this... since the whole argument depends on these 3 reasons... they are called premise

In the case of R3, for instance, the inference that rail travel makes more sense is made on the grounds that trains take passengers right into a city center unlike planes..

nor other two premise on this...



So, even if one of the premise is wrong... you can argue that rail travels makes more sense on the basis of lower emission (R1) and less stress (R2)

to think arguments clearly, you can break it down the arguments in to reasons and conclusions

So, if an argument has 4 reasons and one conclusion...



it's standard form can be represented as R1,R2,R3,R4/C

Oh wow! I can think very clearly now and I must question everything that I see in this structure

Yes! Although, don't start from being sceptical





If we use 'R' for reason and 'C' conclusion we can say that all arguments have the form:

$$R_1, R_2, R_3, \dots, R_n / C$$

The reason and conclusion in a standard argument are all *claims*. In theory there is no limit to the number of reasons that can be given for a conclusion.

Take for example

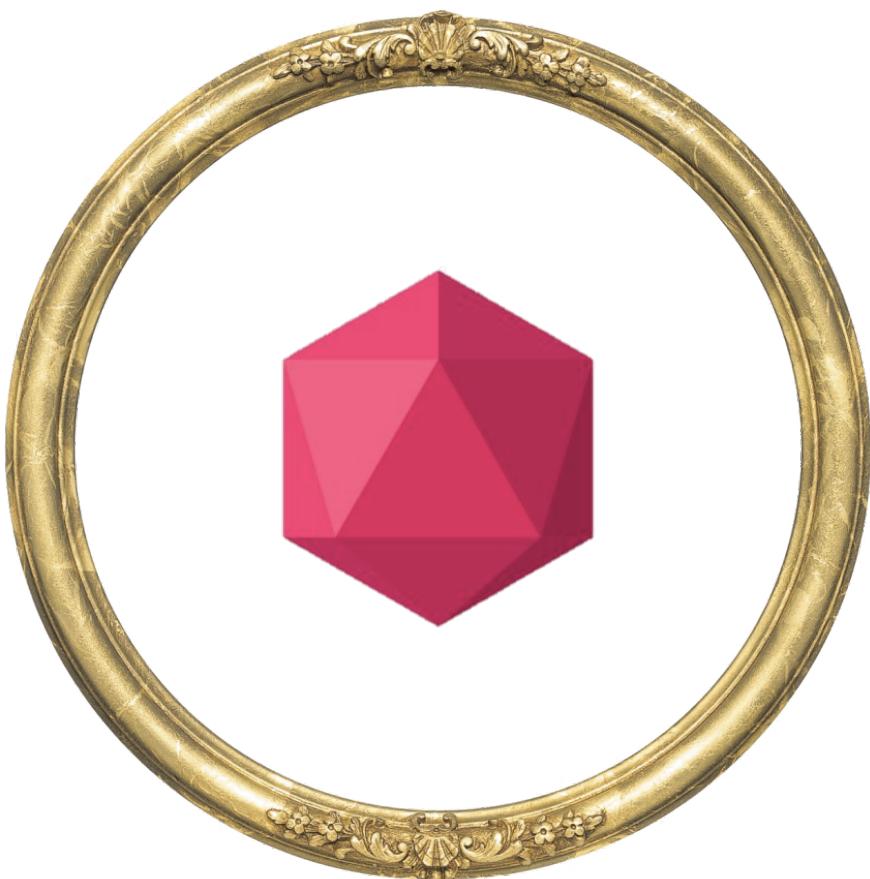
The train doesn't leave until 4.24,
but it can take up to 40 minutes to
get to the station, if the traffic's bad.
It's 3.30 now. We need to leave for
the station within ten minutes to be
sure of catching the train.

It would look like this in its standard form

R1 The train leaves at 4.24.
R2 It can take 40 minutes to get to the station.
R3 It's 3.30 now.

C We need to set off within ten minutes to be sure of catching the train

Shapes and structure





A more formal way of analysing these arguments is...

... is to breakdown all the arguments as reason and conclusions

You remember what argument and reason are from previous sections?



Yes! Argument is a set of reasons given to support an idea!

While reasons are explanations of an action or support to an idea!

So in a formal analysis, we breakdown all the arguments as symbols and analyse the argument!



If we use 'R' for reasons and 'C' For conclusions then standard form of any argument will be

R1, R2, R3..../ C



And if you draw connections, you will see the shape of the argument



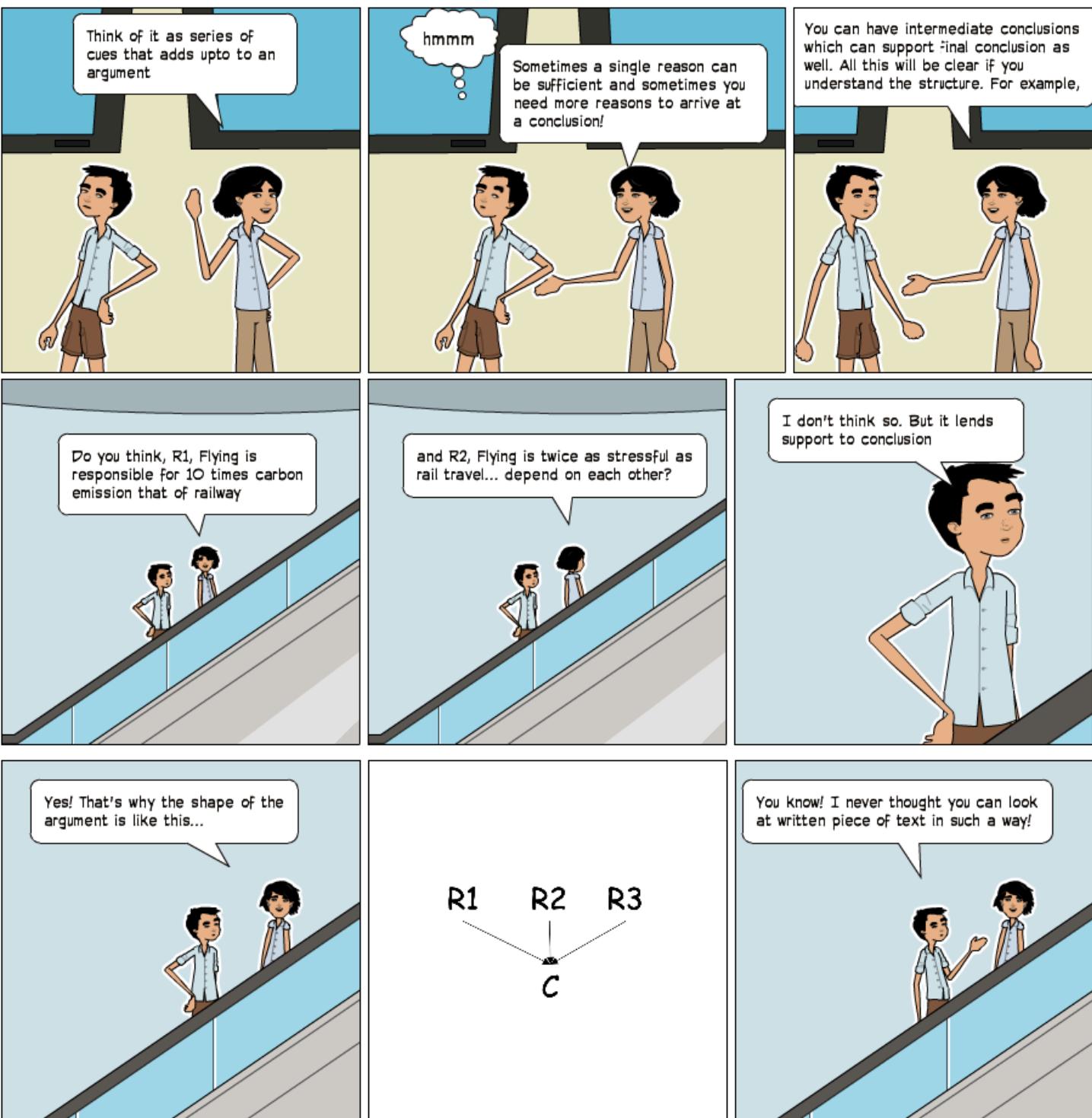
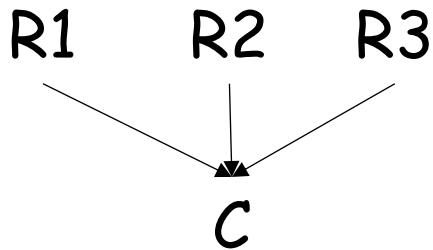
This shape of the argument also called the structure of argument, shows relationship between reasons and conclusions

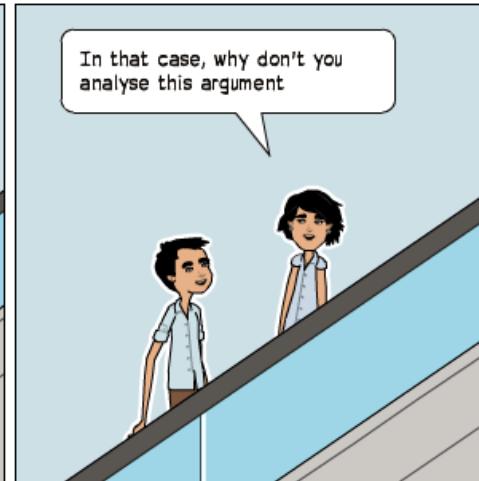
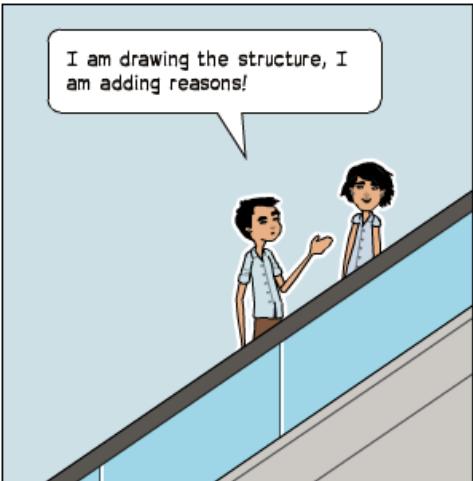


- R1 Flying is responsible for ten times the carbon emissions of rail travel.
- R2 Flying is twice as stressful (as rail travel).
- R3 Trains take you to the heart of a city, not to some far-flung airport.

C Rail travel makes a lot more sense than short-range flights.

If you want to represent the structure of the argument diagrammatically it would look like this:





Look at this argument and analyze it

Rajinder cannot be trusted to keep a secret. He was the only person apart from me who knew about Jai and Jheel getting engaged. I haven't said a word to anyone, yet now the news is all round the college. And he spread another story about Jheel that I told him in confidence.

R1

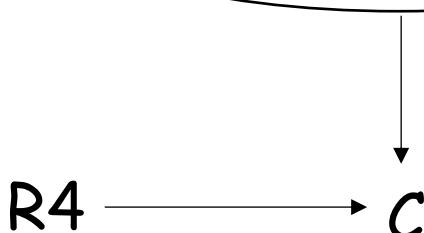
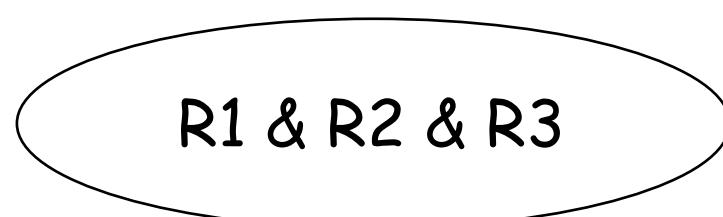
R2

R3

R4

C

Try to draw the structure of the argument and see if you find the structure to be like this





Consider the following report in a local newspaper:

Doctors investigating an outbreak of suspected virus discovered that four of the people who had reported sick had eaten at the fish restaurant the day before; and all had eaten fish. Any establishment that is found to be responsible for food-related sickness will be closed by the authorities and not permitted to reopen until it has been given a certificate of fitness from hygiene inspectors. Today the fish restaurant is closed.

Can any of the following claims safely or reliably be inferred from the passage above?

- A) The source of the outbreak of food poisoning was the fish restaurant.
- B) Fish was the cause of the outbreak.
- C) The has been closed down by the inspectors.

According to the passage we have three facts:

1. Four people who reported sick had recently eaten at the restaurant.
2. Any establishment responsible for food-related sickness is closed by the authorities.
3. The restaurant is closed (today)

Yes! You are absolutely correct!

So between them, do they justify any claim?

Although, there is a suspected link between restaurant and people getting sick

I can not say for sure if restaurant was responsible for sickness

I can not say for sure if restaurant was responsible for sickness

Other than that they ate at the restaurant

YES!!

And why you can't conclude that?

Well, its possible that there were other connections between them

They could be friends who shared food and drinks besides the meal at restaurant

Nor we are told if there were others who were sick besides the four mentioned!

There may have been others who fell sick but did not report their illness

Similarly, we don't know if Fish was the reason for sickness

We are not told if all four who fell sick did not eat anything other than fish

They could have very well eaten something else, a side dish, sauce, contaminated water, etc...

There could be many reasons other than fish that may have caused this... probably lack of hygiene in the kitchen

Nor is it safe to infer that inspector closed the restaurant

The statement in the newspaper that restaurants found responsible for food-related sickness have to close is actually irrelevant

It does not mean that because a restaurant closes it is responsible for the sickness

Many restaurants close on one or more days of the week.

Today may be the chef's day off. Many explanations for the closure are possible besides the seemingly obvious one, that it was closed because of food poisoning.

That makes perfect sense!

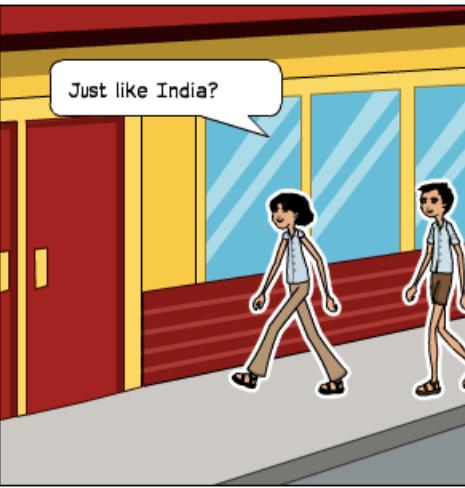
We are finally here!

You know why we are in France?

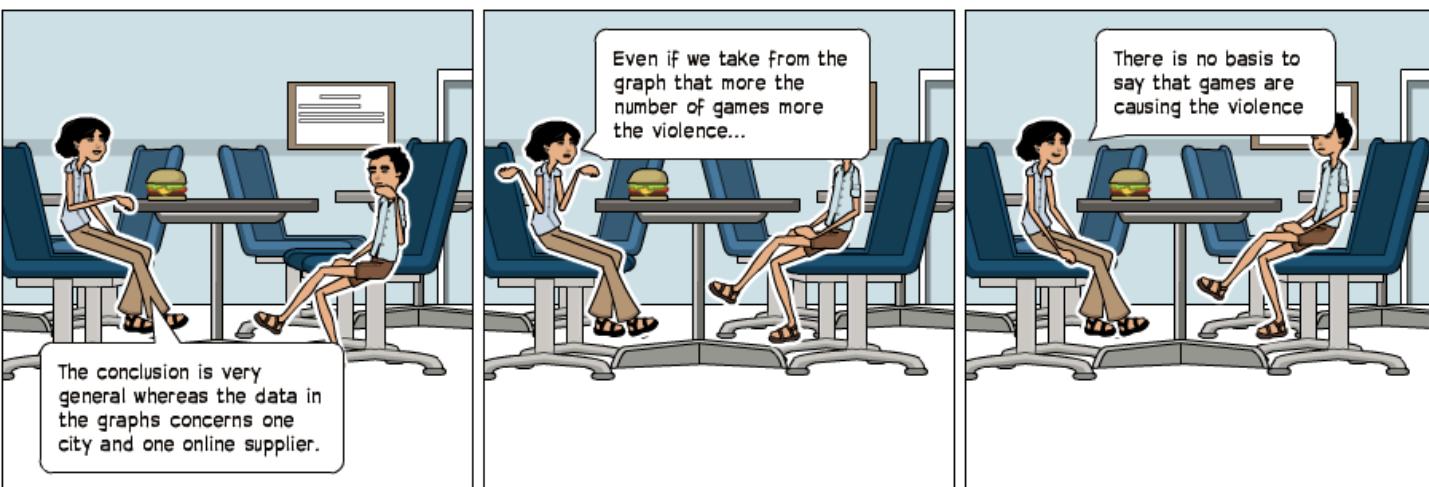
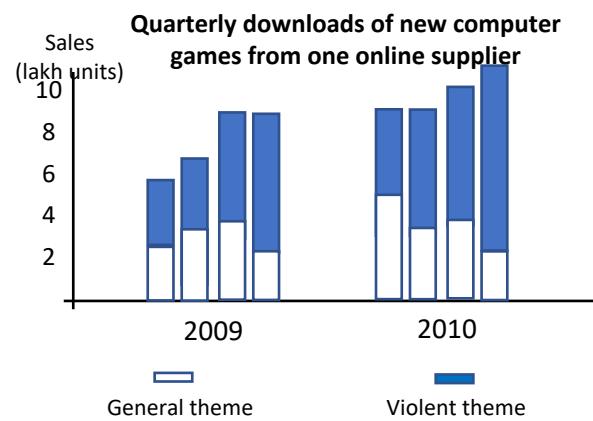
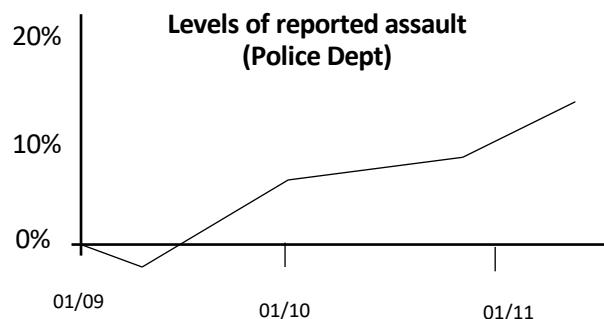
I actually don't

The beginning



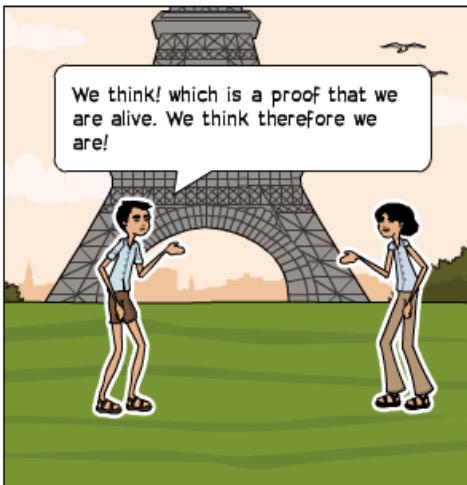
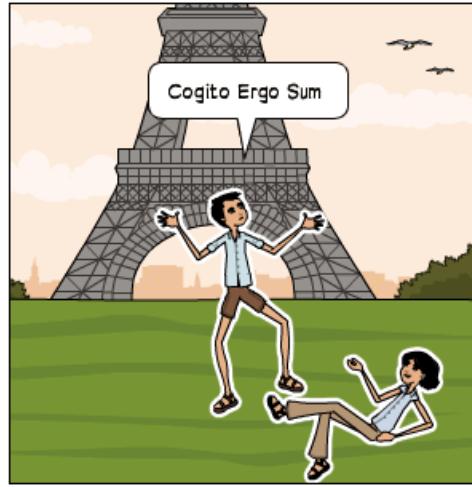


Would the data in the two graphs below support the conclusion that computer games contribute to violence?





René Descartes
(1596 – 1650)



Analysis of arguments

Following is the analysis of arguments given in section "hold your judgement"

Argument 2: The dinosaurs were reptiles, yet they were warm-blooded.

Analysis : The connective is 'yet' and the two connected claims both have to be true for the argument to be true. Firstly that dinosaurs were reptiles, and secondly that they had warm blood. But the use of the connective 'yet' also suggests that there is something surprising or unusual in this: that the second claim is true despite the first being true. The implication is that reptiles are usually, or normally, cold-blooded; and if this is not the case then the use of 'yet' is not really justified, even if both the claims are true in themselves.

Argument 3: Sea levels are rising around the world because global warming is melting the polar ice caps.

Analysis: This argument has two claims connected by 'because'. The author not only asserts that the seal levels are rising and that global warming is causing melting of the polar ice, but also that the sea level is rising because of polar ice cap melting. If all these three conditions are true i.e. two claims and that the first claim is causing the second claim then the argument is sound.

Analysis of arguments

Argument 4: Many parts of the world will soon be submerged if nothing is done to reverse climate change.

Analysis: The connective in this argument is 'if'. First of all it is not claiming either that parts of the world will soon be under water, or that nothing will be done about climate change. Since, the connective is 'if', it indicates that one argument is true, then the other argument also must be true. For instance, if nothing is done, about climate change, then parts of the world will be underwater. If nothing is done and the prediction turns out a false alarm, then the argument as a whole is untrue.

Acknowledgement

We acknowledge the work done by Mr. John Butterworth and Mr. Geoff Thwaites on critical thinking through their book - Thinking Skills (Critical Thinking and Problem Solving)

This book has been a big source of inspiration for
Cogito

Additional resources

Readings

1. Introduction to Logic and Critical Thinking, Matthew J. Van Cleave
2. The basic concepts of Logic, University of Massachusetts

Videos

1. [TED-Ed - Riddles](#)
2. [5 tips to improve critical thinking](#)

We thank all the contributors for making the above resources available on the internet.



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