



# How Heavy is Air?

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Lakshmi's palms were raw from the weight of the bags she carried. One bag had half a kilo of potatoes, and the other, half a kilo of tomatoes and a sliver of ash gourd.

And home was still half a kilometre away. She put the bags down by a shopfront to rest.





A balloon seller was walking by, shouting, **“Balooooonee – colour-colour balooooonee.”**

How easily he carried the lot. If only her bags were full of air!





Then Lakshmi thought back to her science class. That afternoon, Ammu Miss had said air had weight. "One cubic metre\* of air weighs 1.2 kg," she had said.

*\*1 cubic metre is the volume of a cube that measures 100 cm x 100 cm x 100 cm.*

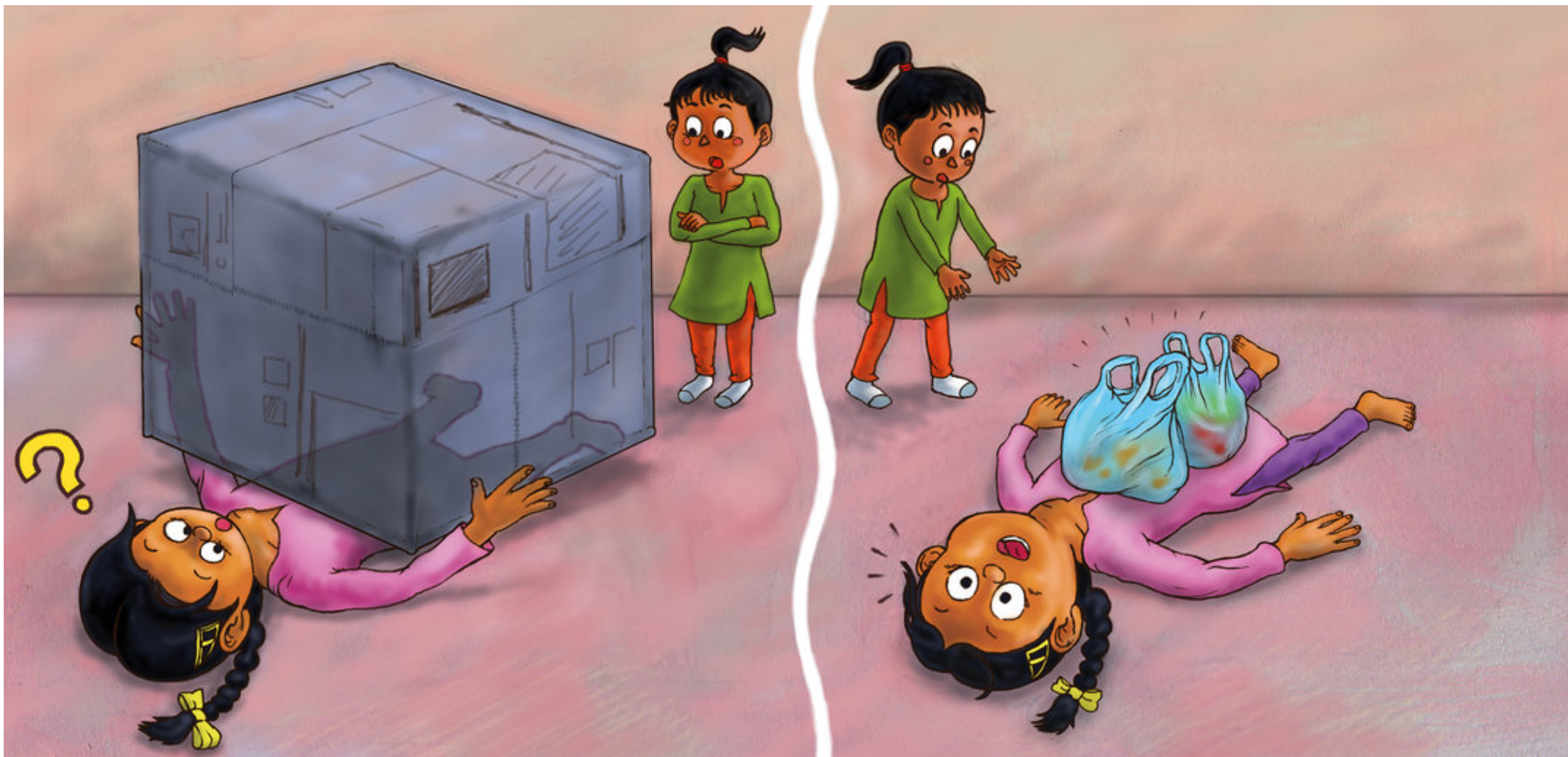




That seemed like a lot – nearly as heavy as her two bags. If air had weight, wouldn't she feel it?

When she got home, Lakshmi decided to find out. Gowri, her little sister, could help her. Lakshmi pulled out twelve sticks from the new broom by the kitchen sink. Using a ruler, she made sure each one was 100 cm long. And she stuck them to make a cube.

Lakshmi and Gowri used the cube as a frame and taped up old newspaper till all its sides were covered.

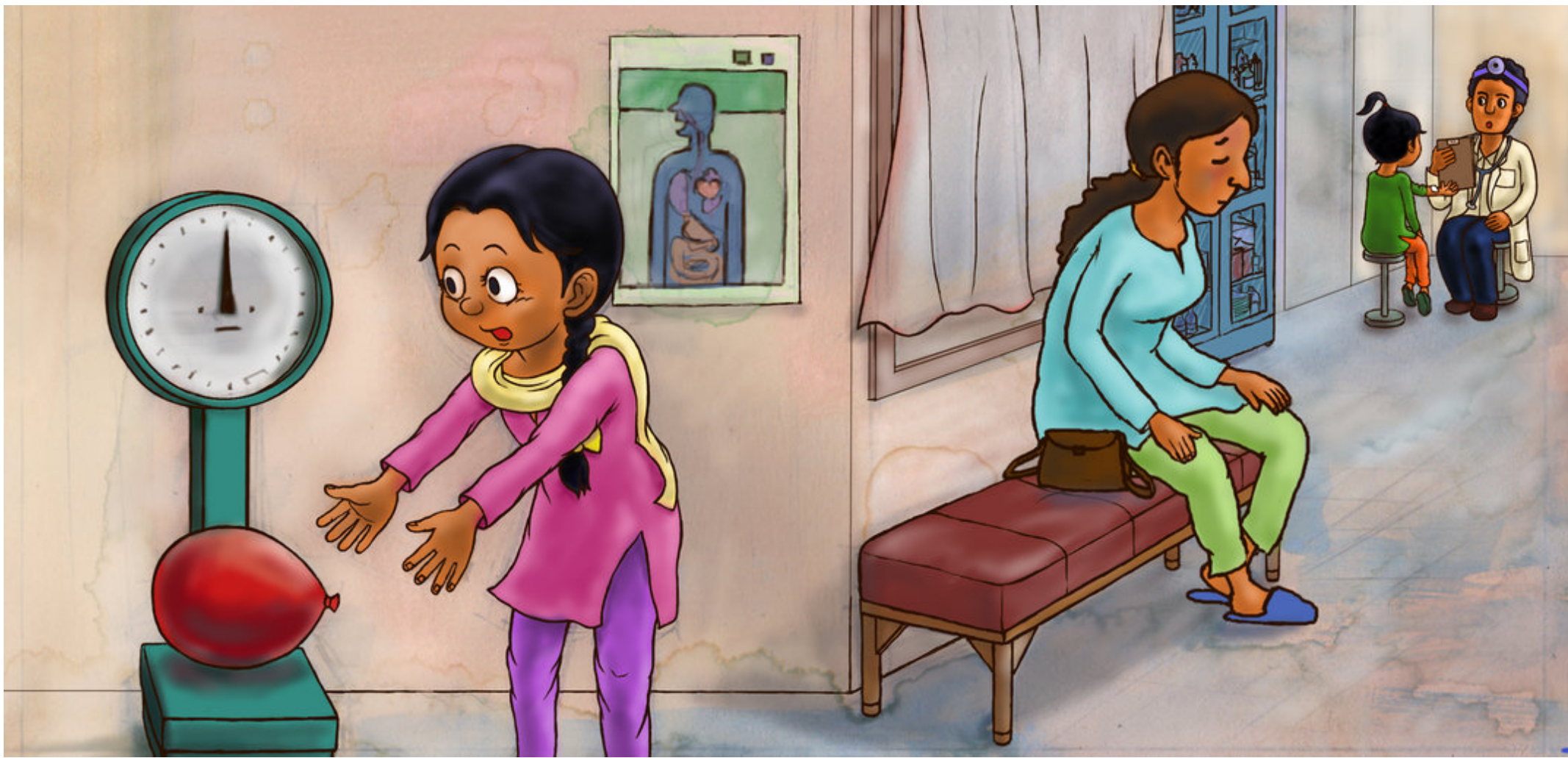


'Now, this should have 1.2 kilograms of air!' Lakshmi thought. Then she lay down under it to check if she could feel its weight. She couldn't feel a thing! But when Gowri put the vegetable bags on Lakshmi's chest, she could feel them pressing down on her.





Next, Lakshmi blew a balloon and dropped it. If air did have weight, a full balloon should fall faster than an empty one, right? But the balloon didn't fall at all. It floated away. Lakshmi ran behind it.



She took the balloon along to the primary health centre. While Gowri was getting a vaccination, Lakshmi stood on the weighing scale in the doctor's office – she weighed 19 kg. Then she carefully put the balloon on the machine. The needle didn't move.





"Air has no weight, Miss," she declared in class the next day. "You can't feel its weight."

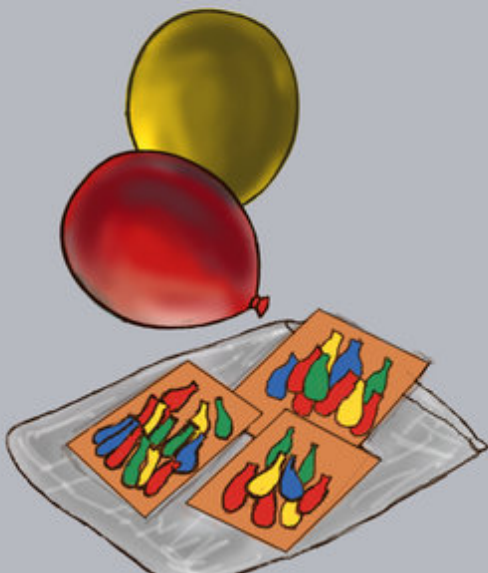
"You can feel air when it moves," said the teacher, puffing away a strand of hair from her forehead. She pointed towards the leaves dancing in the wind and the grey clouds hiding the sun. "And air moves things."



"As for feeling its weight," said Ammu Miss, "let's find out today. She scribbled a note and handed it to a student. "Shyam, could you go and get three packets of thick balloons, please? Class, come on, let's clear this place for our experiment."



The students moved the chairs and tables to a corner and created space in the middle of the room. Ammu Miss found a cubical cardboard box. She measured its sides and announced, "The volume of this box is roughly one cubic metre. Let's blow the balloons and put them into this box."





The students huffed and puffed, and scrunched their faces and twisted the balloons for half an hour.

Some balloons floated away.

Some balloons slowly lost air.

**PHAT!** Some balloons burst.

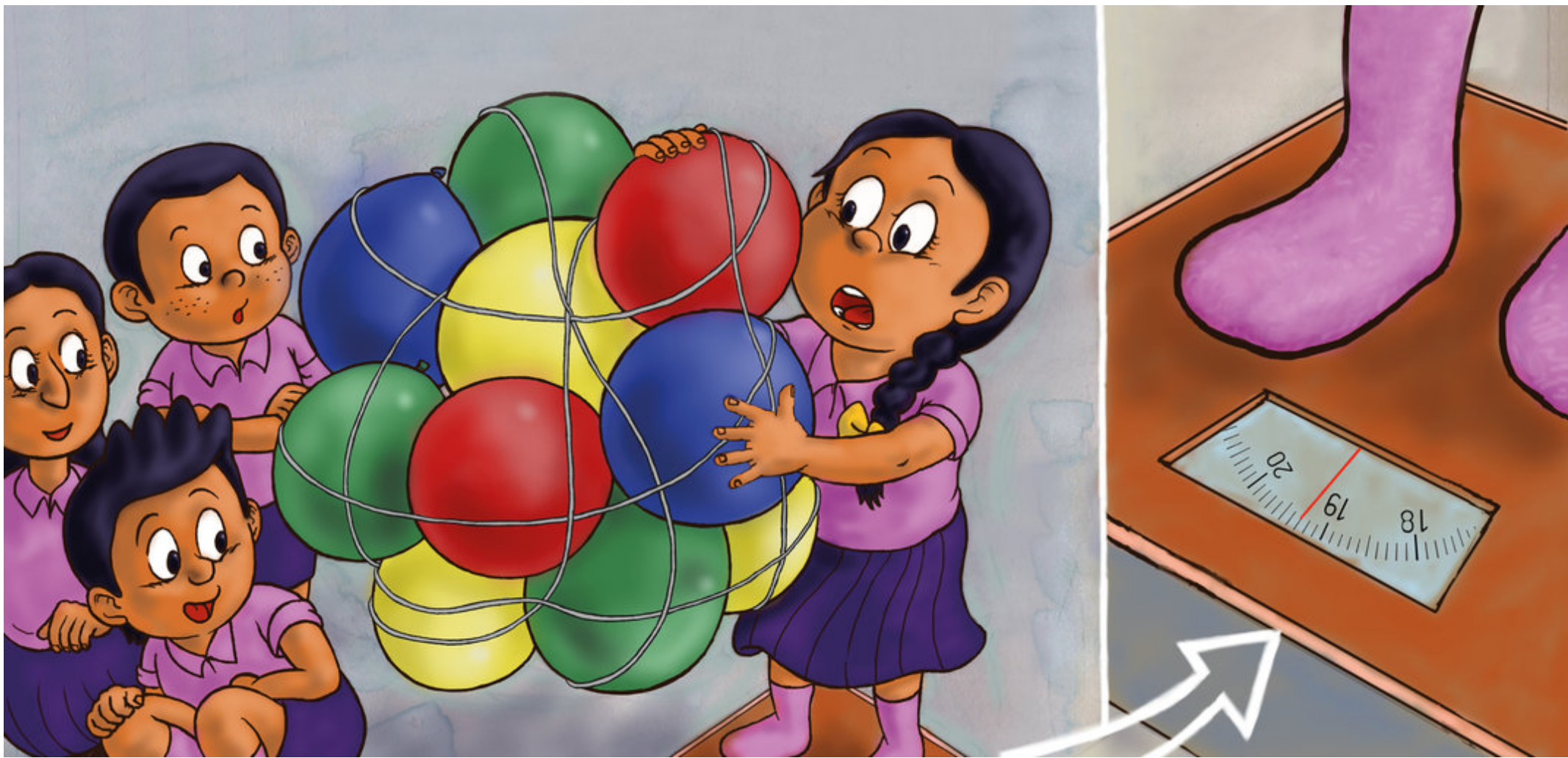
Ammu Miss stood by the box and watched the students fill it up with the inflated balloons.





Once the box was full, she tied the balloons together with a string to make a giant ball. Carrying this, the students trooped to the Principal's office, where the weighing machine was.





Lakshmi stood on it – she still weighed 19 kg. As she struggled to hold the giant globe Ammu Miss gave her, the class looked closely at the number below. Did the needle twitch? Yes, it looked like it had moved a little beyond 19 kg\*.

*\*The weight of air can vary a little from place to place.*

*\*\*The rubber of the balloon has some weight too.*

*\*\*\*Why do you think the needle moved so little? Do you think the air outside pushing back on the balloon had anything to do with it?*





Ammu Miss took a pin and poked five of the balloons. Lakshmi was startled, but soon began to laugh. The class cheered as Ammu Miss burst the rest of the balloons. When she finished, the needle on the weighing machine had moved back a little.

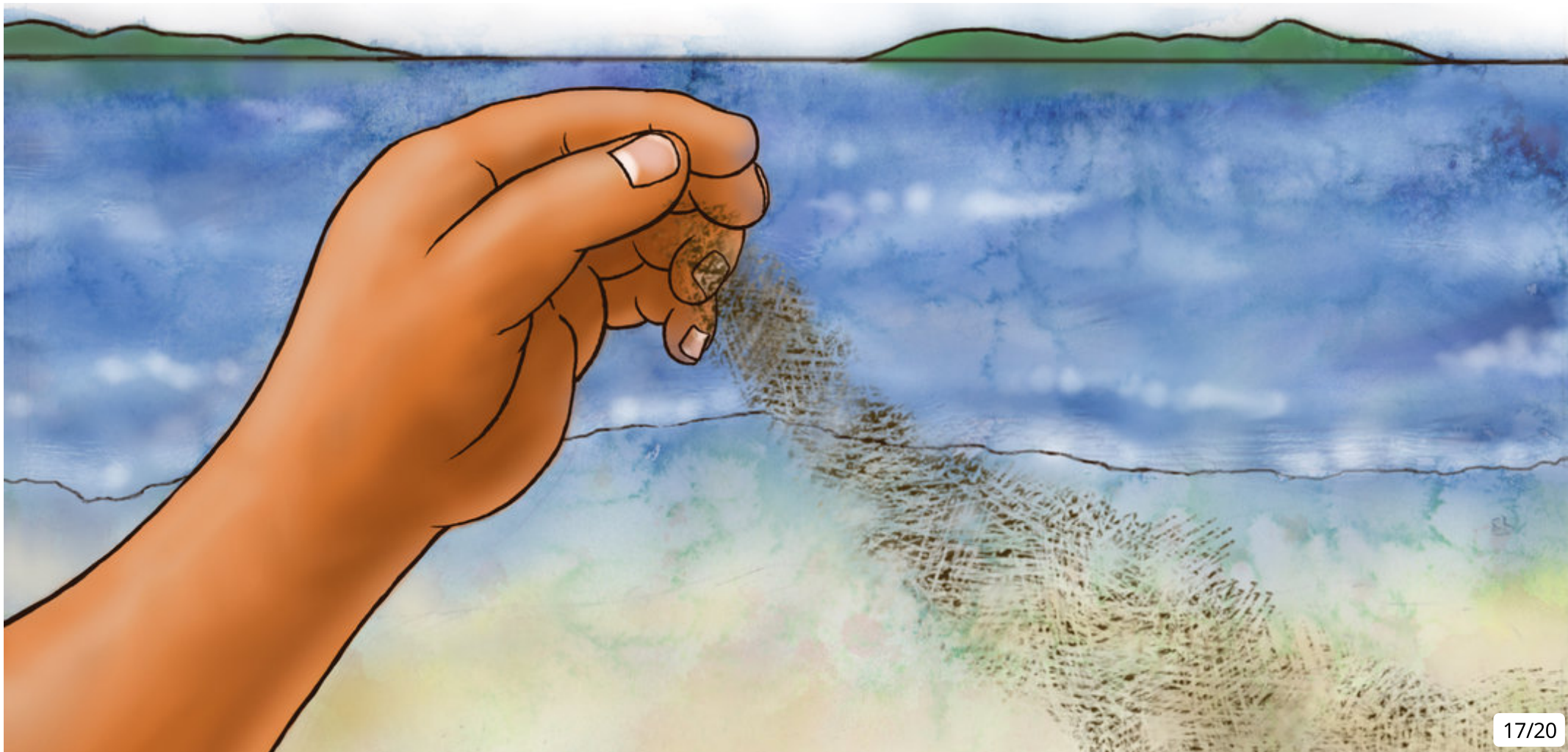


Lakshmi was happy. It had been proved in class today that air did have weight. Before the bell rang, she had one more question: "Miss, if air has weight then why do balloons float when they're full, and fall when they burst?"

What do you think?

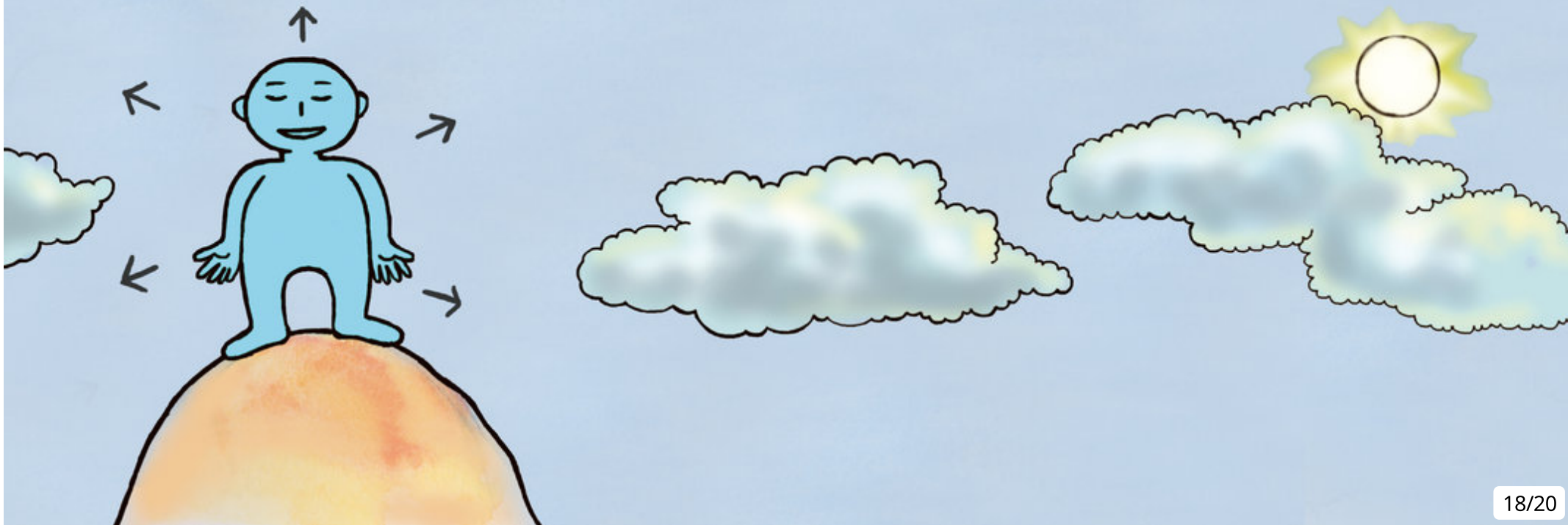


Did you know, there are more air molecules around us in the atmosphere than the total number of grains of sand on all the beaches in the world! Many of these particles collide with us and push against us.



## **How is it that we never feel the weight of these air molecules?**

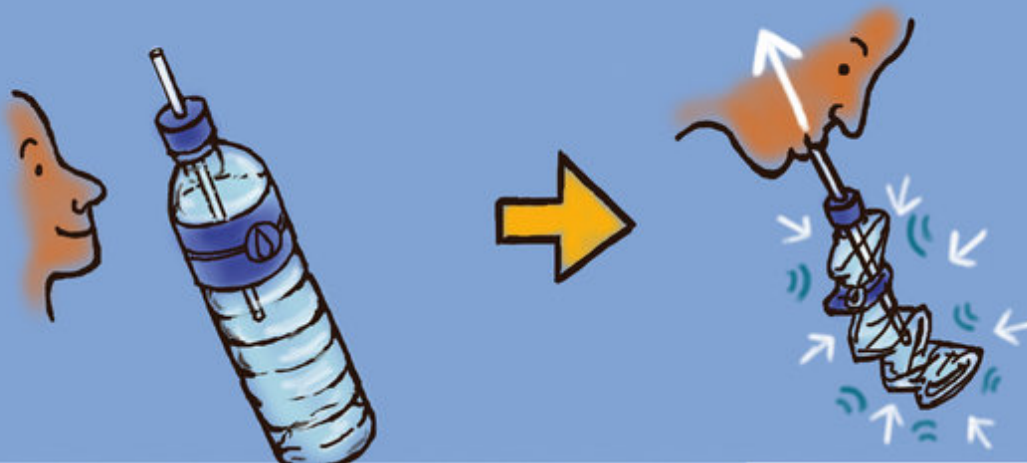
From the time we are born, our bodies adjust to the pressure of air molecules on them. Our bodies are made up of bones, muscles, fluids and a lot of air and exert as much pressure outwards against the air molecules. This is why we do not feel the weight of air on us. We only feel it when the air pressure changes, like when we are on a flight or high up on a mountain.





## Let's play with air!

Take an empty mineral water bottle or any other bottle made of thin plastic. Drill a hole in the cap, insert a straw into it and seal it with clay. Or seal the mouth of the bottle with clay and poke a straw through. Now suck in the air through the straw. The bottle crumples. Why? The air outside is pushing against it, and there isn't enough air inside the bottle to push it back with equal force.



When there is air outside *and* inside the bottle, the bottle stays in shape.

Take a straw. Cover one end of it with your finger and suck in air from the other side. What do you observe?

Can you figure out why the straw crumples?





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# How Heavy is Air?

(English)

Balloons are colourful and light. Does the air inside them weigh anything at all, you might have wondered. Lakshmi has. So she and her classmates find out if air has any weight at all. Peek inside the covers to see what they learnt.

This is a Level 4 book for children who can read fluently and with confidence.



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