

Gus the Goose



Gus the Goose went out to play
Out with friends on a sunny day



Who were they? You may try to ask?

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



Duckie, Cottontail, and Blues McGee

He began to count them (1, 2, 3) and ended with the cardinality!



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?



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?



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

Its got “2” cardinality



Just be careful about the count for union,
The sum of both may be more than bargained!



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



A relation like this is also a set

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



After the question, losing team had their doubts

When in the game did each person get out?



They made a relation of each person and times
To find if each person had gone behind.



Each person could only have been once been outed

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



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



Gus was happy

He had had a great day



He wanted to go home
but couldn't find a way



He needed to get from house to house

But he wanted to travel, as quick as a mouse



He had a list of all the streets

A relation on all the places to eat!



This graph he drew as quickly as he could
Drawing a tangle of walkways called edges



How could he get from house A to house Z?

Which of the paths to travel should he?



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

The new acyclic graph he called it a tree!



Gus was exhausted

He went off to sleep



He dreamt of soft sheep

Without making a peep



When he woke up, refreshed

He wondered “hmm see”



I know all these meanings,
But don't have feelings



Because how can I reason about
Graphs, sets, and trees?



I can argue directly “A leads to B”

But it may not be easy if it cannot be



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!