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道脇　裕

Mikkyu-san's Challenge

# The Mystery of 100 Inhabitants Island

## ～What is division by zero?～

I am Mikkyu-san.
I travel around the world
to save people with my wit!
What will be today's wit?

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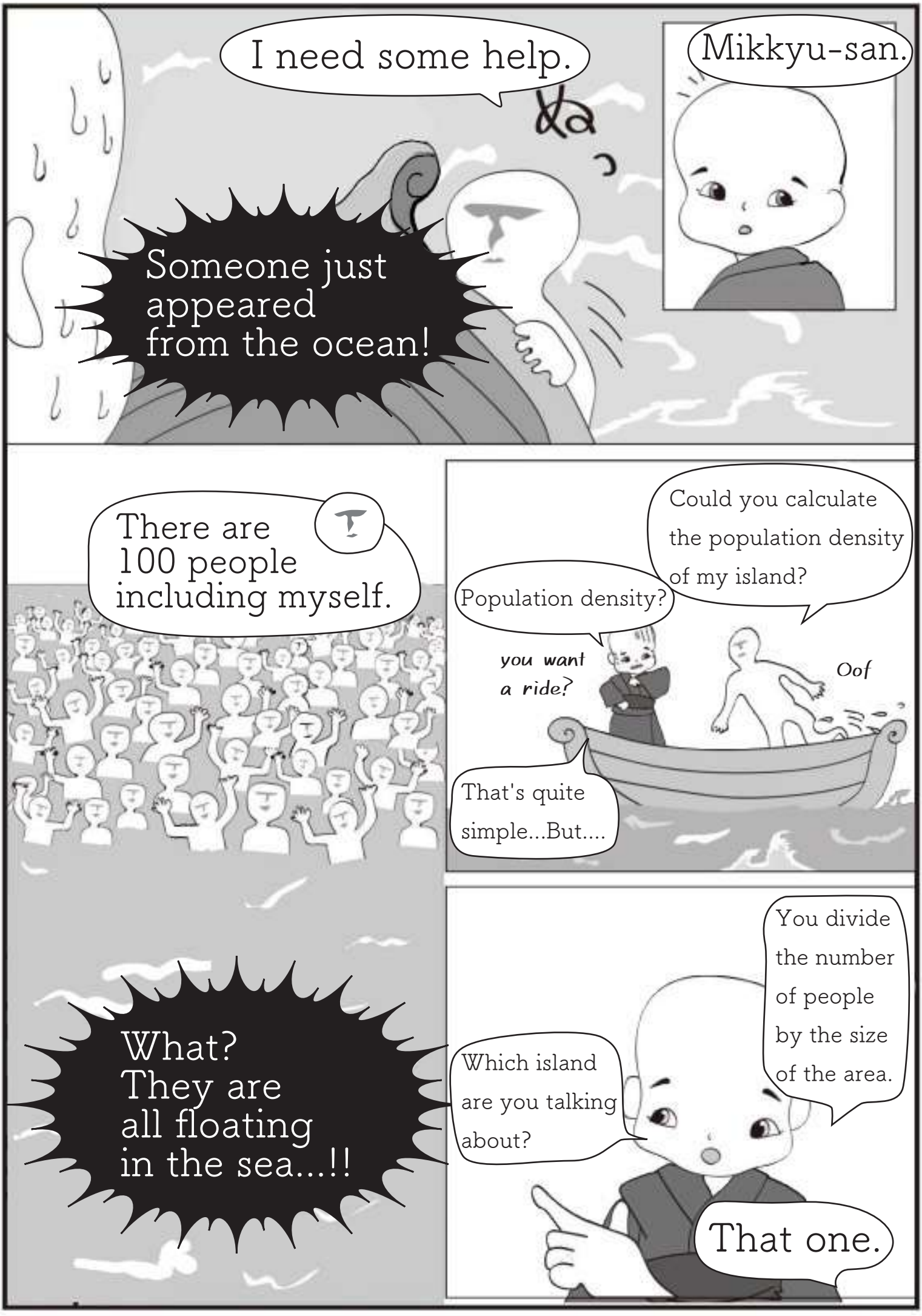
**Drawing by Onitsuka Jiro**


I need some help.
Mikkyu-san.
Someone just appeared from the ocean!
There are 100 people including myself.
Could you calculate the population density of my island?
Population density?
you want a ride?
Oof
That's quite simple...But....
What? They are all floating in the sea...!!
You divide the number of people by the size of the area.
Which island are you talking about?
That one.

Listen, as I said before, the formula for calculating the population density is population/area.

This is impossible because, even if the population is 100, when you divide it by the non-existing land, which means 0, you will get no answer!

There is no island so the population density is 0.

But we must report the number to the government!

Don't cry...

Let me tell you the history of our island!

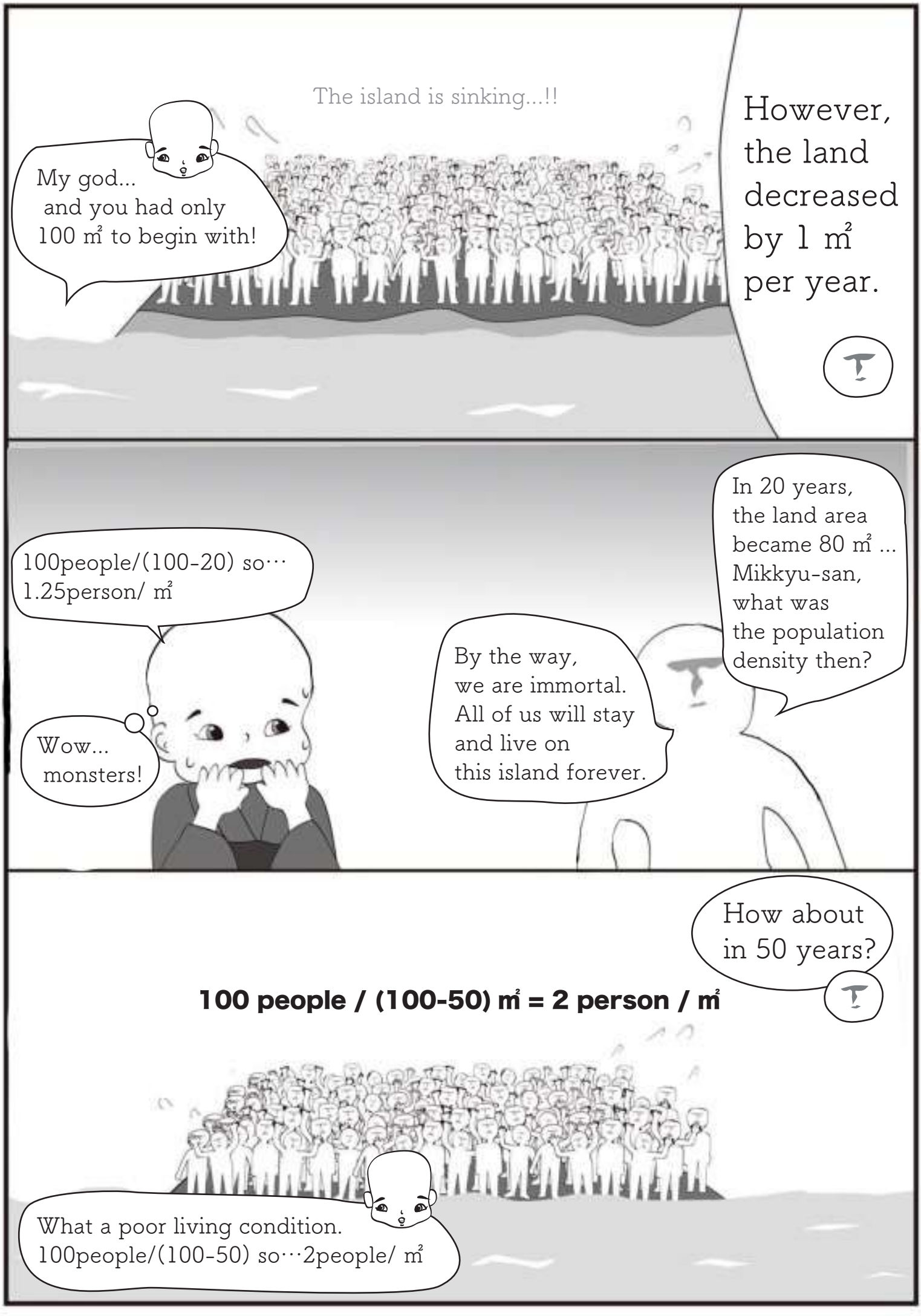
Ugh...
You need at least a basic knowledge of mathematics.

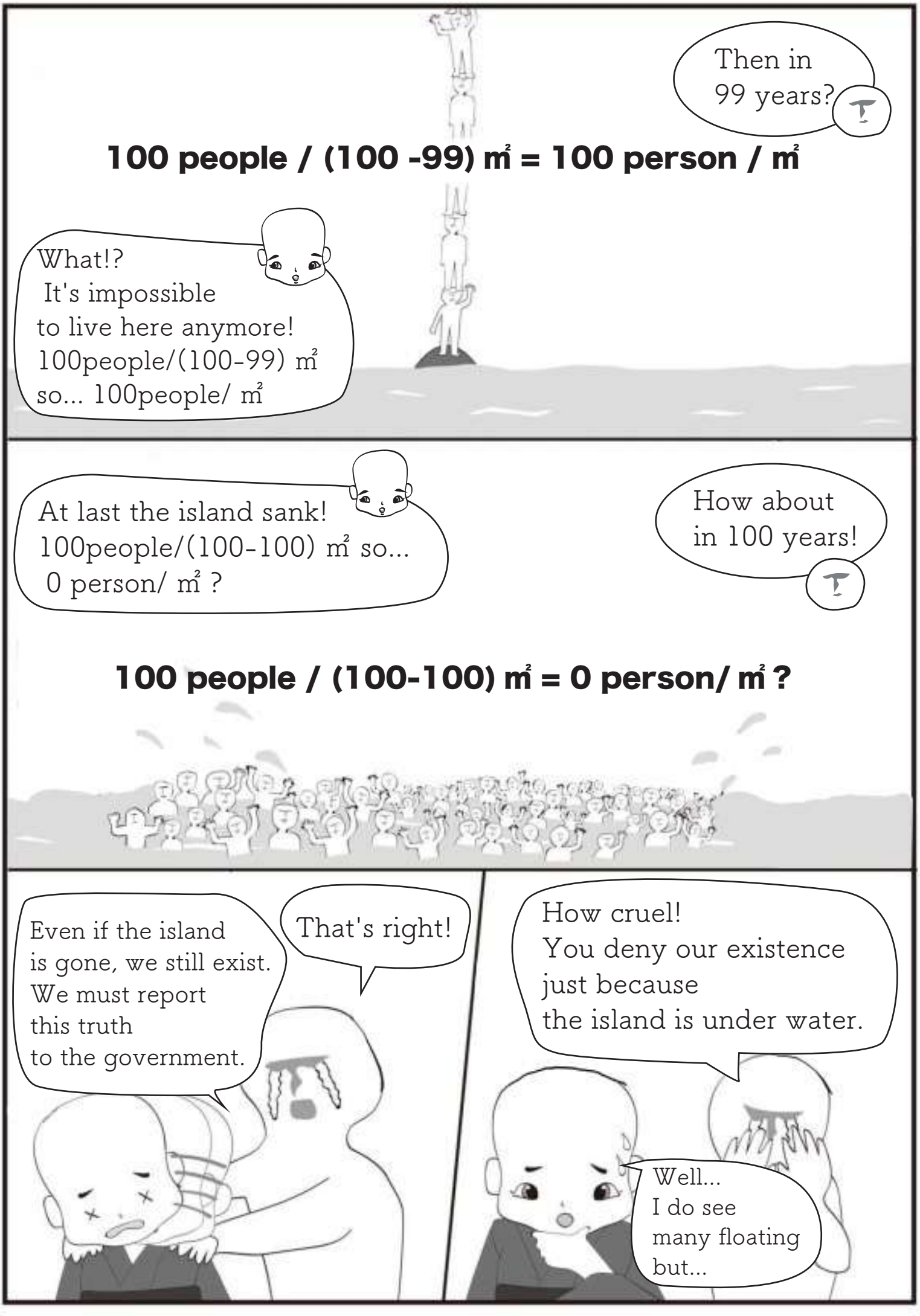
Sob, sob sob....

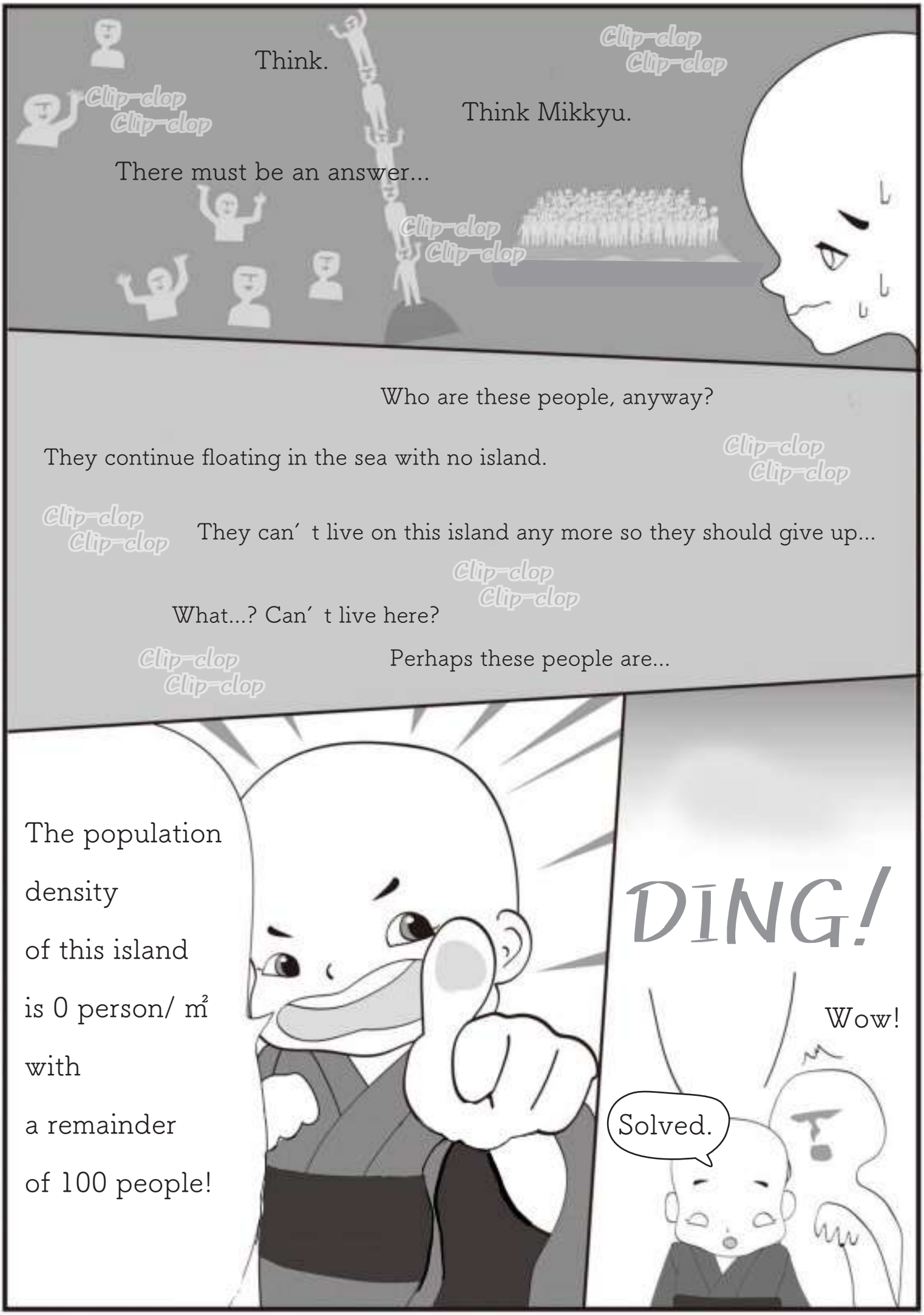
**100 people / 100 ㎡ = 1 person / ㎡**

Long ago, there existed a land of 100 ㎡. What was the population density then?

That's easy! 100people/100 ㎡ so… 1 person/ ㎡!


The island is sinking...!!
My god...
and you had only
100 ㎡ to begin with!
However,
the land
decreased
by 1 ㎡
per year.
100people/(100-20) so…
1.25person/ ㎡
Wow...
monsters!
By the way,
we are immortal.
All of us will stay
and live on
this island forever.
In 20 years,
the land area
became 80 ㎡ ...
Mikkyu-san,
what was
the population
density then?
How about
in 50 years?
100 people / (100-50) ㎡ = 2 person / ㎡
What a poor living condition.
100people/(100-50) so…2people/ ㎡


Then in
99 years?
100 people / (100 -99) ㎡ = 100 person / ㎡
What!?
It's impossible
to live here anymore!
100people/(100-99) ㎡
so... 100people/ ㎡
At last the island sank!
100people/(100-100) ㎡ so...
0 person/ ㎡ ?
How about
in 100 years!
100 people / (100-100) ㎡ = 0 person/ ㎡ ?
Even if the island
is gone, we still exist.
We must report
this truth
to the government.
That's right!
How cruel!
You deny our existence
just because
the island is under water.
Well...
I do see
many floating
but...


Think.
Think Mikkyu.
There must be an answer...
Clip-clop
Clip-clop
Who are these people, anyway?
They continue floating in the sea with no island.
They can´ t live on this island any more so they should give up...
What...? Can´ t live here?
Perhaps these people are...
The population density of this island is 0 person/ m²with a remainder of 100 people!
DING!
Wow!
Solved.

In the case the land area becomes 0 after gradual sinking
100people/(100-100) ㎡

=

In the case the land area is 0 to begin with
100people/0 ㎡

Namely, the calculation to divide the number of people by the area 0 is the same.

I wasn't sure if I could count you as inhabitants of the island, but regardless of the island history, where the land gradually decreases, the current situation remains the same.

huh?

Impressively, you guys are floating.

Hehehehehehe

Mikkyu-san, you have touched upon the secret of division by zero.

You, you are!?

Splat!!

However, when you try calculating, you will realize that in every equation...

Division by 0, was thought to be impossible...

# You will notice, there are remainders!

〈After 0 year〉
**100 people / (100 ㎡ -1 ㎡ /year × 0 year) = 1 person / ㎡**

**remainder 0 person**

〈After 20 years〉
**100 people / (100 ㎡ -1 ㎡ /year × 20 years) = 1.25 persons / ㎡**

**remainder 0 person**

〈After 50 years〉
**100 people / (100 ㎡ -1 ㎡ /year × 50 years) = 2 persons / ㎡**

**remainder 0 person**

〈After 90 years〉
**100 people / (100 ㎡ -1 ㎡ /year × 90 years) = 10 persons / ㎡**

**remainder 0 person**

〈After 99 years〉
**100 people / (100 ㎡ -1 ㎡ /year × 99 years) = 100 persons / ㎡**

**remainder 0 person**

〈After 100 years〉
**100 people / (100 ㎡ -1 ㎡ /year × 100 years) = 0 person / ㎡**

**remainder 100 people**

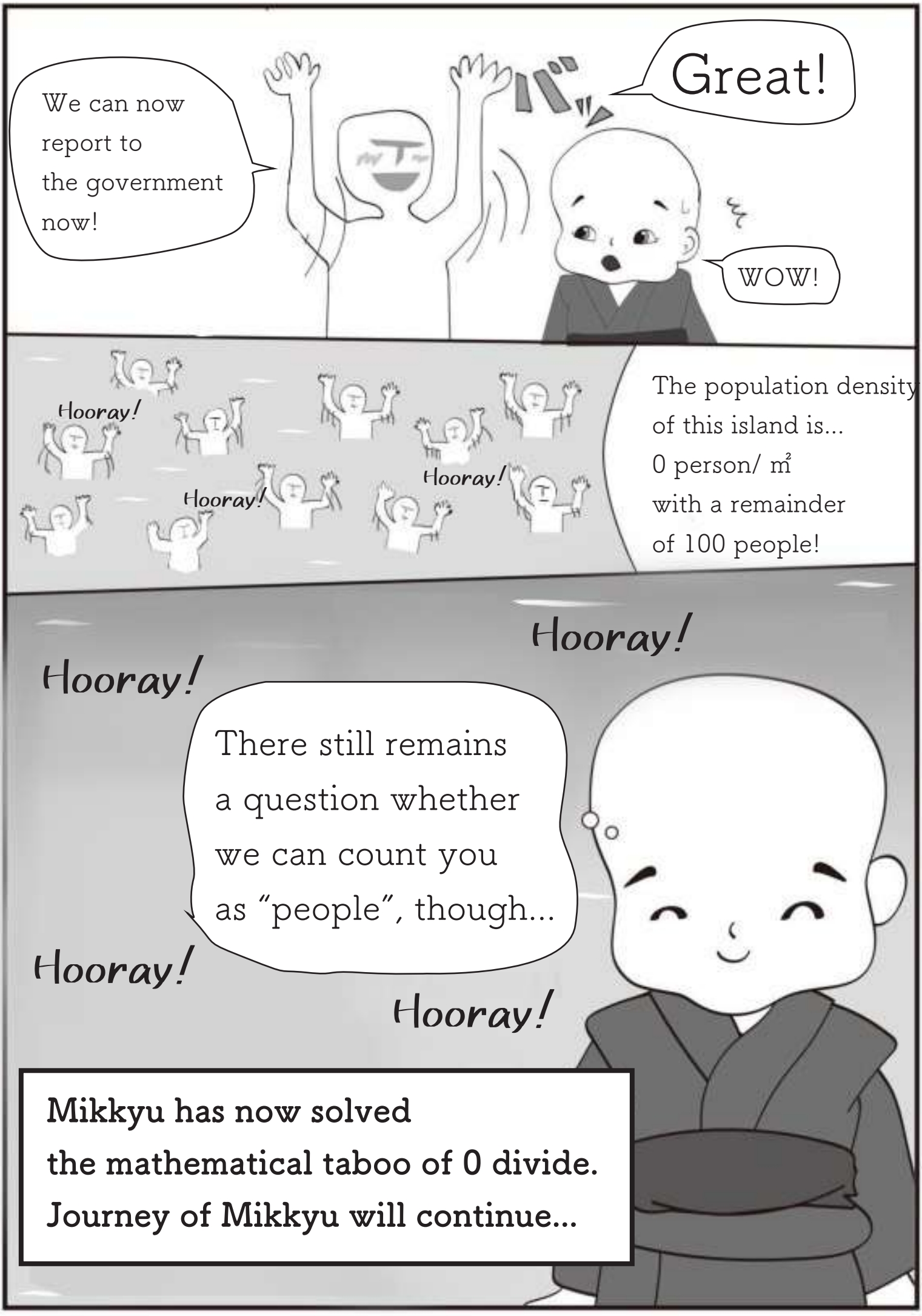
That's right!

*hubble-bubble*

Who was that guy?

I see!
With this logic,
there are no indivisible numbers!

It is omitted when the number is divisible.
The remainder is noticed only when the number is getting divided by 0.


We can now report to the government now!
Great!
WOW!
Hooray!
Hooray!
Hooray!
The population density of this island is... 0 person/ m² with a remainder of 100 people!
Hooray!
Hooray!
There still remains a question whether we can count you as "people", though...
Hooray!
Hooray!
Mikkyu has now solved the mathematical taboo of 0 divide. Journey of Mikkyu will continue...