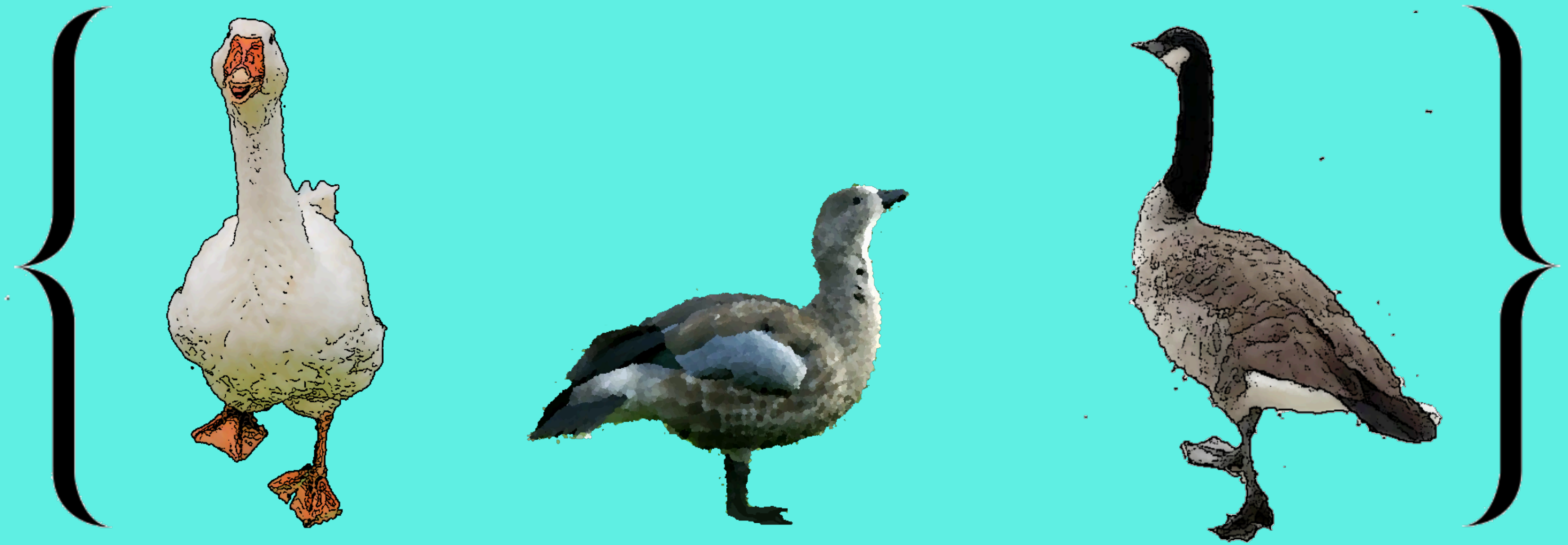
Gus the Goose

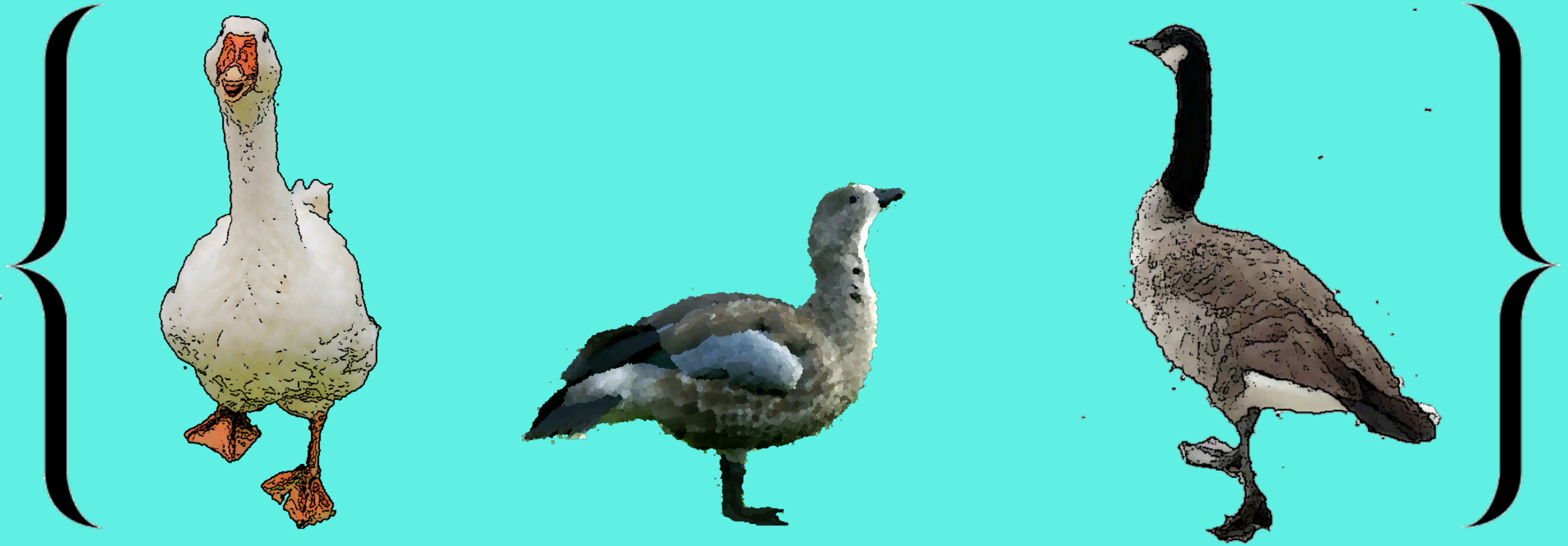
Gus the Goose went out to play

Out with friends on a sunny day

How many? You may wish to ask?

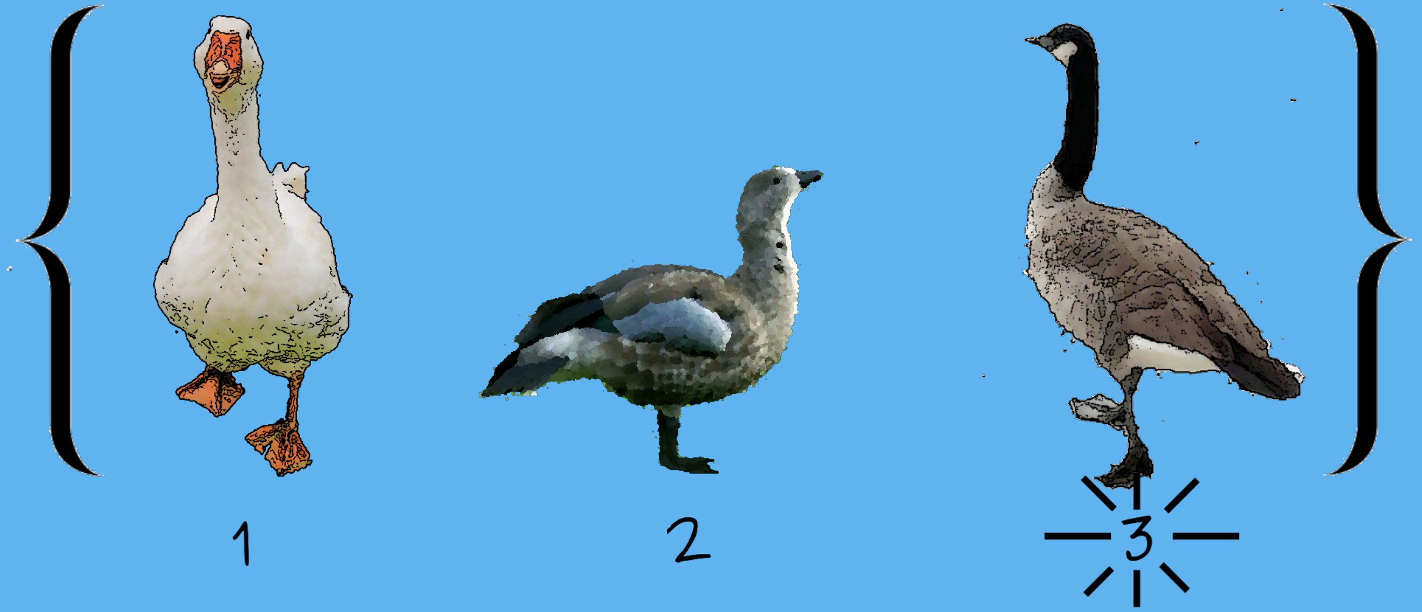
This **set** of friends with whom Gus basked?

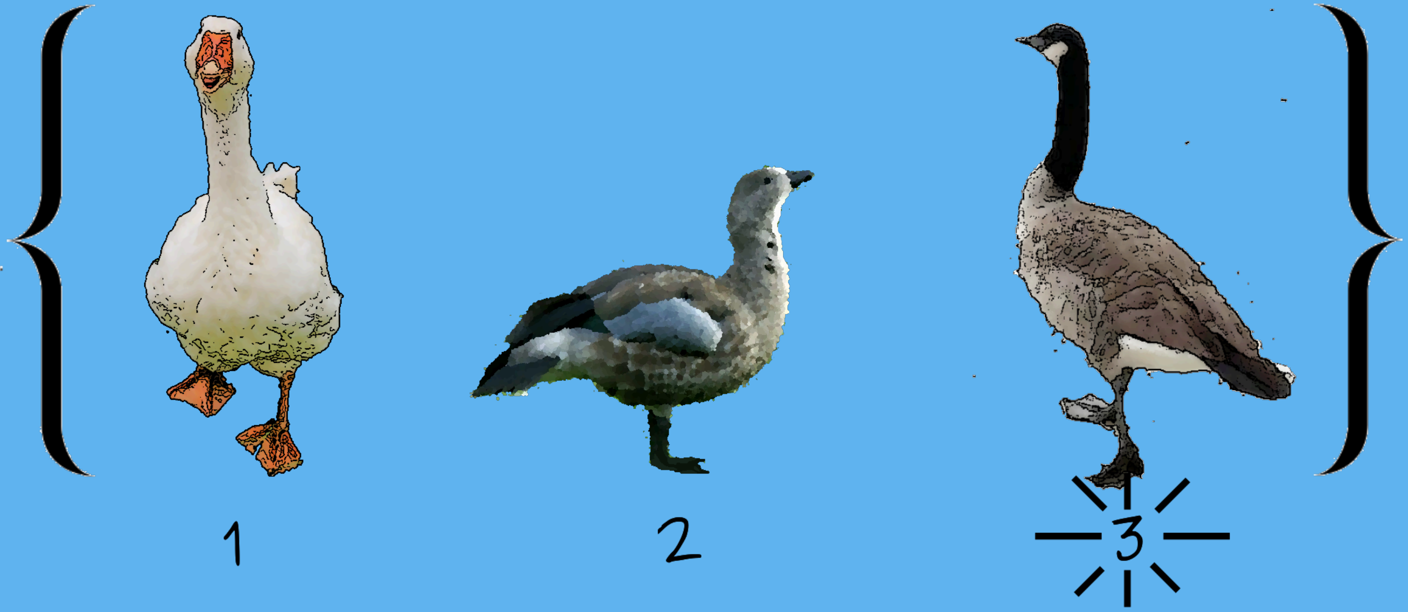




He began to count them (1, 2, 3)

And ended with the cardinality!



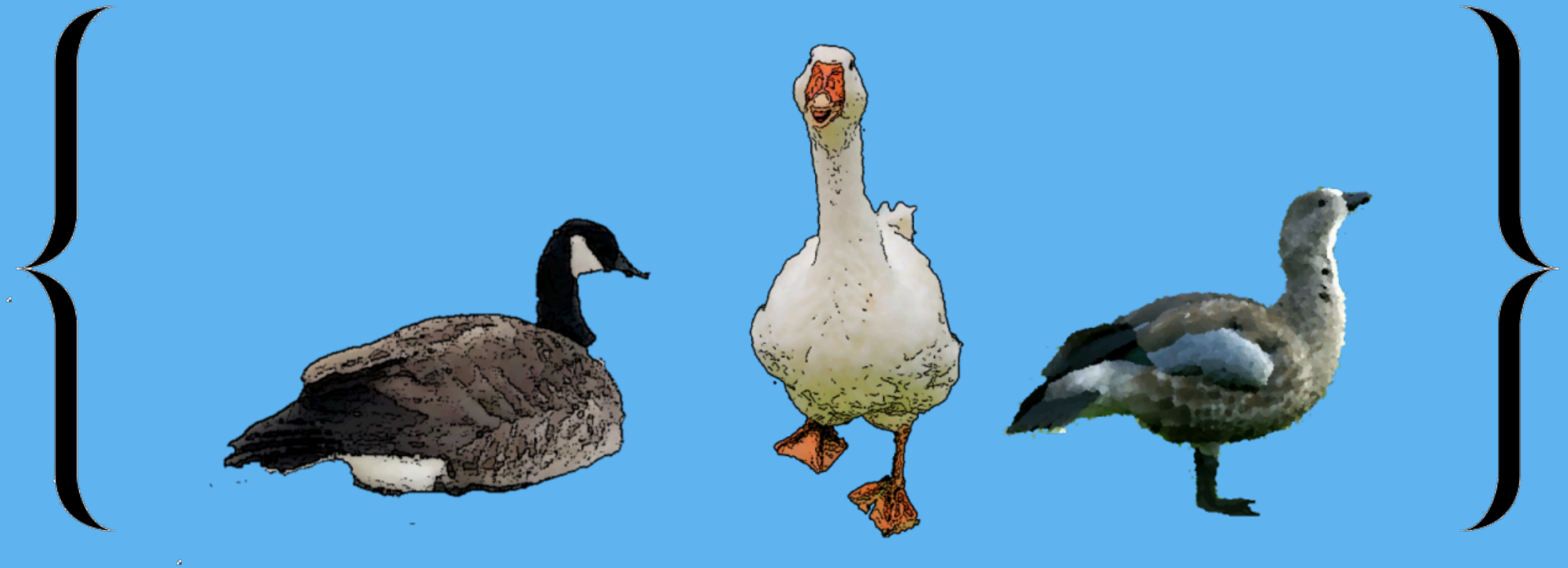

1
2
3

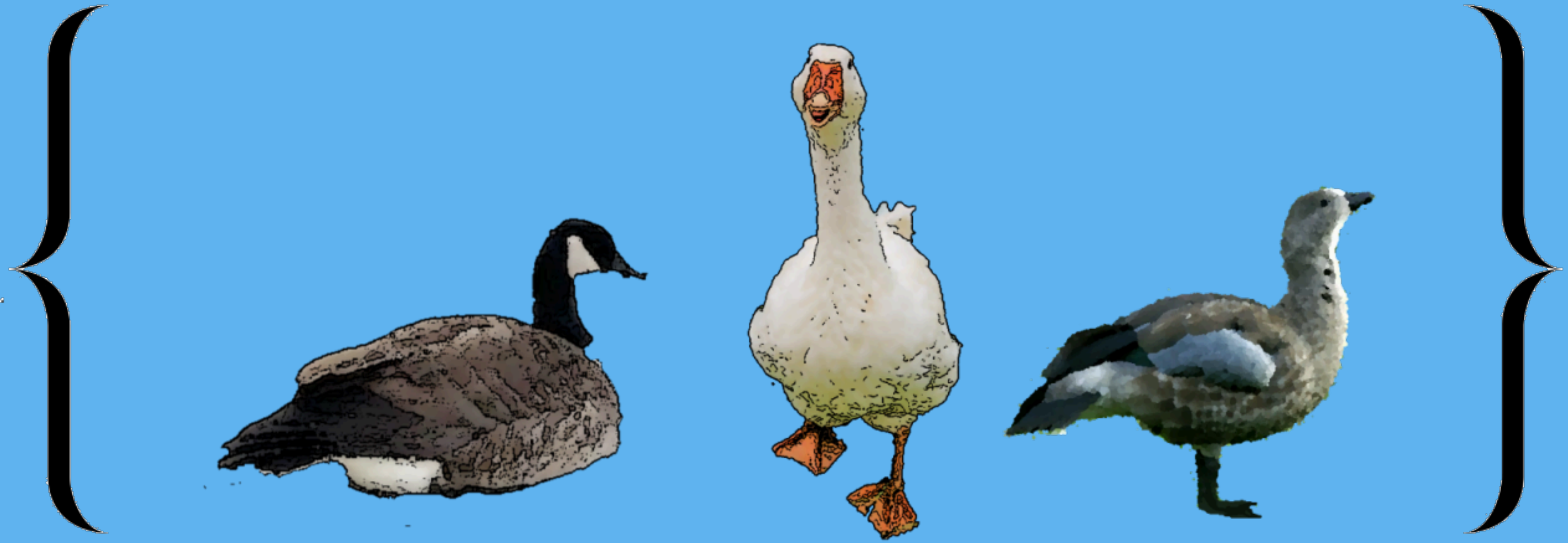
Tomorrow new friends came to play

And some friends had to go away

This gave a new set: 2, 3, 4

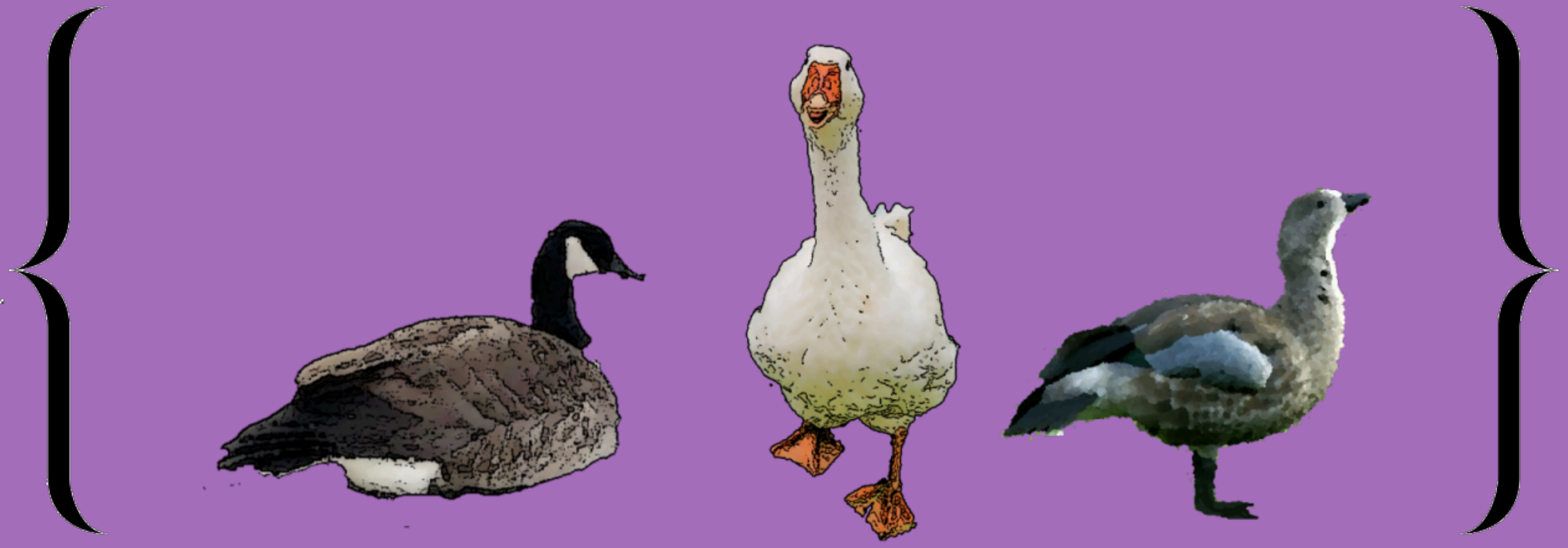
Looks like Gus has friends galore!

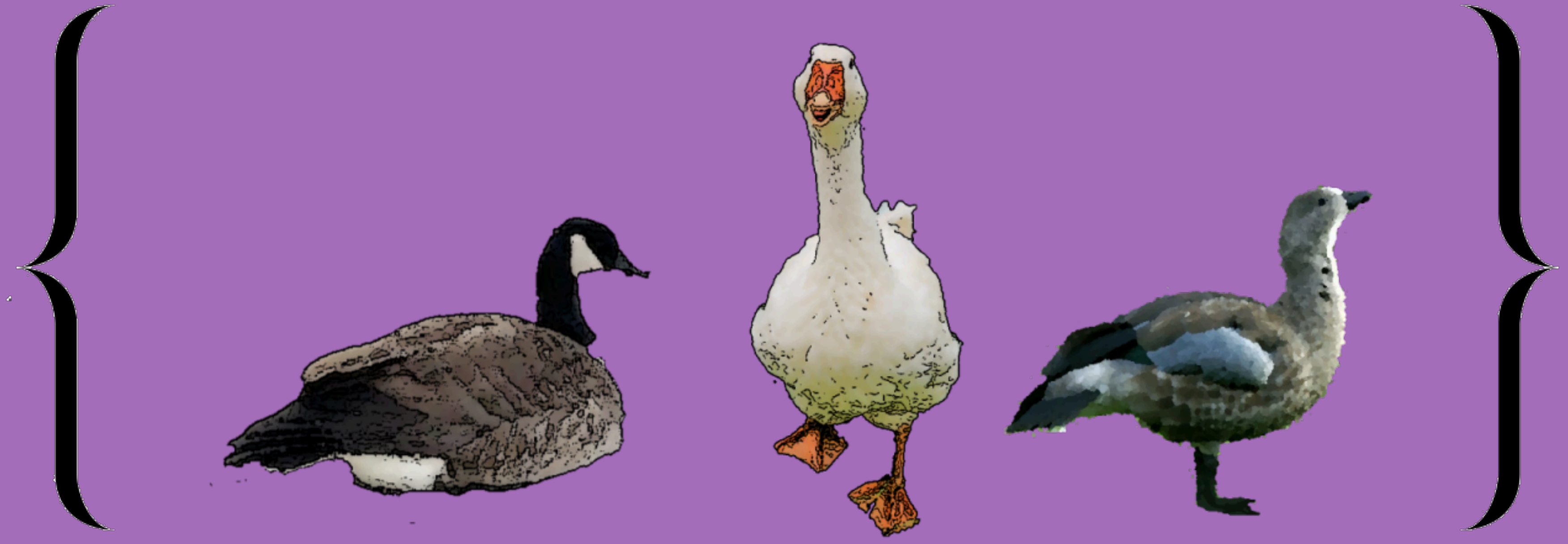




Yesterday, we called friends “A”

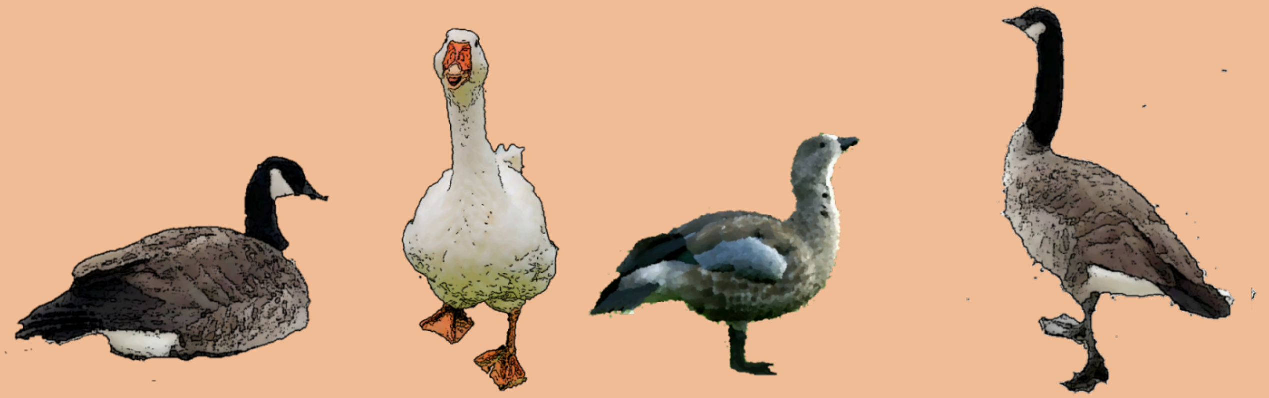
Today Gus plays with friends called “J”

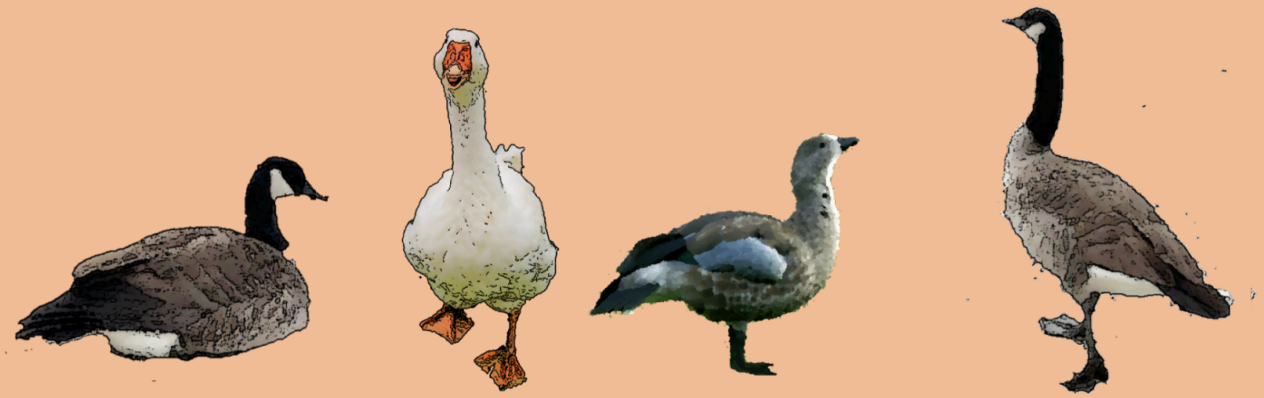




What happens if we join them together?

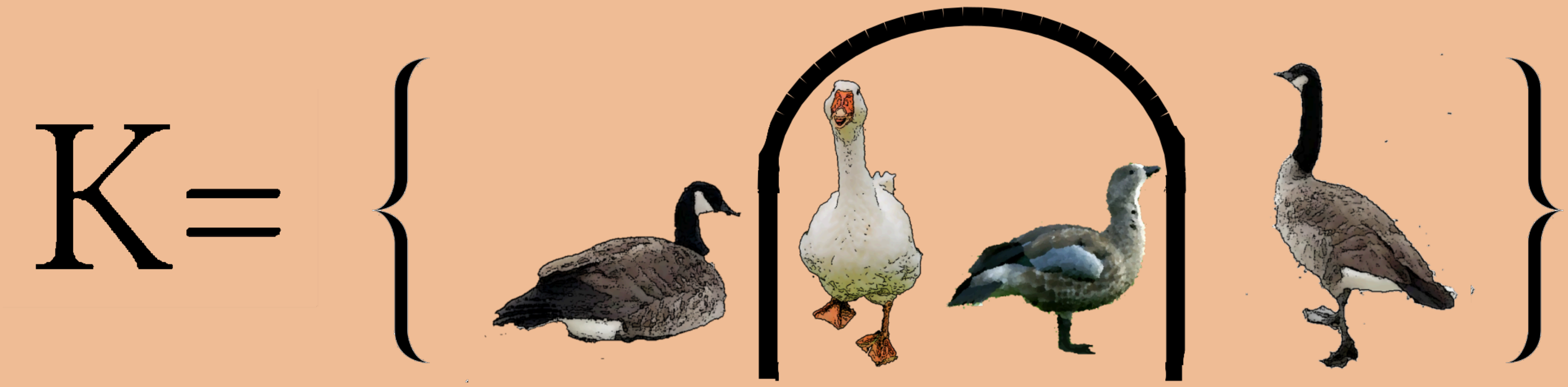
The **union** of these friends forever?

$K=\{$  $\}$

$K = \{$  $\}$

We get set “K” with all of them!

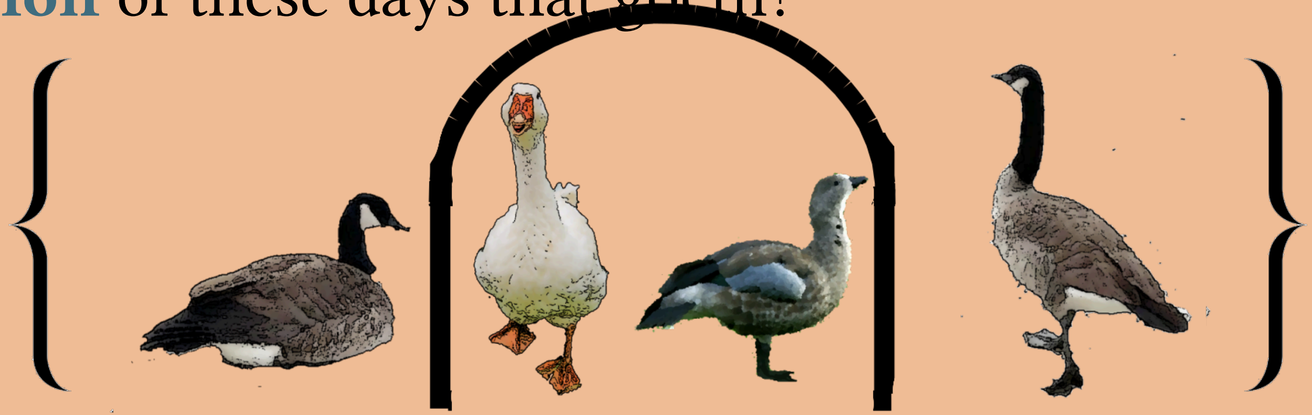
{1, 2, 3, 4}



What if we took the friends from both?

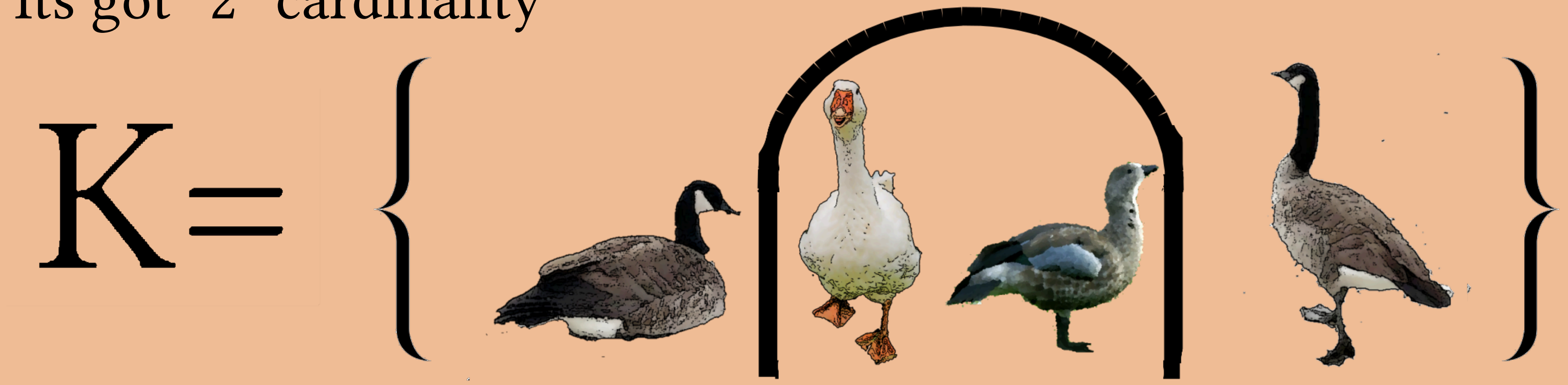
The **intersection** of these days that goeth?

K=



We get {2, 3} as you can see!

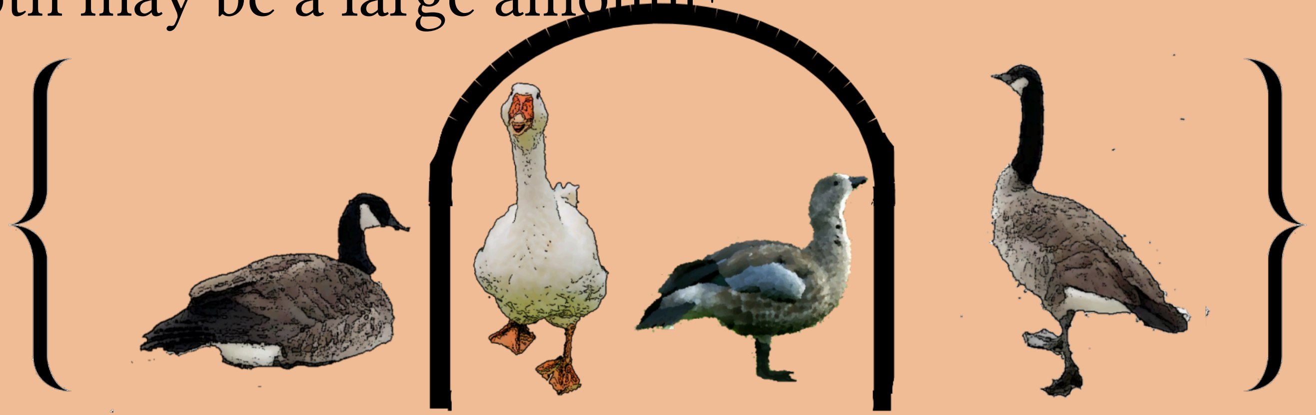
Its got “2” cardinality



Just be careful about the union count,

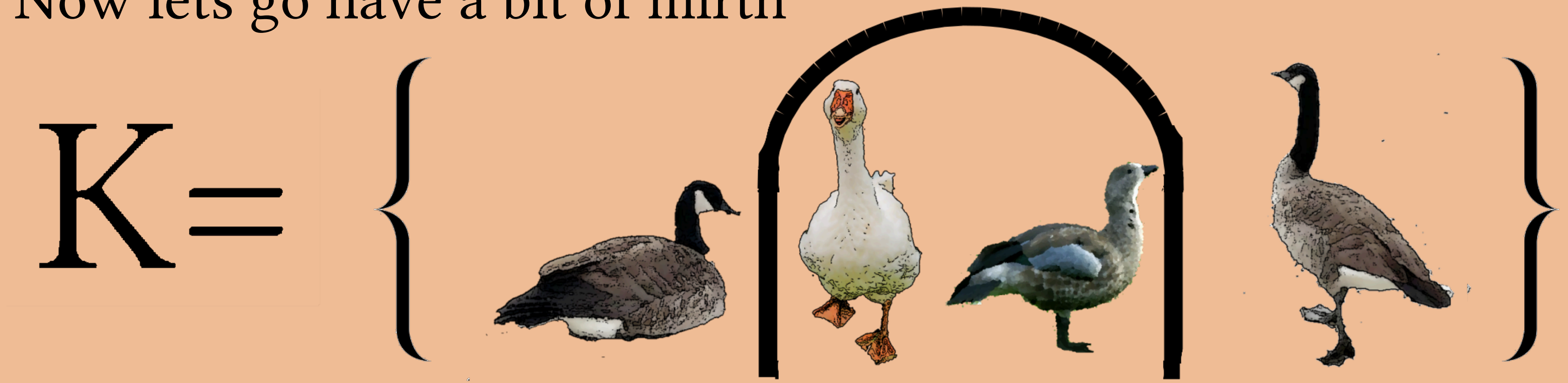
The sum of both may be a large amount!

$K=$



Phew! Now that was quite a bit of work

Now lets go have a bit of mirth

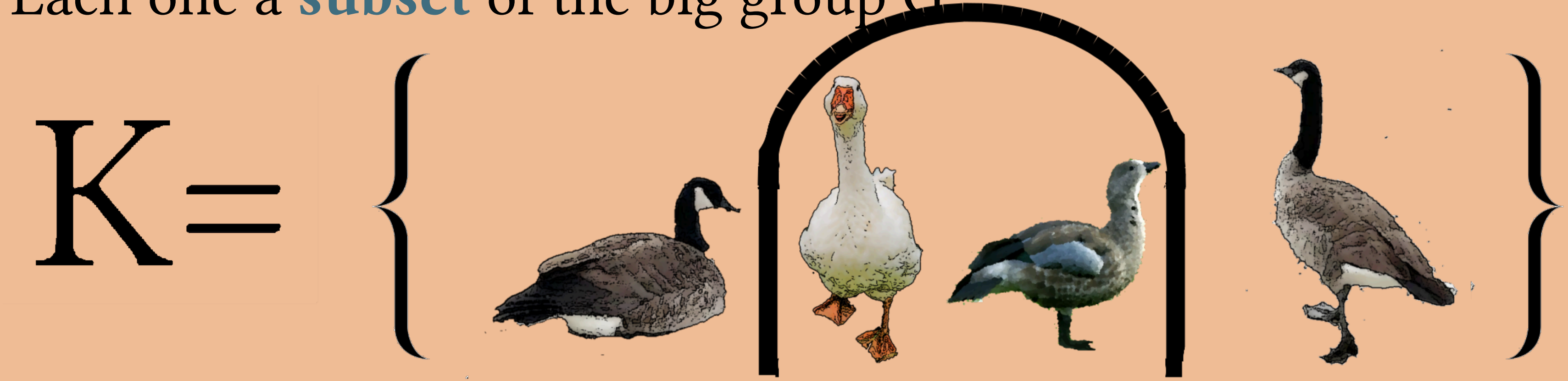


Cottontail thought of a game to play

Dodgeball would make it an excellent day!

Lets make teams, two sets, P and T

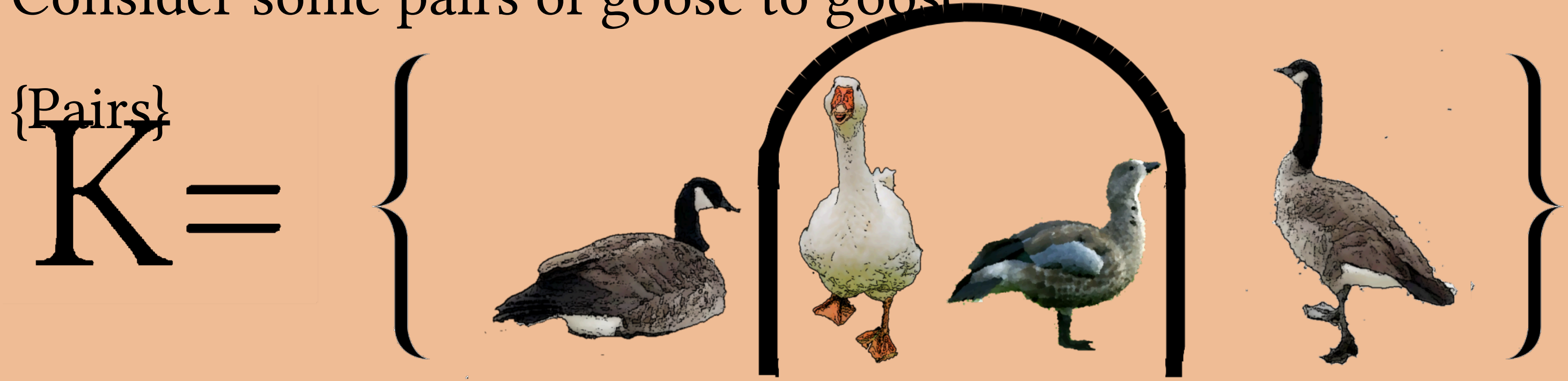
Each one a **subset** of the big group G



Now how to think about who hit who?

Consider some pairs of goose to goose

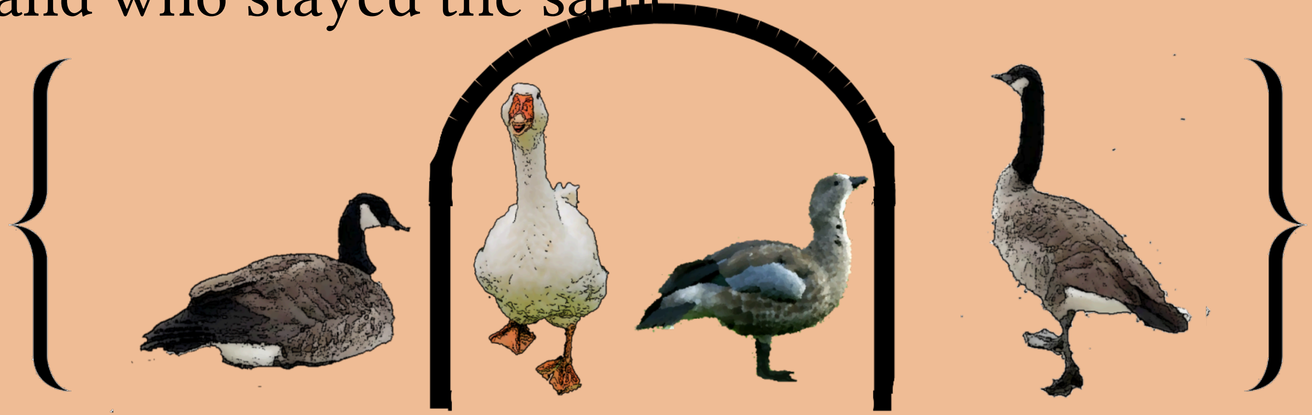
{Pairs}



This **relation** between them shows us the game

Who hit who and who stayed the same

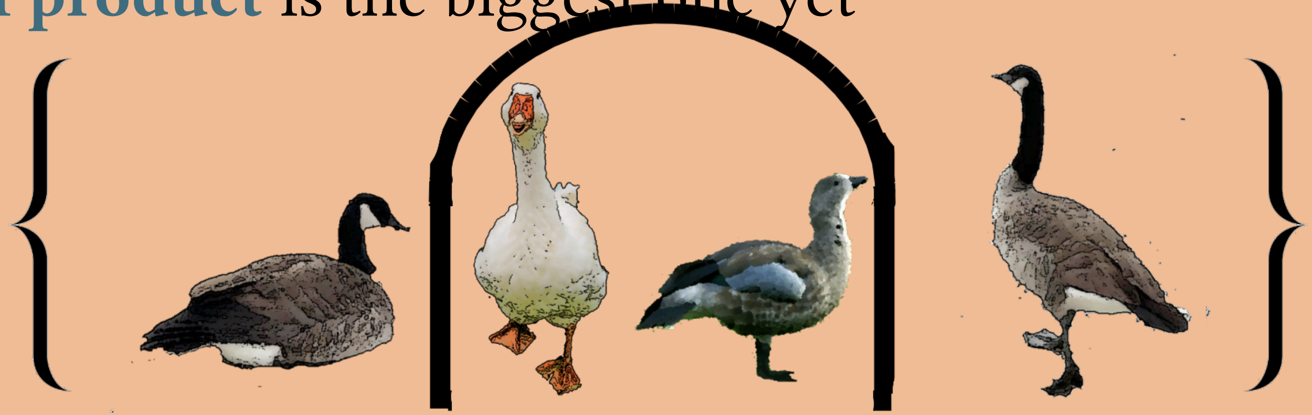
$K =$



A relation like this is also a set

The **cartesian product** is the biggest one yet

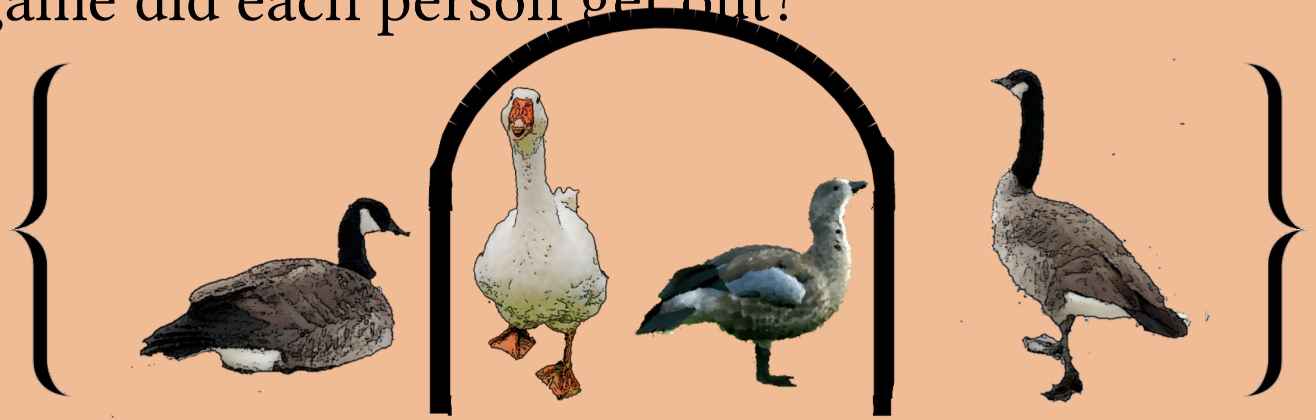
K=



After the question, losing team had their doubts

When in the game did each person get out?

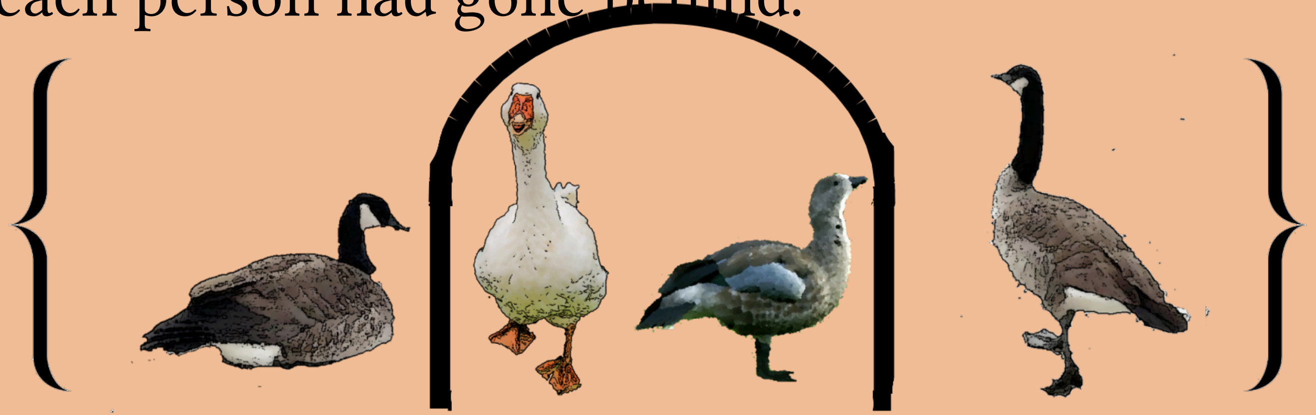
K=



They made a relation of each person and times

To find when each person had gone behind.

$K=$

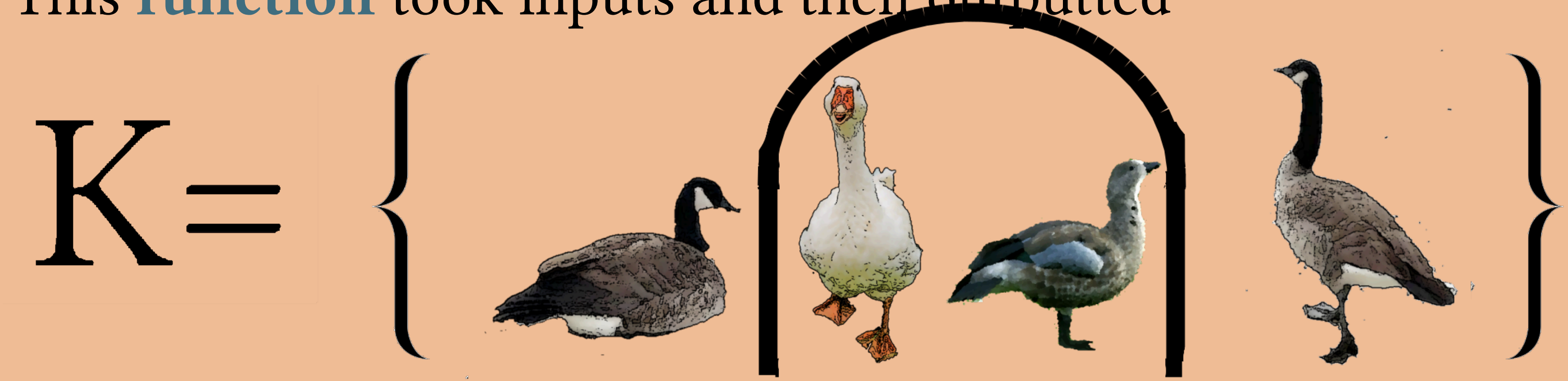


Each person could only have once been outed

So there is only one pair (player, time) per player who pouted

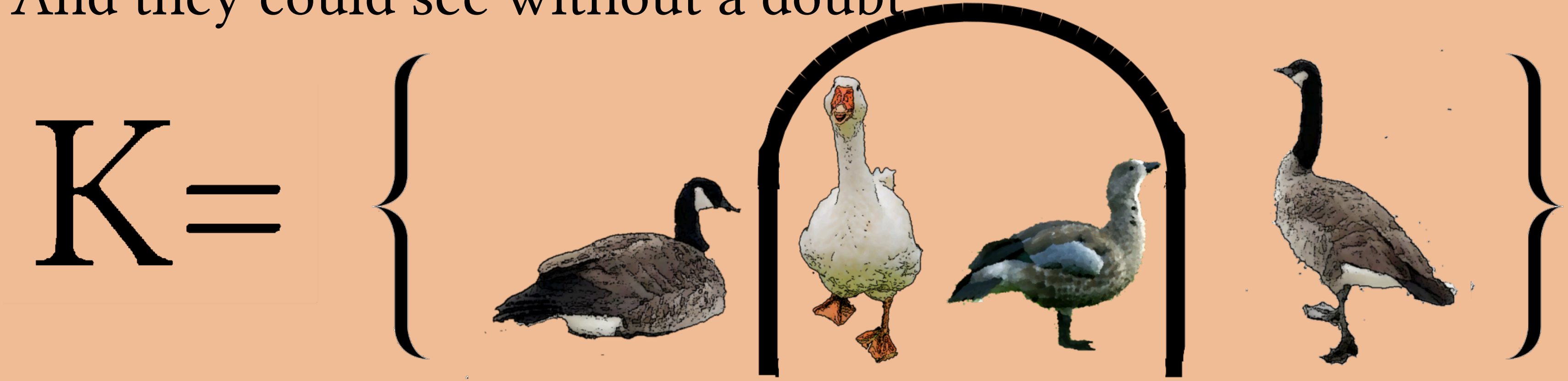
Because at the end, every player was outed

This **function** took inputs and then outputted



The time that each goose got knocked out

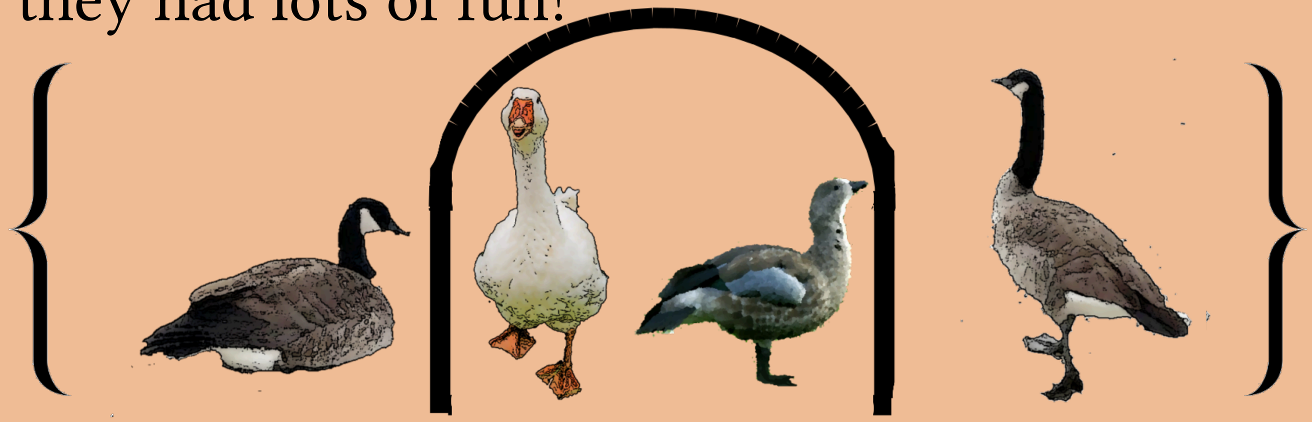
And they could see without a doubt



That they had lost and the others had won

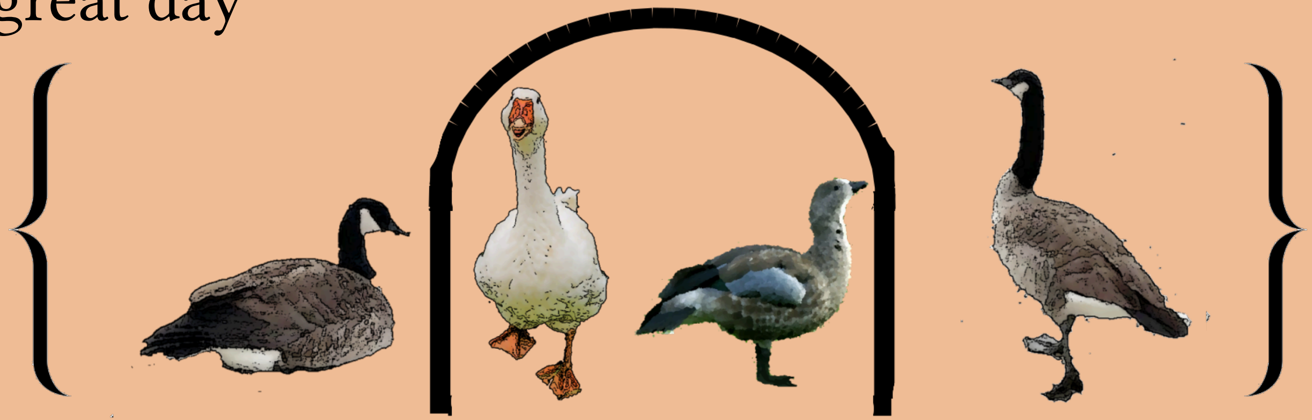
But that's OK, they had lots of fun!

$K=$



Gus was happy

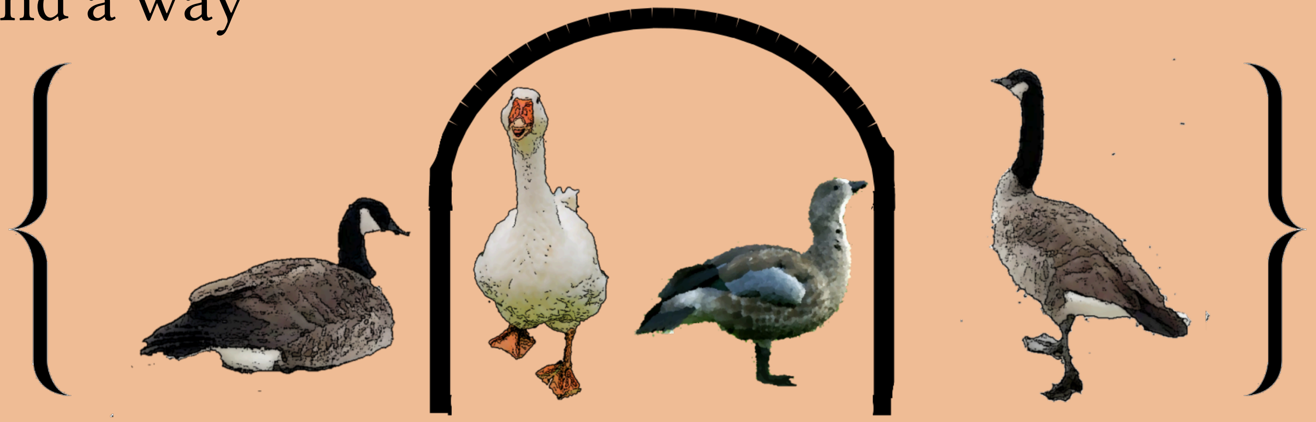
He had had a great day

$K =$ 

He wanted to go home

but couldn't find a way

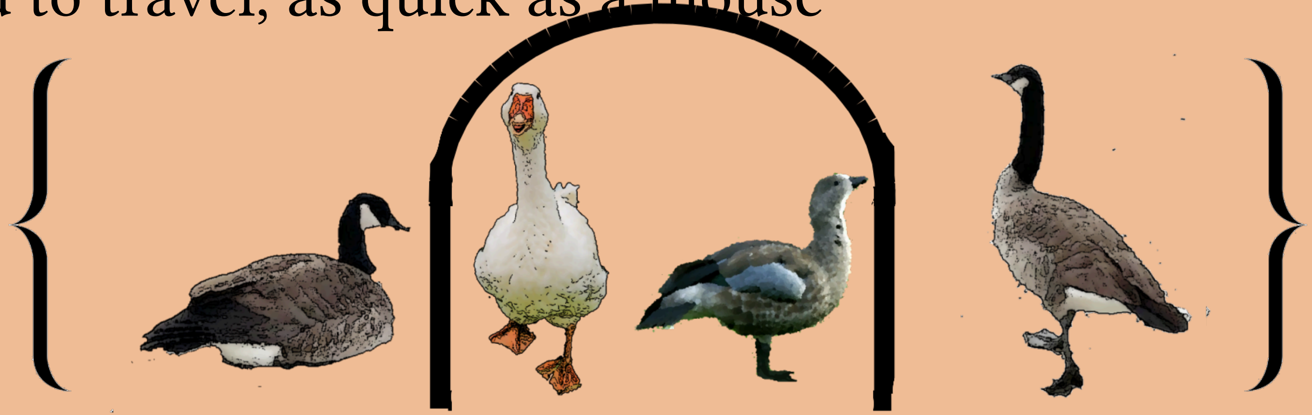
$K=$



He needed to get from house to house

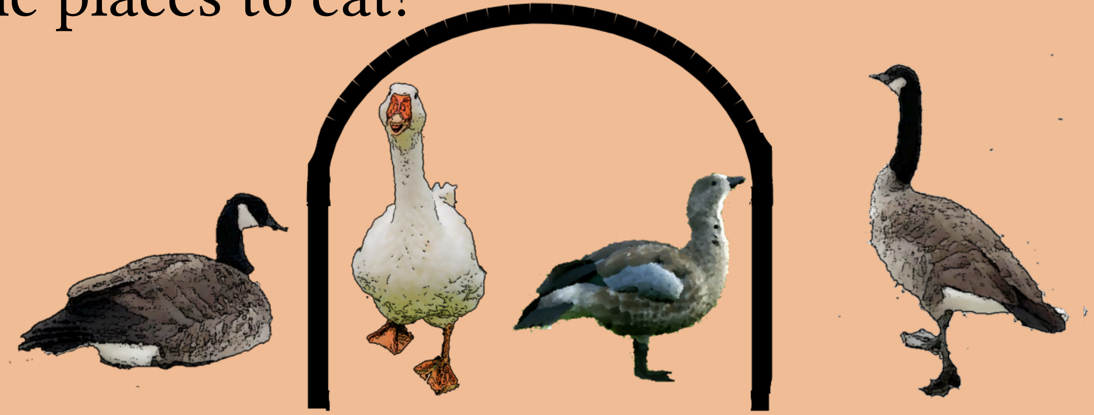
But he wanted to travel, as quick as a mouse

$K =$



He had a list of all the streets

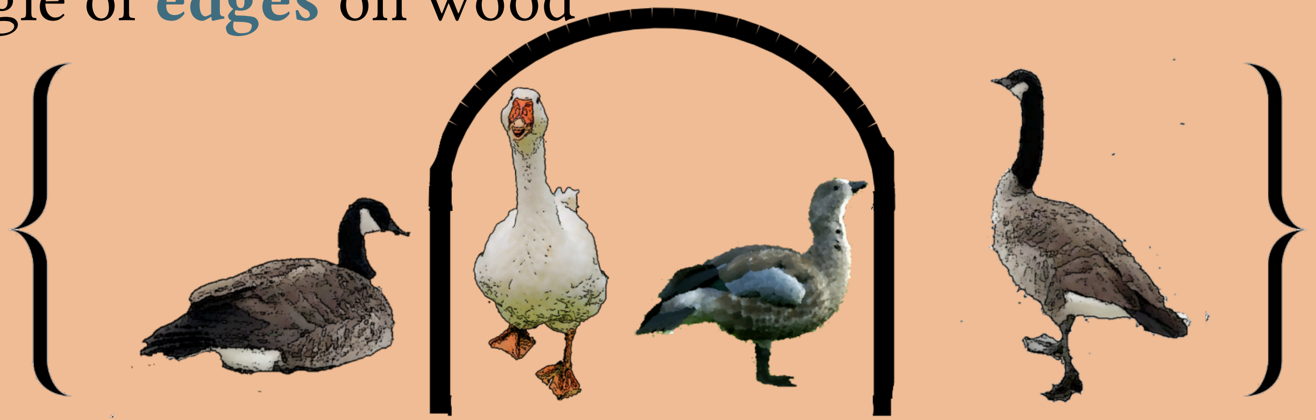
A relation on all the places to eat!

$K = \{$  $\}$

This **graph** he drew as quickly as he could

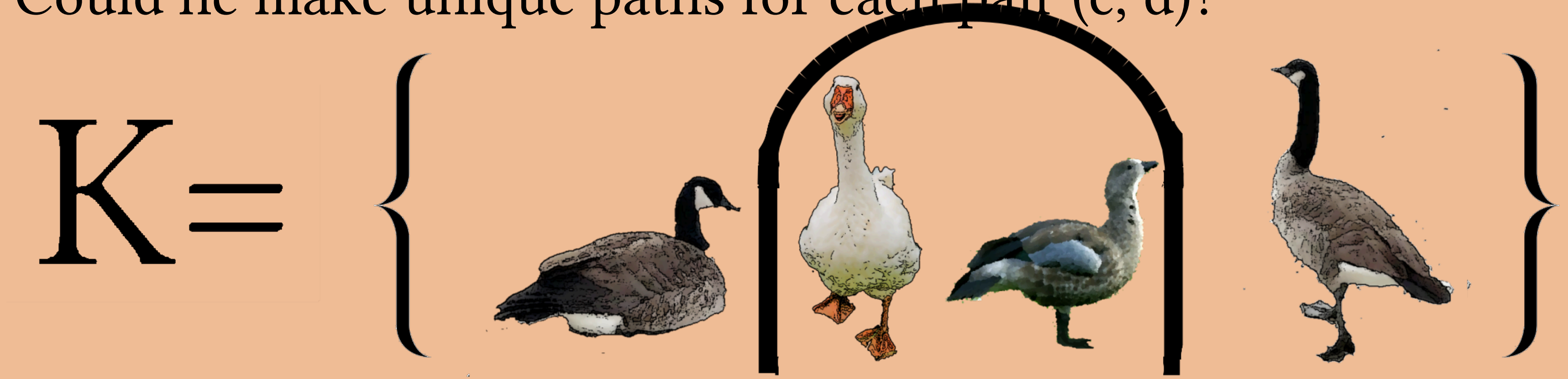
Carving a tangle of **edges** on wood

K=



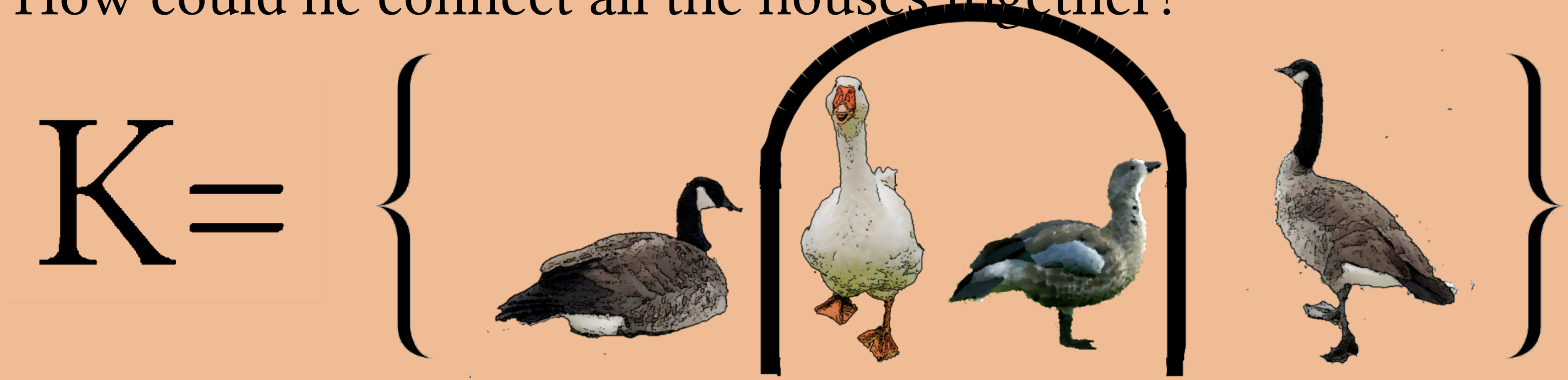
How could he get from house A to house Z?

Could he make unique paths for each pair (c, d)?



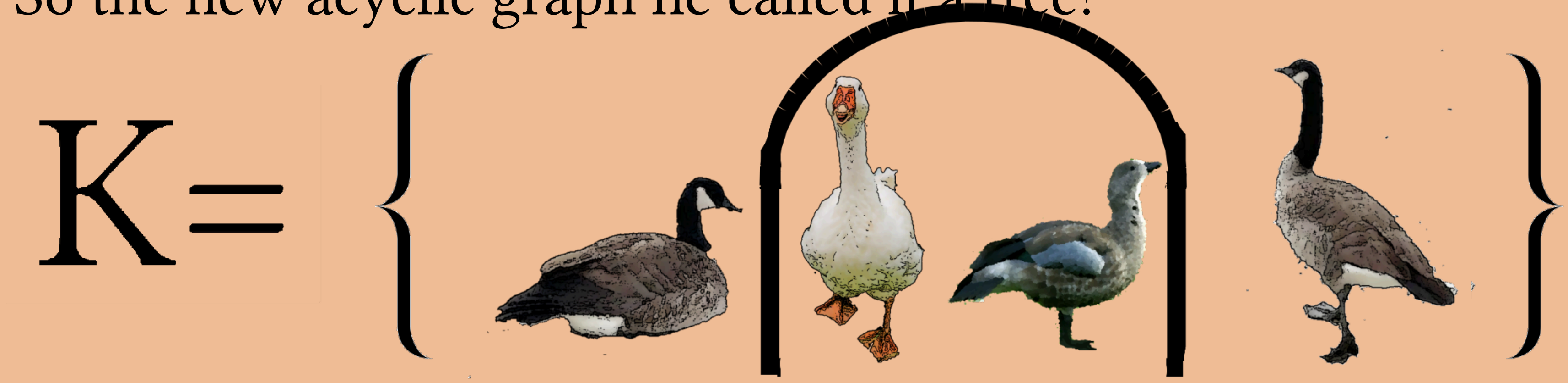
Once he made it back home he had an idea

How could he connect all the houses together?



He didn’t want to have to become absentee

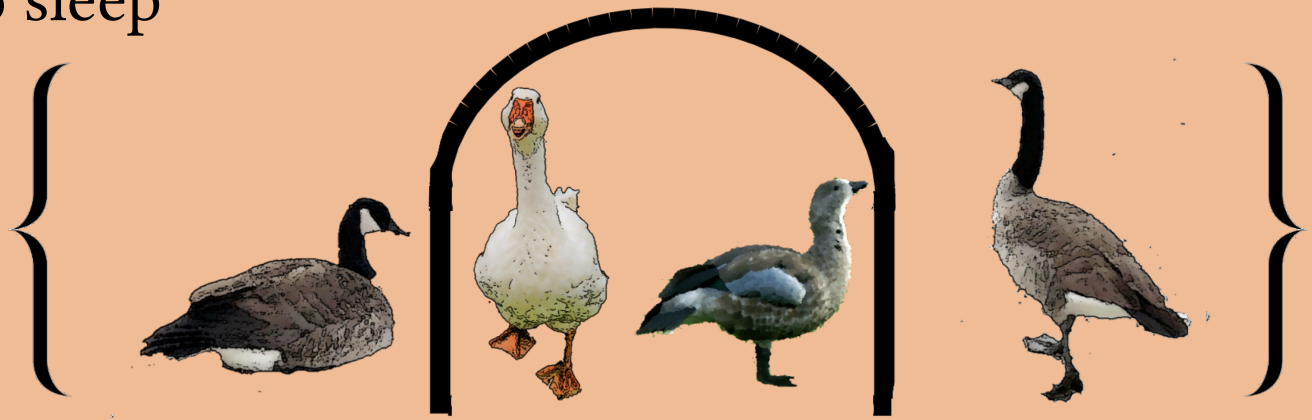
So the new acyclic graph he called it a tree!



Gus was exhausted

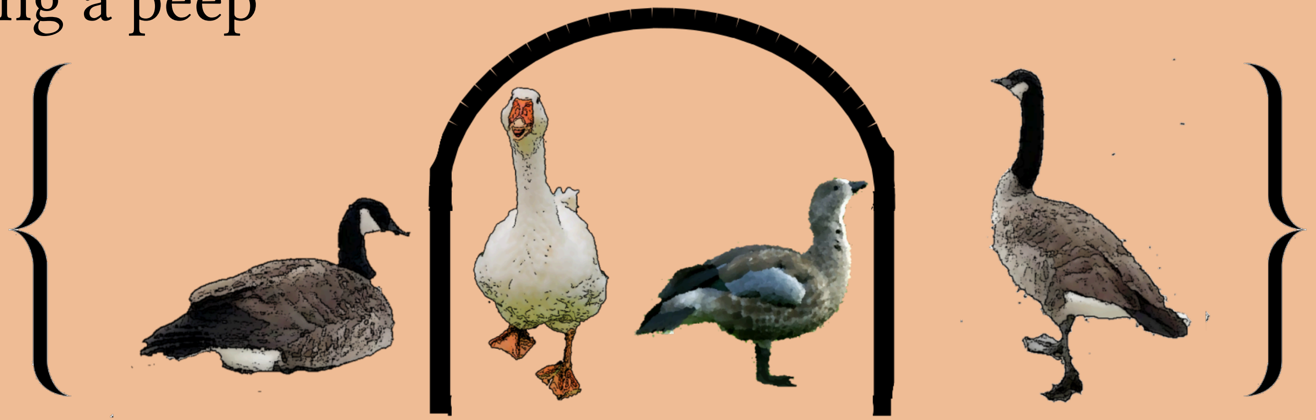
He went off to sleep

K=



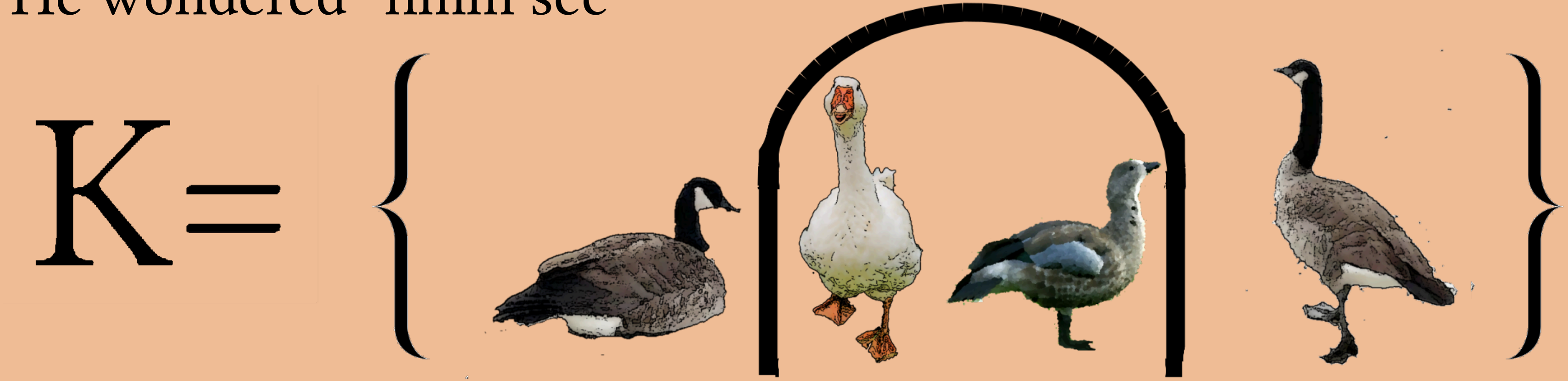
He dreamt of soft sheep

Without making a peep

$K =$ 

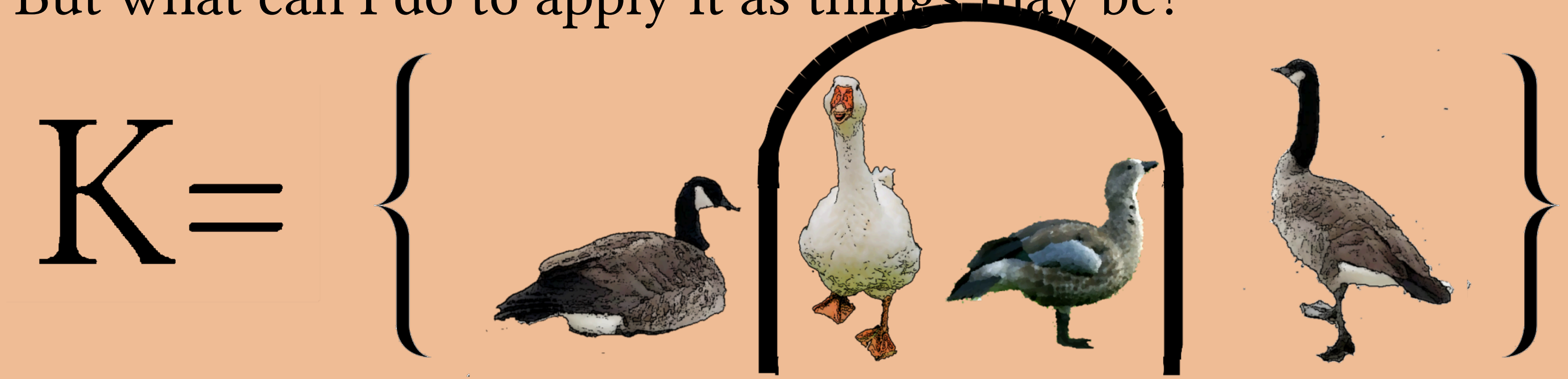
When he woke up, refreshed

He wondered “hmm see”



I know all this math about graphs and trees,

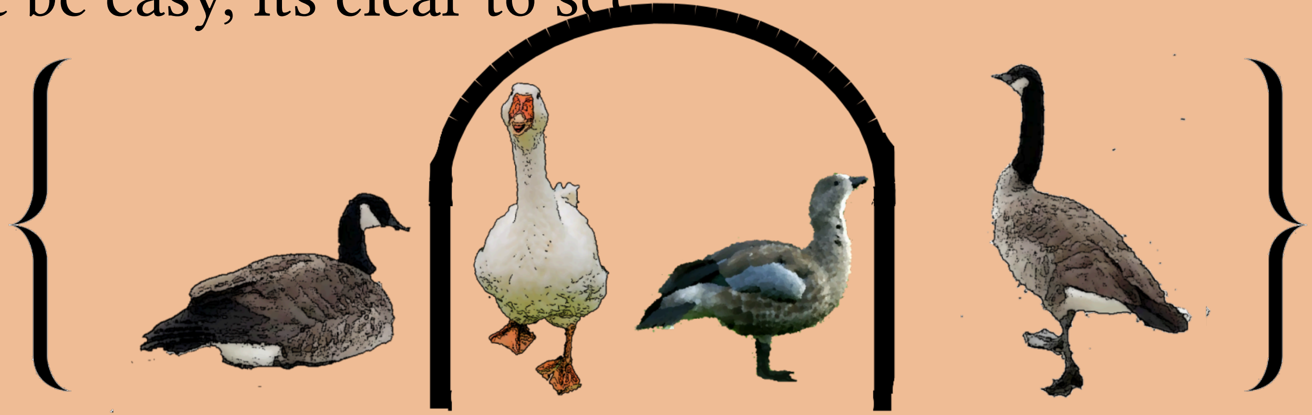
But what can I do to apply it as things may be?



I can argue directly “A leads to B”

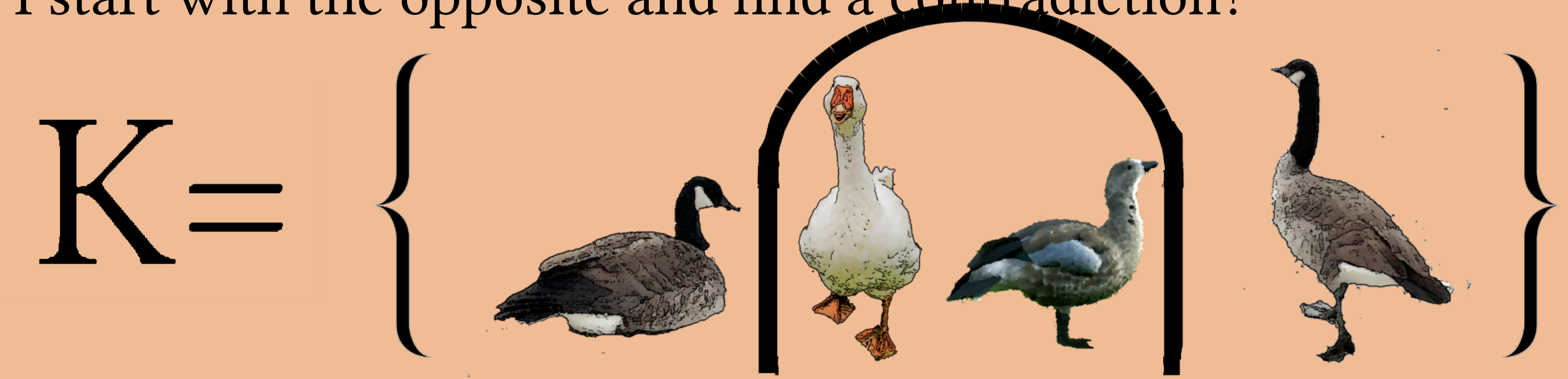
But it may not be easy, its clear to see

K=



What if I went through another direction?

I start with the opposite and find a contradiction?



That means that the opposite cannot be true

So the statement is done. Yay and woo-hoo!