



# There's a Hole in my Galaxy

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**Illustrator:** Chaaya Prabhat

Level 4



It is the year 2563 on planet Earth.

Maya's family owns a rocket ship. But she is not allowed to use it. Not without a grown-up.

Ava really wants to see Pluto. She is Maya's best friend and loves everything about space and astronomy. She wants Maya to fly her to Pluto.



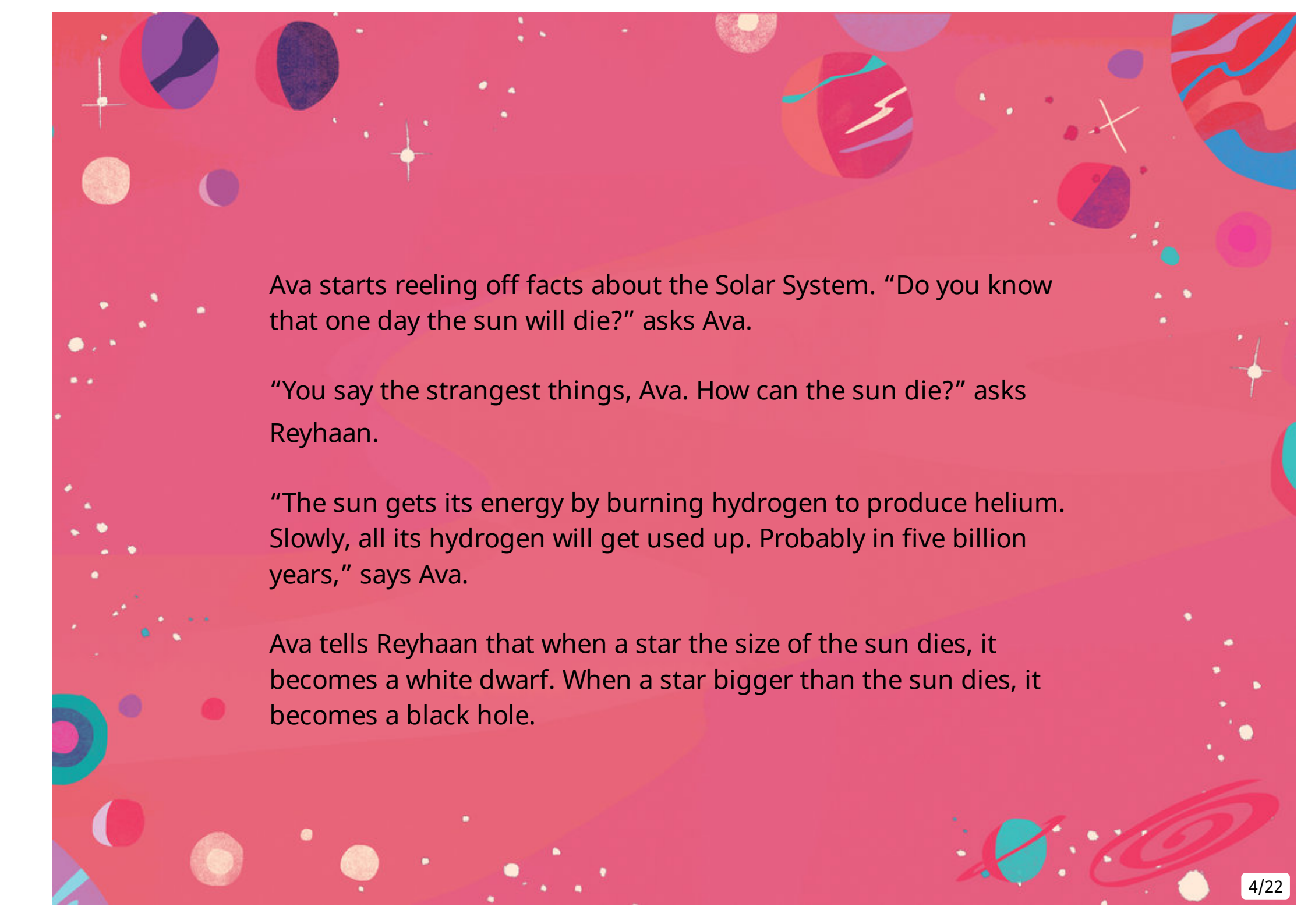
“Please,” says Ava. “Please, please.”

“My parents will be angry,” Maya protests.

“They’re out for the weekend, and it’s not that far to Pluto. We’ll be back before your parents return,” promises Ava.

Maya reluctantly agrees. Her brother Reyhaan tags along.

The three friends soar off from Earth on a hot summer night. Ava bounces with excitement.



Ava starts reeling off facts about the Solar System. “Do you know that one day the sun will die?” asks Ava.

“You say the strangest things, Ava. How can the sun die?” asks Reyhaan.

“The sun gets its energy by burning hydrogen to produce helium. Slowly, all its hydrogen will get used up. Probably in five billion years,” says Ava.

Ava tells Reyhaan that when a star the size of the sun dies, it becomes a white dwarf. When a star bigger than the sun dies, it becomes a black hole.





ALERT

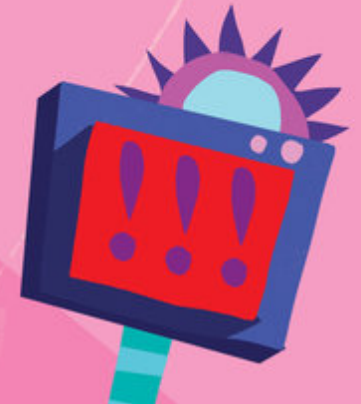
Suddenly, there is a loud beeping.

**'ALERT! ALERT! HEAVY OBJECT PULLING SHIP OFF COURSE,'** says the computer.

The friends stare at the screen. "But I can't see anything," says Reyhaan.

"No, look," says Maya. "The stars in Orion's Belt are no longer in a straight line."

Ava gulps. "I...I...I think we are near a black hole. The gravitational field of the black hole is bending the light of the stars near it, like a lens bends light that passes through it."





**'CONFIRMATION. BLACK HOLE TWICE AS HEAVY AS THE SUN. MOVING AT THE SPEED OF THE SHIP. BLACK HOLE EVENT HORIZON 5 KILOMETRES AWAY.'**

**"BLACK HOLE?"** Maya and Reyhaan ask together.



“W...w...we need to move away NOW,” Ava stammers. “If we reach the black hole, we will be sucked in forever!”

“Why?” demands Reyhaan.

“First let’s get away!” Ava says, almost in tears.

Maya is shaking with fear. She yells commands at the computer.

“Full power, double power. Accelerate away from the black hole. Put everything you have!”





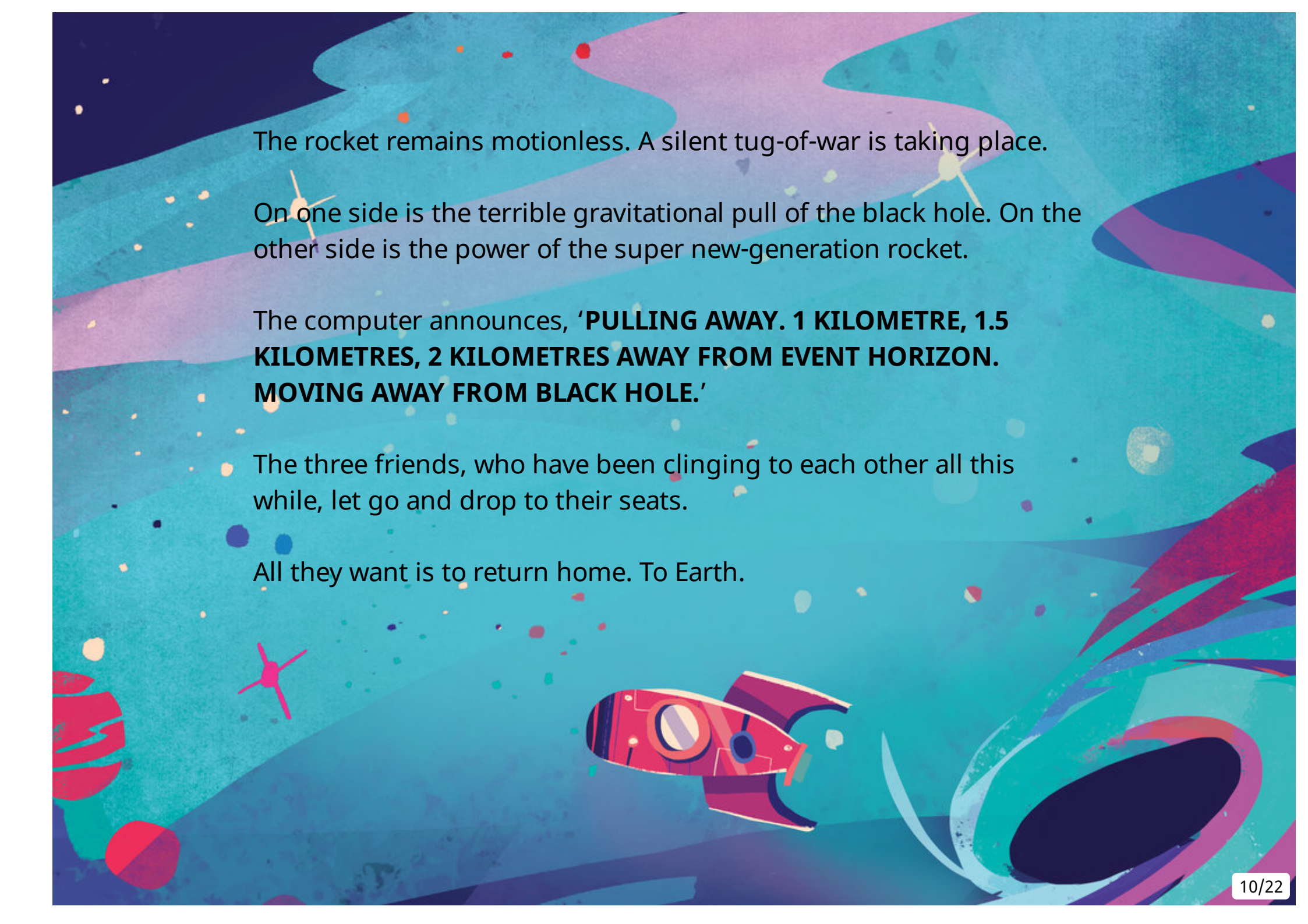
**'FIRING EMERGENCY BOOSTERS.'**

But the pull is too strong.

**'APPROACHING BLACK HOLE. 4 KILOMETRES TO EVENT HORIZON. 3 KILOMETRES. 2 KILOMETRES.'**

"We're being pulled towards it," Maya says.

Suddenly, the computer announces, **'HOLDING AT 1 KILOMETRE. 500 METRES AWAY FROM EVENT HORIZON. MAXIMUM POWER. HOLDING. HOLDING. HOLDING. HOLDING...'**



The rocket remains motionless. A silent tug-of-war is taking place.

On one side is the terrible gravitational pull of the black hole. On the other side is the power of the super new-generation rocket.

The computer announces, '**PULLING AWAY. 1 KILOMETRE, 1.5 KILOMETRES, 2 KILOMETRES AWAY FROM EVENT HORIZON. MOVING AWAY FROM BLACK HOLE.'**

The three friends, who have been clinging to each other all this while, let go and drop to their seats.

All they want is to return home. To Earth.



Maya makes sure the spaceship is on the right course and then asks, “Ava, what happened just now? What exactly is a black hole?”

Ava takes a deep breath and explains that when a star larger than the sun dies, it collapses into itself. It squeezes into nothing and becomes like a hole in space.

“Even time behaves funnily inside and near a black hole. It runs at a different rate near the black hole from anywhere else,” she says.

“What happens when something like a rocket ship falls into a black hole?” asks Reyhaan.

“Well, it is sucked into the centre of the black hole and is torn into nothing,” Ava says.

Reyhaan squeals, “Seriously?”

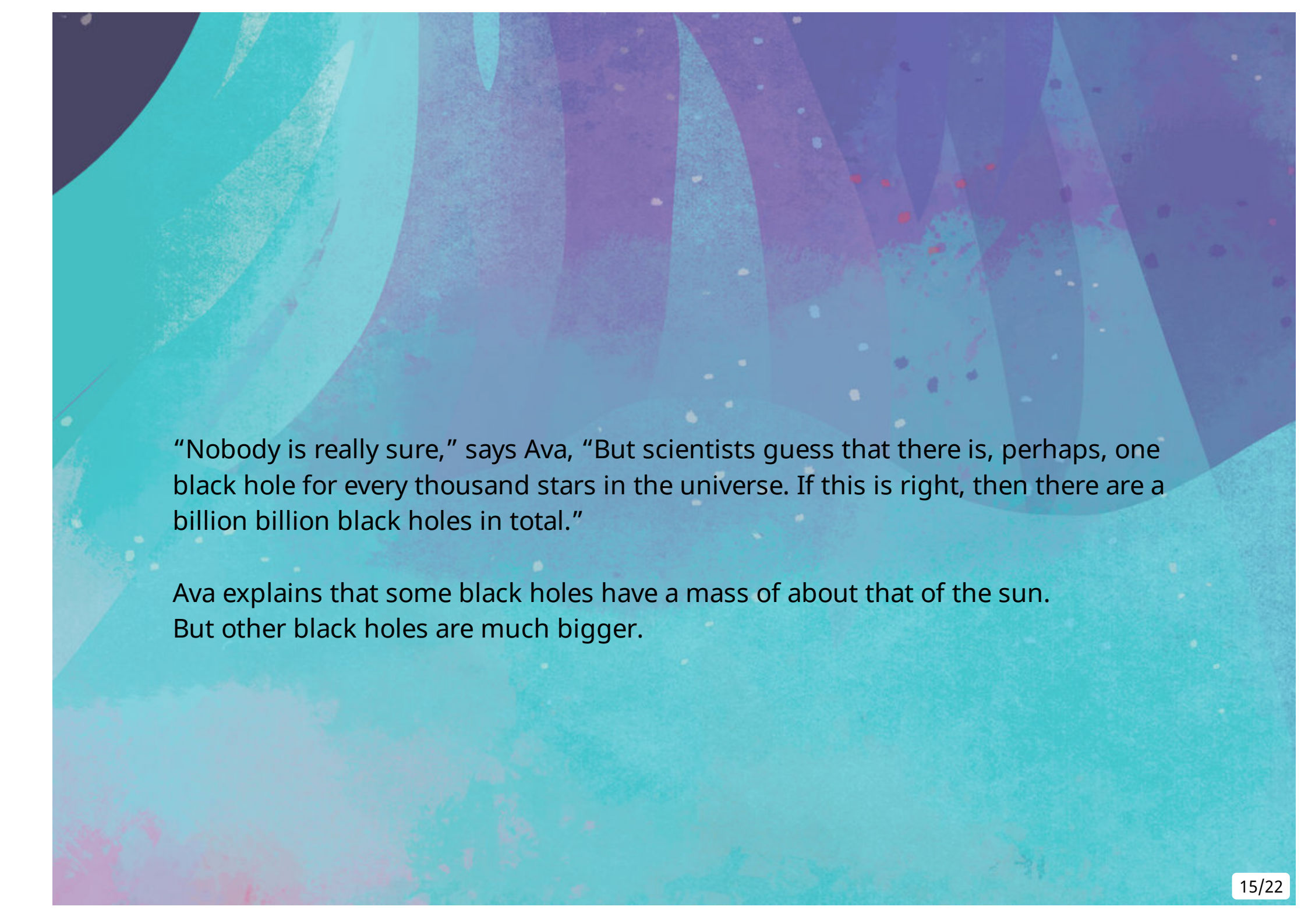
He and Maya realise that they have had a narrow escape.



“Can nothing come out of a black hole?” Maya asks.

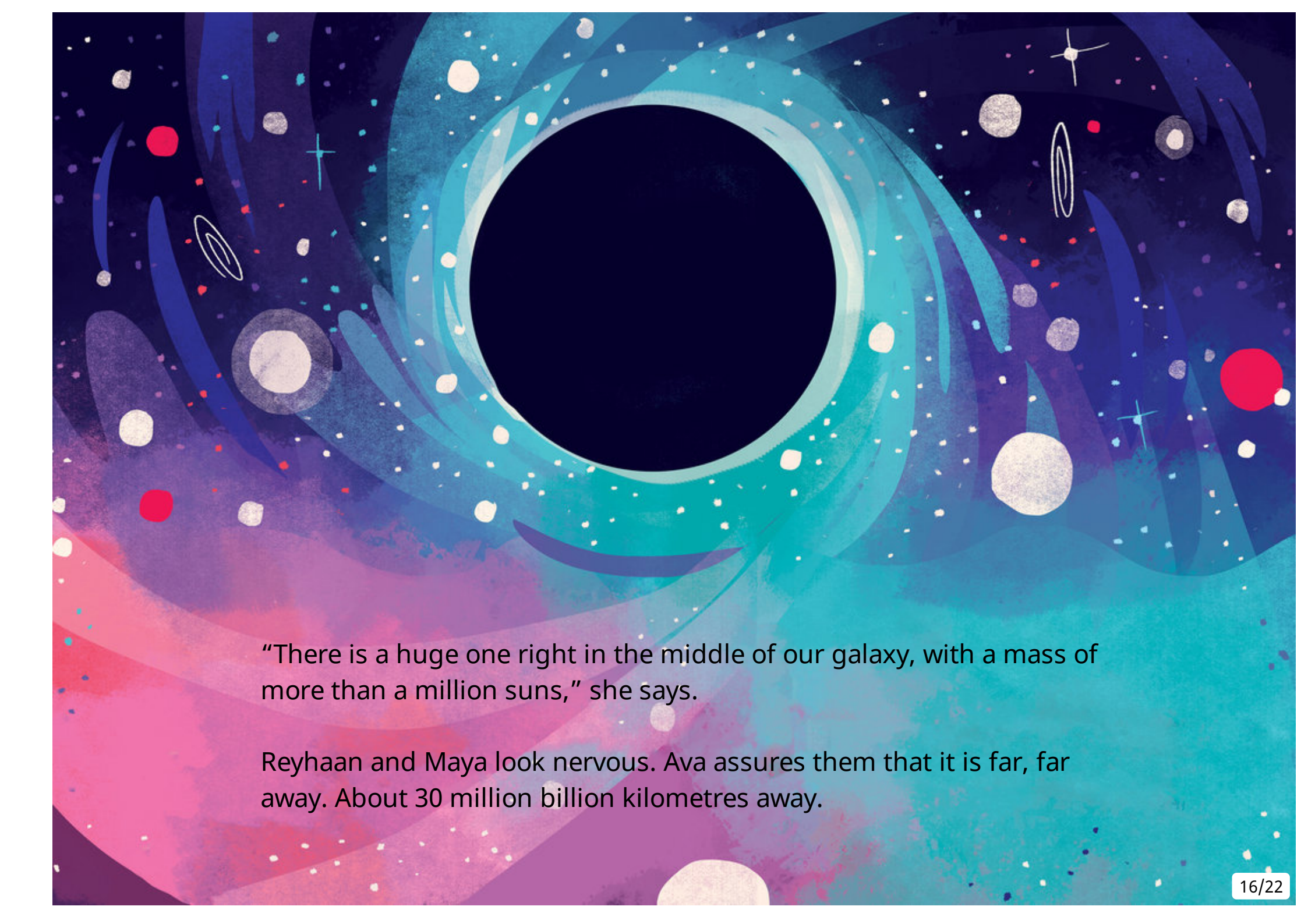
Ava shakes her head. “Not even light comes out of a black hole. The event horizon of the black hole is the point of no return. Anything that falls into the event horizon is lost forever to the outside world.”

Reyhaan shudders but Maya has more questions. She wants to know how many black holes there are in the universe.



“Nobody is really sure,” says Ava, “But scientists guess that there is, perhaps, one black hole for every thousand stars in the universe. If this is right, then there are a billion billion black holes in total.”

Ava explains that some black holes have a mass of about that of the sun. But other black holes are much bigger.



“There is a huge one right in the middle of our galaxy, with a mass of more than a million suns,” she says.

Reyhaan and Maya look nervous. Ava assures them that it is far, far away. About 30 million billion kilometres away.





The rocket zooms towards Earth.

“I want to get home now,” says Reyhaan.

“I think we are very close,” Maya says.

To everyone’s relief, the computer announces, **‘LANDING. WELCOME BACK TO EARTH.’**



The three of them rush out of the ship into Maya and Reyhaan's backyard. They are stunned by the chilly winds that hit their faces.

"Didn't we leave when it was super hot? And I thought we were away from home for just a few hours," says Maya.



“Maya...Reyhaan...It’s winter...” says Ava.

Maya finishes Ava’s thought, “Time runs at a different rate near the black hole from anywhere else.”

In the time that they had spent fighting the black hole, six months had gone by on Earth.

Maya and Reyhaan’s parents had come back from their weekend trip months ago.

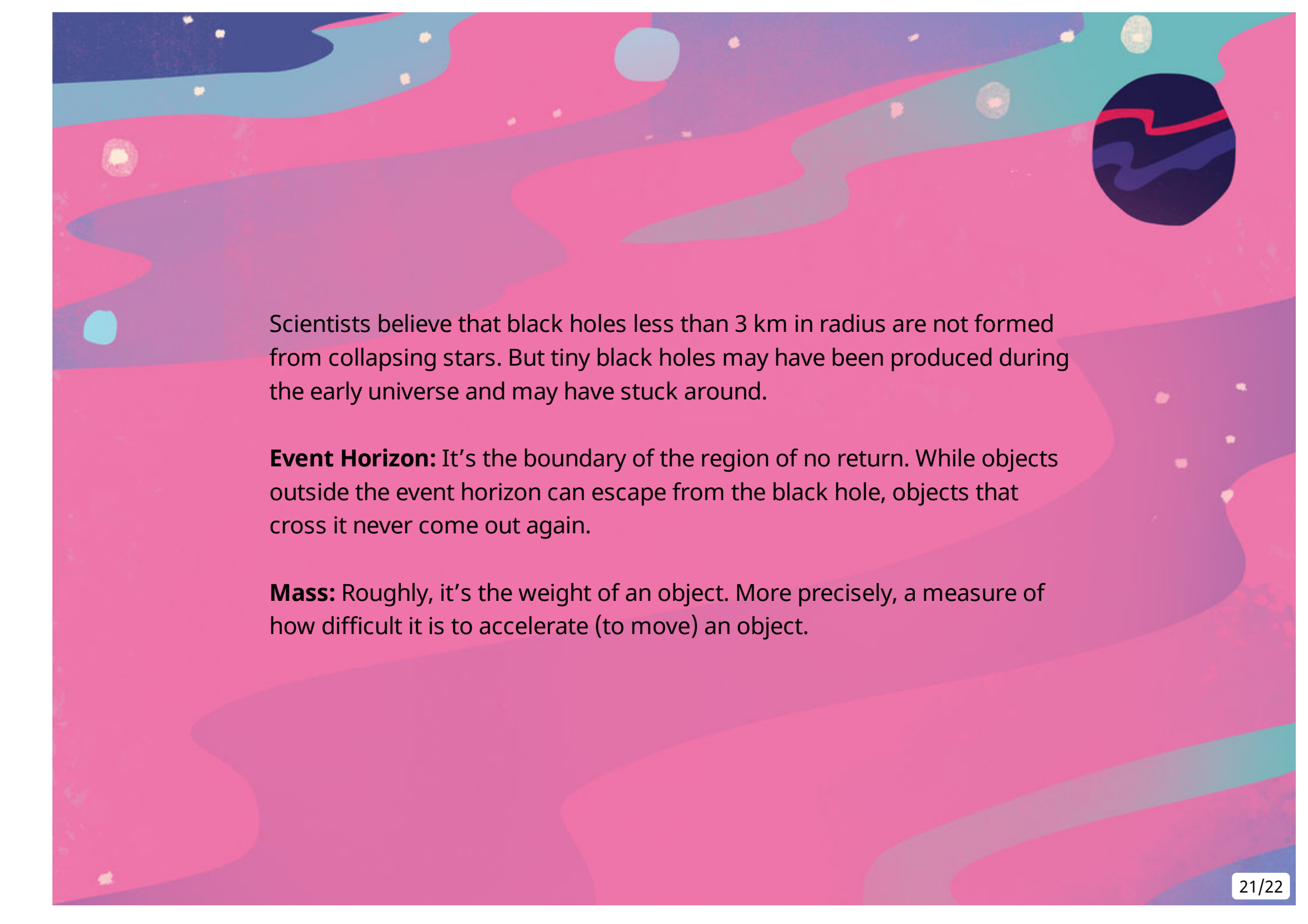
The three friends are in big trouble!

## What is a Black Hole?

The Indian scientist Subrahmanyan Chandrasekhar first understood that big stars collapse into black holes. This discovery won him the Nobel Prize.

Black holes are the densest objects in the universe. No object of the same mass can occupy less space than a black hole.

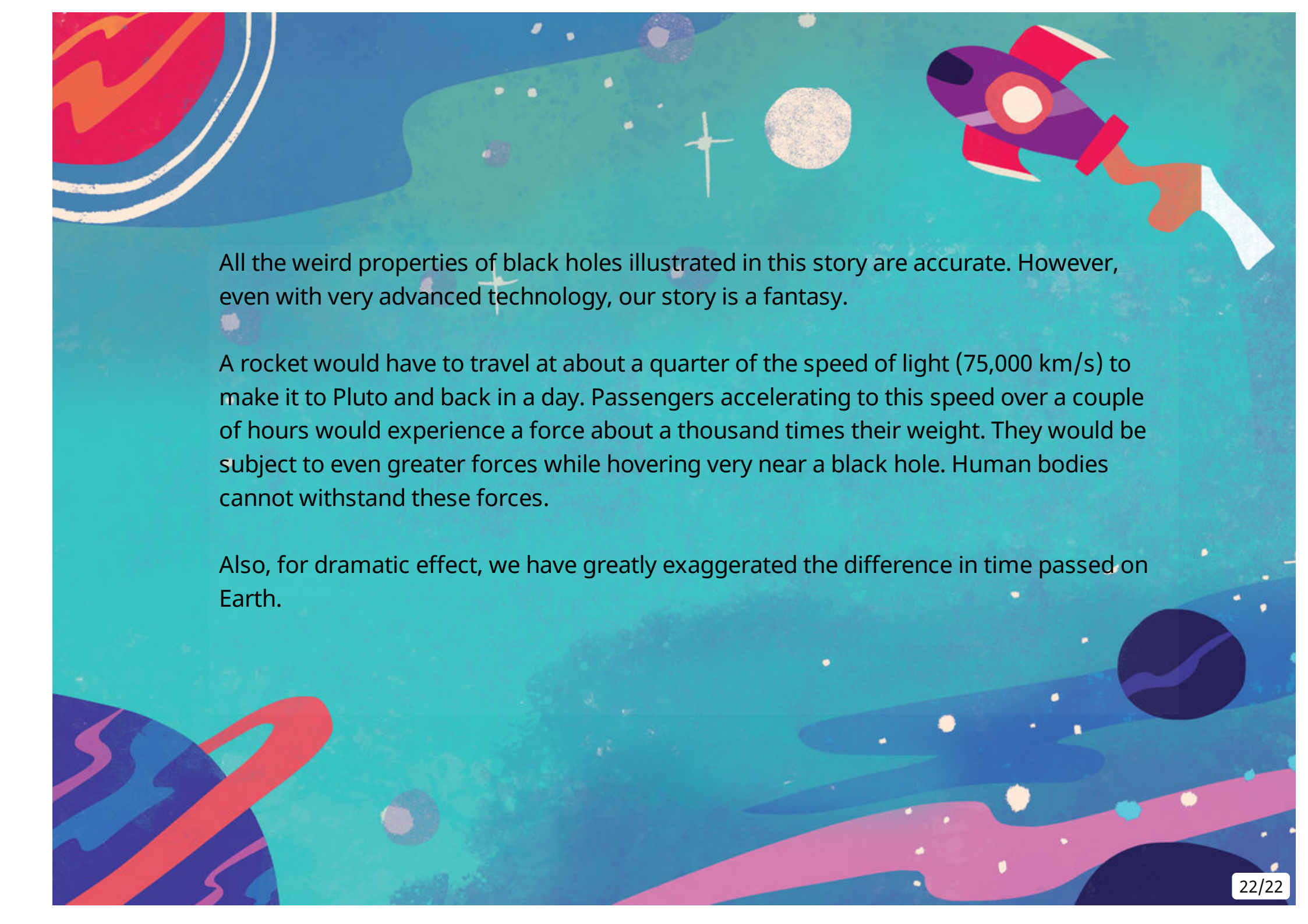
Throwing things into a black hole makes it bigger, but it is almost impossible to make black holes smaller.



Scientists believe that black holes less than 3 km in radius are not formed from collapsing stars. But tiny black holes may have been produced during the early universe and may have stuck around.

**Event Horizon:** It's the boundary of the region of no return. While objects outside the event horizon can escape from the black hole, objects that cross it never come out again.

**Mass:** Roughly, it's the weight of an object. More precisely, a measure of how difficult it is to accelerate (to move) an object.

A vibrant, stylized illustration of outer space. The background is a mix of teal, blue, and purple. In the top right, a purple rocket with red fins and a white exhaust trail is flying towards the left. The top left shows a portion of a planet with red and orange bands. The bottom left shows a planet with blue and purple bands and a red ring. The bottom right shows a planet with blue and purple bands. Various stars and celestial bodies are scattered throughout the scene.

All the weird properties of black holes illustrated in this story are accurate. However, even with very advanced technology, our story is a fantasy.

A rocket would have to travel at about a quarter of the speed of light (75,000 km/s) to make it to Pluto and back in a day. Passengers accelerating to this speed over a couple of hours would experience a force about a thousand times their weight. They would be subject to even greater forces while hovering very near a black hole. Human bodies cannot withstand these forces.

Also, for dramatic effect, we have greatly exaggerated the difference in time passed on Earth.

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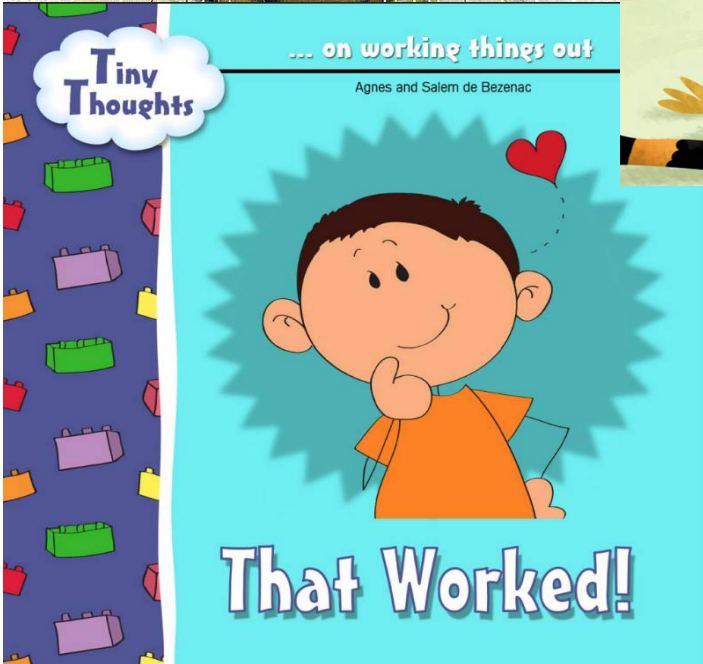
(English)

Three friends blast off from Earth in a rocket to explore the Solar System. Suddenly, they find themselves being pulled by a black hole. Do they manage to escape? Find out what happens on this space odyssey.

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



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