THE 2021 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

THE CINDY NEUSCHWANDER AWARD

(THE 12-15 YEARS OLD CATEGORY)

WINNER

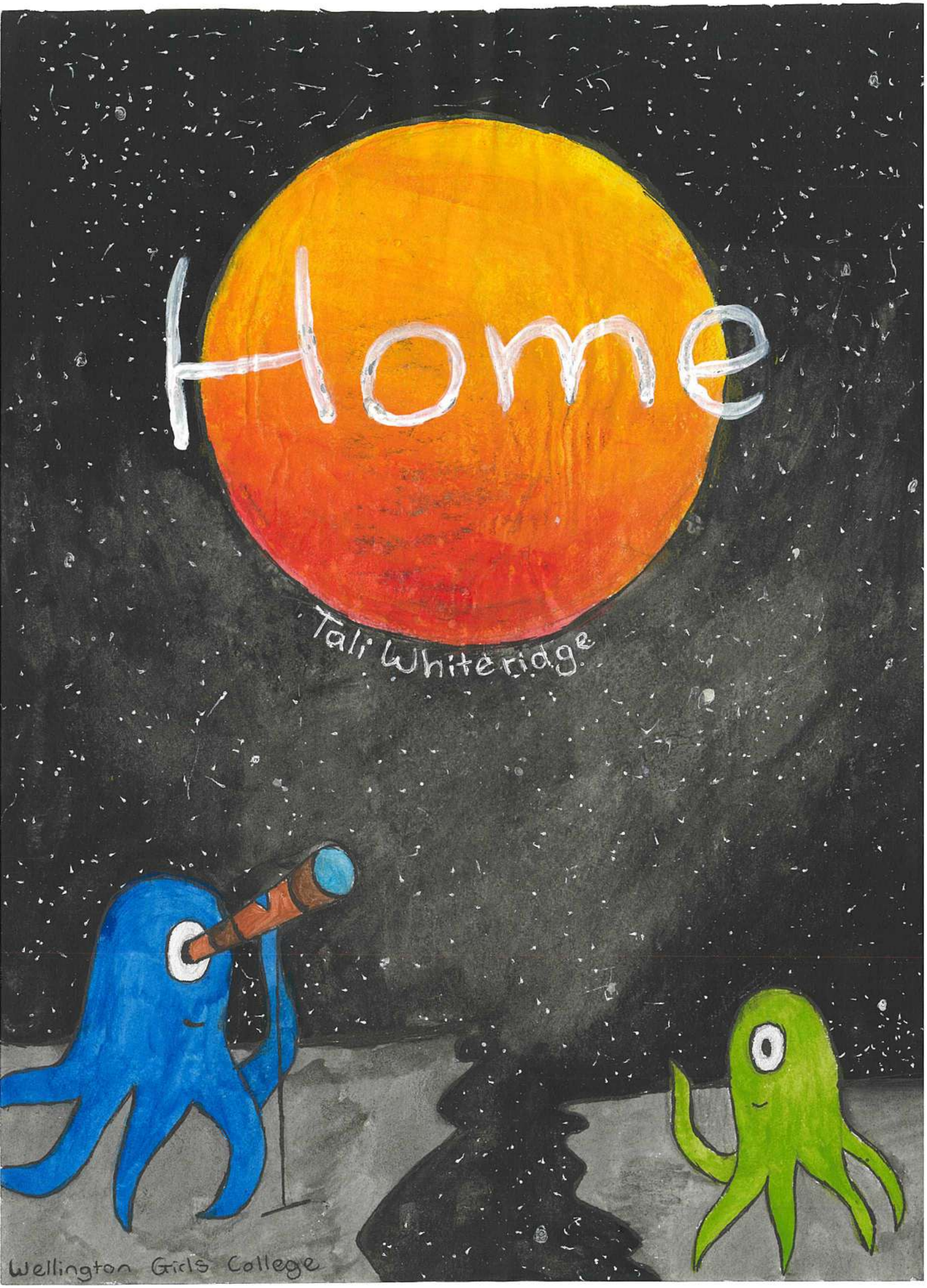
‘Home’ by Natalia Whiteridge (13 years old)

at Wellington Girls’ College (New Zealand)

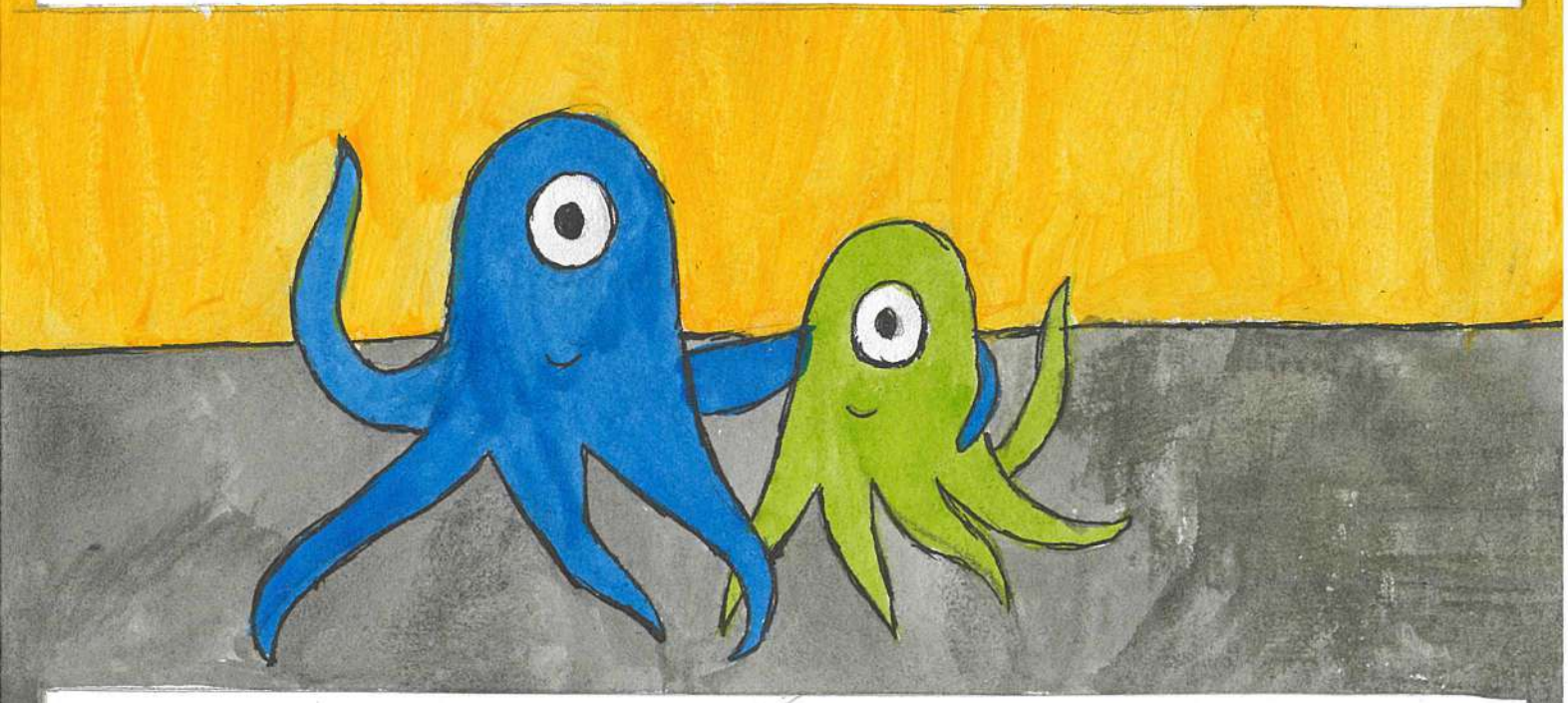
You can read the author’s inspiration for the story and the judges' comments on:

www.mathsthroughstories.org/ymsa2021

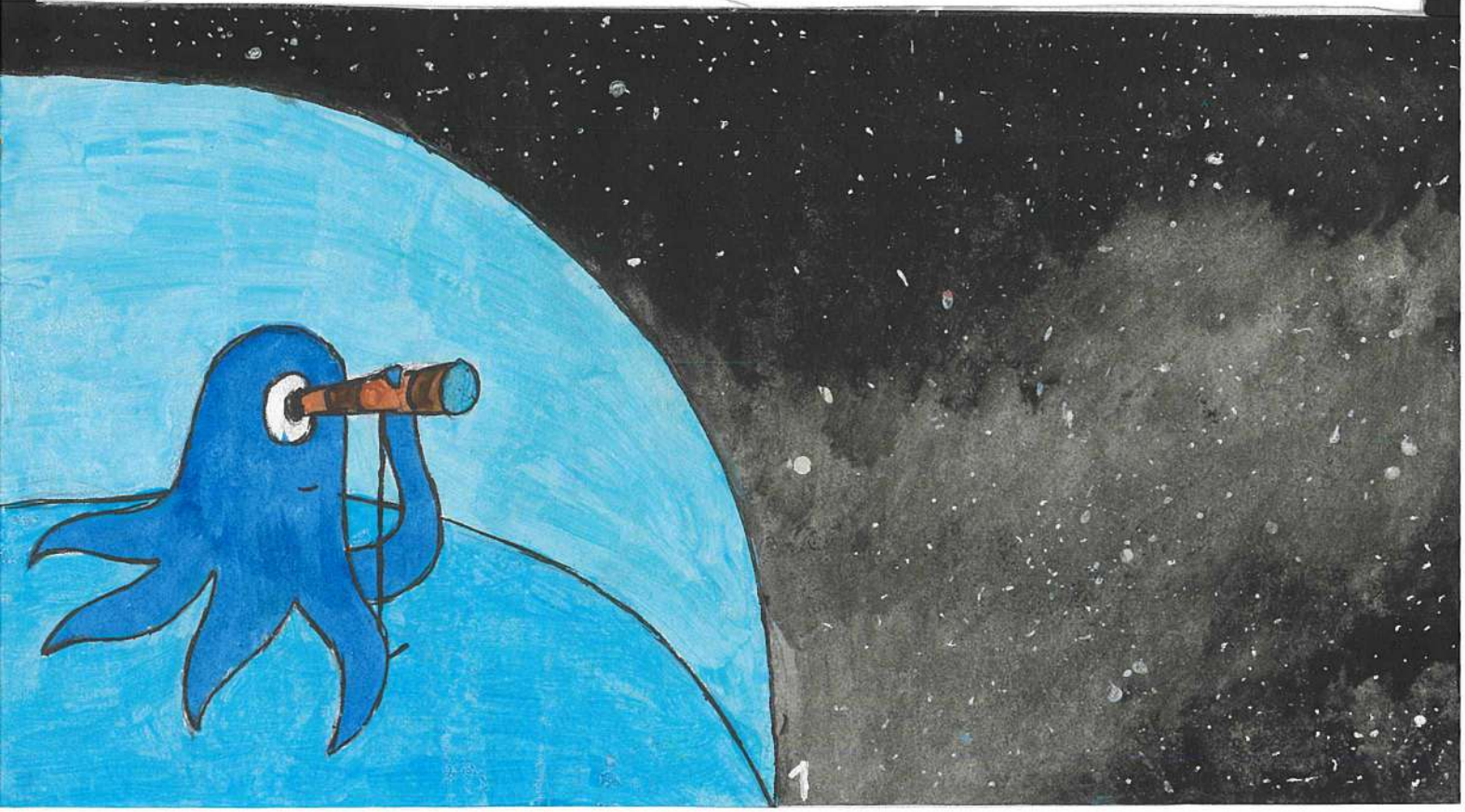
#YMSAMaths


Home
Tali Whiteridge
Wellington Girls College

This is Igmo and her son, Tars. They've been roaming around the galaxy on their spaceship for as long as Tars can remember, because no planet wants to take aliens like them. The only contact that they have with anyone else is when they stop at refueling stations, but they are always quickly sent back on their way, into the depths of the galaxy. It hurts to be treated like this, but they've resigned themselves to the fact that they can't do anything about it while they are exiled as they are.



Igmo and Tars have lots of fun exploring the galaxy, but they hate how they can't do anything about how they are treated. Which is why when they are thought to be just drifting around, they are actually looking for something. A planet to call their own. If they were the first ones to set foot (or tentacle) on a planet, then they would be able to claim it. They would be able to set their own guidelines, and make a planet where aliens and humans alike were equal. So each night, the two aliens climb up to the top of their spaceship, where they've managed to get hold of an old telescope. They take turns combing the sky, looking for anything even slightly out of the ordinary. But as beautiful as the sky is, it never gives them any answers.



One night, long after Imgo was asleep, Tars silently ascended the stairs to the telescope. He crept out across the observation deck, and put it to his eye. For a while he just watched the stars slowly move across the sky, always humbled by their graceful journey. Moments like this were the ones that made him glad to be a part of their beautiful world, even if the beings in charge were cruel ones. The stars weren't bound by rules, by regulations. They were free, as he hoped to be one day too.

Returning from his thoughts, Tars scanned the sky intently, but to no avail. Tonight wasn't the night for a planet to magically appear, it seemed. He gave the stars a last quick glance, and was about to pull his eye reluctantly away when he saw something. Almost breathless with excitement, he quickly focused the telescope where the thing had been. Tars squinted intently, his eye glued to the telescope in anticipation. It appeared that he was staring at a small ball of light. It was too big to be a star… "A planet!" he whispered, not quite believing it. A planet was the answer to all of their problems! They weren't allowed anywhere near the discovered ones, which meant that this one had to be not yet registered… if they were the first ones to get to it, they could claim it as their own!

Tars raced down the stairs, and rushed to the room that held the recharging pods. He quickly prised open Igmo's, his whole being alive with excitement. This was it! He had found it! A *planet!* He waited impatiently while Igmo opened her eye sleepily. "Tars!" she said blearily. "It's the middle of the night!"

"I've found a planet!" he said, ignoring her comment. That got Igmo awake.

"A planet?!" she exclaimed, already jumping out of the pod. "Where? Show me now, Tars!"

Together they rushed up the stairs. The telescope was still angled where Tars had left it, and Igmo went straight to it. But when she pulled her eye away, she wasn't wildly excited, as Tars had expected.

"What's wrong?" he asked, dread forming inside him.

"We're scheduled for a stop at a refueling station within the next few days," she told him.

"And?" he said, not wanting the answer.

"I don't think we have enough fuel to get there," Igmo replied.

"To the station?" Tars asked.

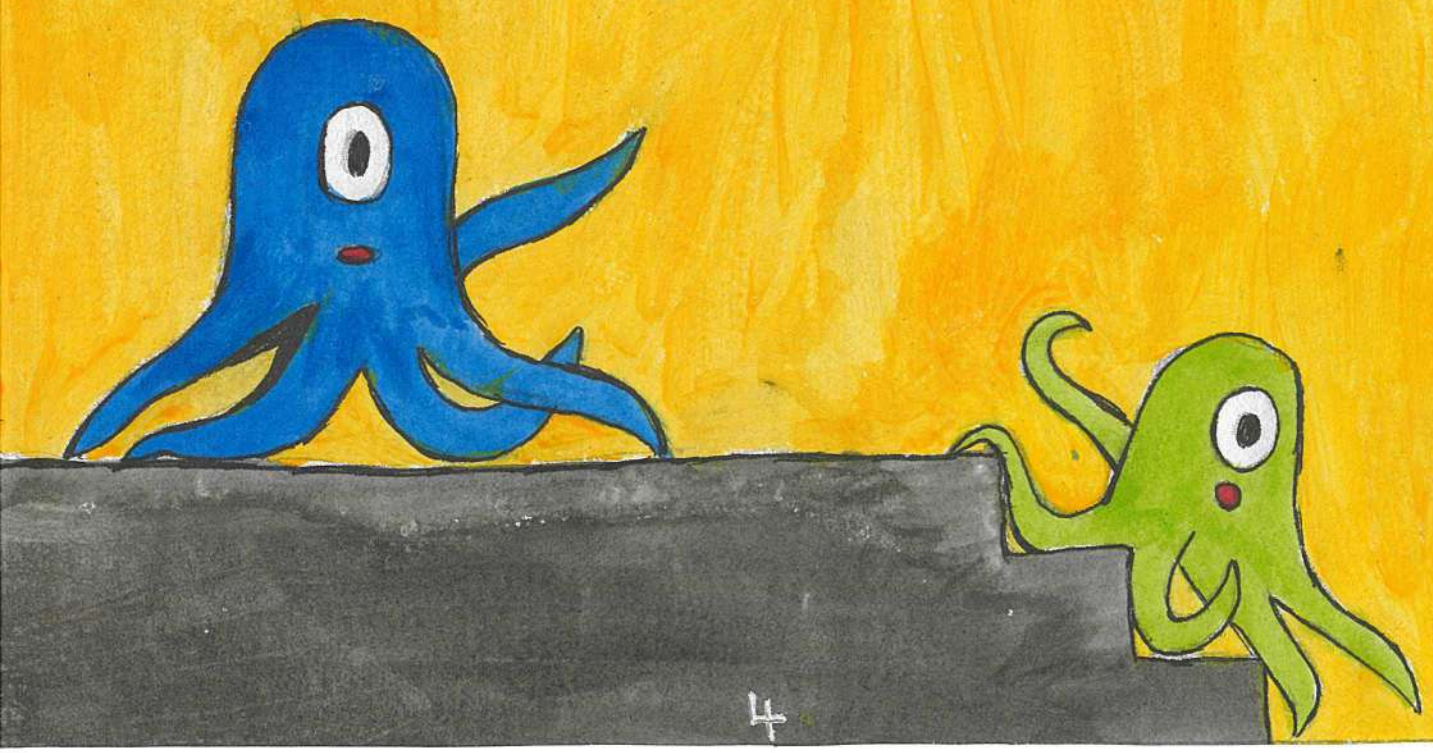
"No. To the planet."

"Surely we can refuel and then go to the planet," he said hopefully. "It will take longer, but a couple of days won't make that much difference."

"Tars, you know that if we land we are obliged to report any findings we make to the humans. And if they get there first, which they will, the planet is theirs, not ours."

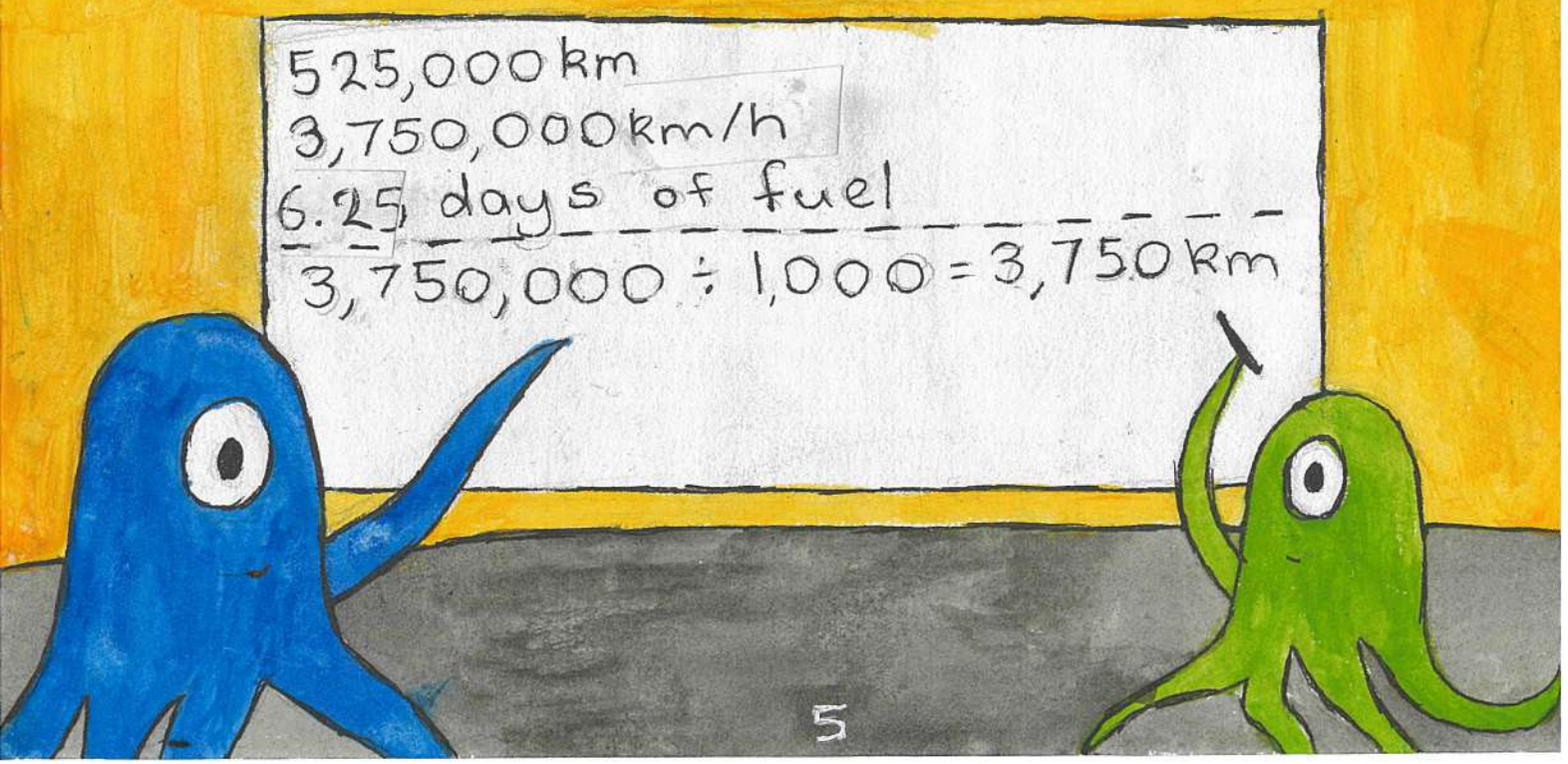
Tars did know, but he didn't want to admit defeat. "Mum, this is our one chance!" he said. "We've been searching for a place to call home ever since I was born, and now we're going to throw this once in a lifetime chance away because of some human rules? That's completely stupid!"
"I know it's stupid, but life's not fair!" Igmo said harshly. "If we don't follow their rules, they get the planet anyway, and we end up no longer existing!"
"What, are you agreeing with them?" Tars asked angrily. "I thought that you wanted a better world for everyone like us!"
"I do," Igmo said, and suddenly her harshness had been replaced by a look of overwhelming tiredness. "But not if you end up dead for nothing Tars."

But Tars wasn't going to be defeated in his moment of triumph. There must be *some* way to get to the planet, he thought. Then it hit him. "Mum," he asked, "Exactly how do you know that we don't have enough fuel to get there?"
"I don't know for sure," Igmo replied, "But the planet is pretty far away. Much further away than the fueling station."
But Tars was off, running in the direction of the control room. Igmo followed him, though she kept her own excitement tucked inside her, not wanting Tars to get over excited for nothing. It was a cruel world for beings like them, but if they could just make this work… Igmo sped up. If there was any chance at all, they had to try. This was bigger than just them; they were doing this for all the aliens who had been exiled from their own planets.

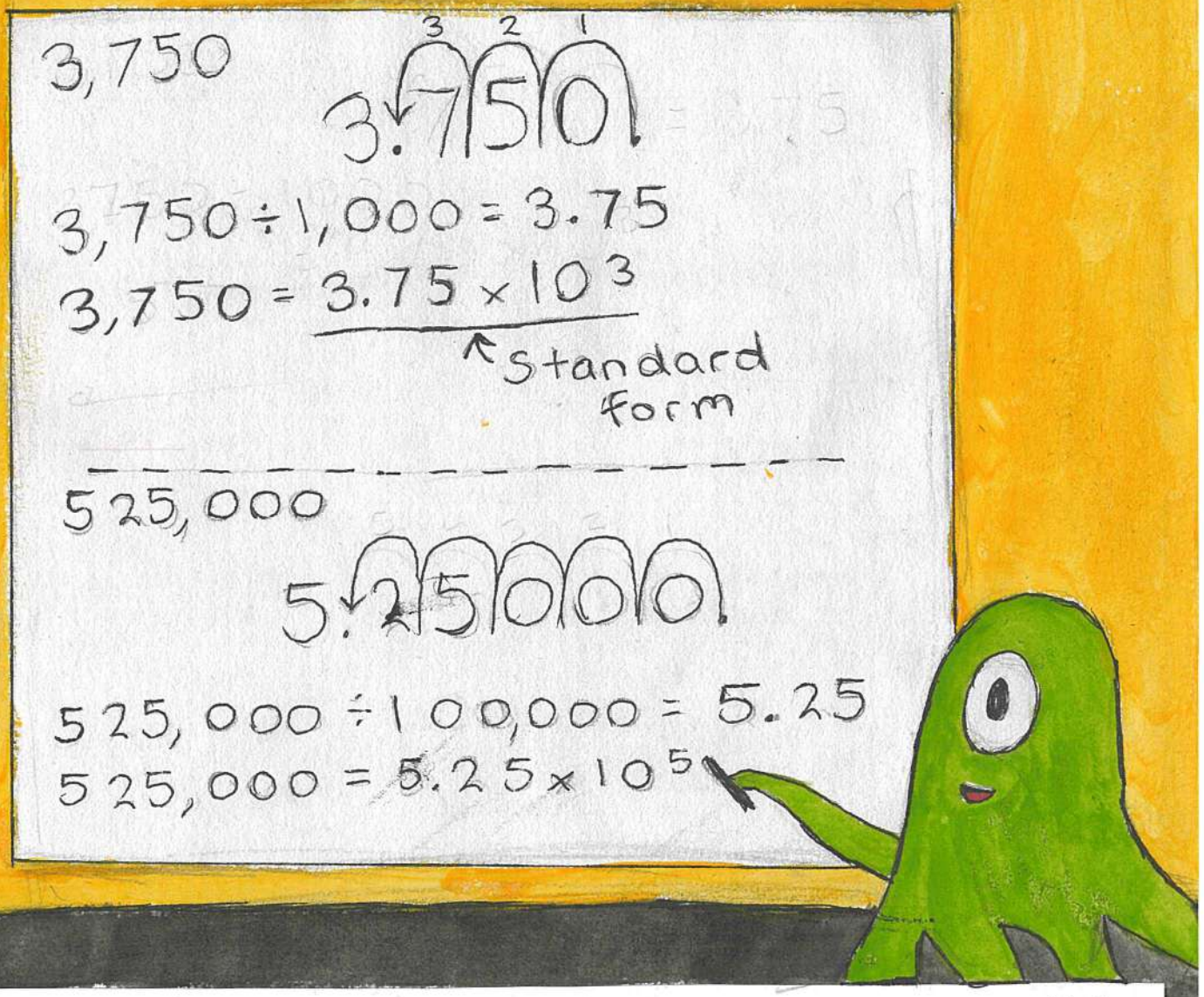


When Igmo got to the control room, Tars had already started. As she entered, he said, "I've scanned the area, and it's approximately 525,000km to the planet. The maximum speed we can go is 3,750,000km/h and we have 6.25 days worth of fuel left." He looked away from the dashboard and up at her. "I have no clue what to do. I'm hopeless with big numbers."

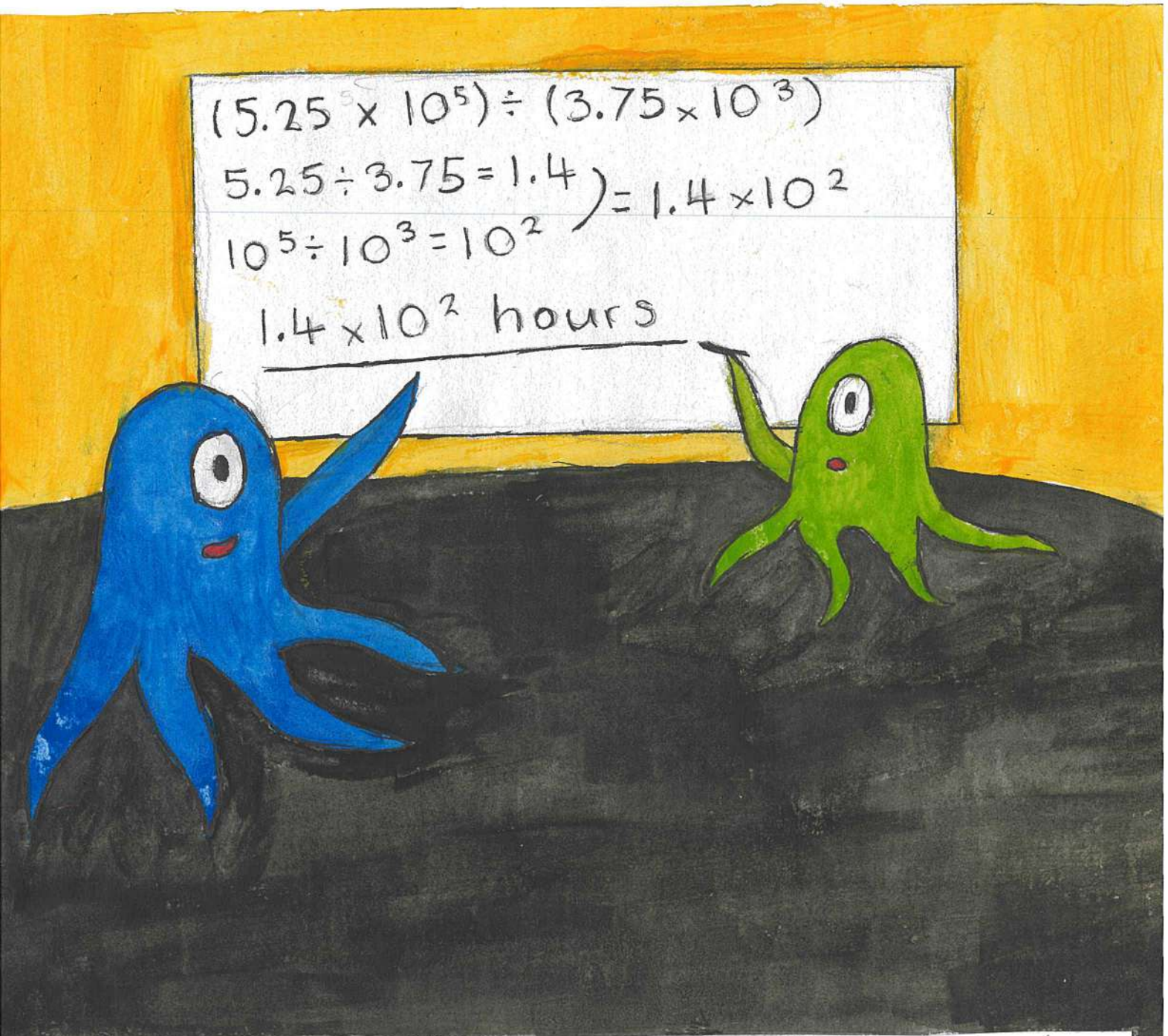
Igmo moved over to the dashboard, and got up a separate screen. "I think it would be easier if we worked this out in standard form," she said. "It makes big numbers a lot easier to work with."
"Standard form?" Tars said, looking confused. "What in the galaxy is that?"
"I'm getting to it," Igmo replied. "But first we need to make sure our numbers are both using the same unit."
"Well... there are a thousand meters in a kilometer, so if we wanted them both in the same unit then we would have to either multiply the distance by 1,000 or divide the speed by 1,000."
"Very good. Let's divide the speed by 1,000, as kilometers are more useful for large distances."
"Okay, then 3,750,000 ÷ 1,000 = 3,750km."
"Correct. Now it's time for standard form. You use standard form when you want to make very big or very small numbers easier to read and work with. But today we are only using very big numbers."
"Okay?" said Tars apprehensively, aware that his mother was about to go on a maths rampage, and that he was going to have to hold on tight.



"Let's start with the speed, as it's smaller," Igmo began. "The first step is to move the decimal point so that the number is between one and ten."
"That would make it 3.75, right?" Tars asked. "Because the zero at the end no longer has any value."
"That's right. The next step is to count how many places forward we moved the decimal point."
Tars thought for a moment. "Three?"
"Correct. But effectively what were we doing with the number?"
"It was like what we were doing before, I guess, when we were dividing the speed by 1,000. We were dividing the number by... 1,000 again.
"That's a good way to think about it. Except we have a special way of writing this. We have our number which is now between one and ten, which is 3.75, and then we have × 10 with a little number next to it with how many times we moved the decimal point. It's a 'to the power of' symbol."

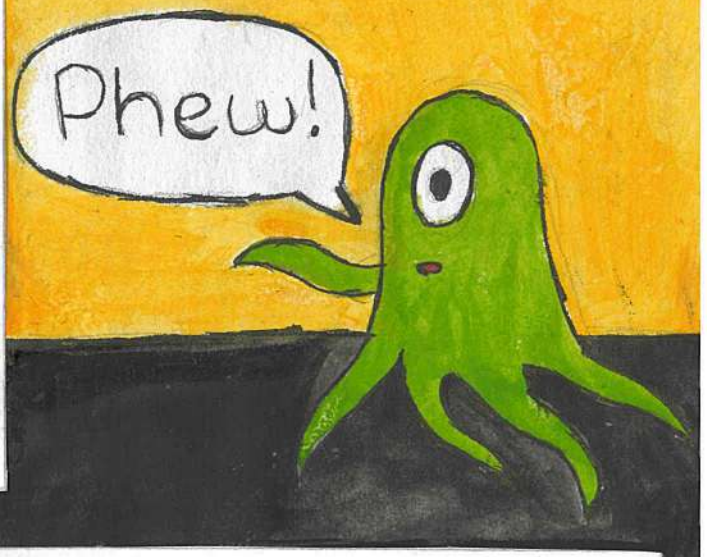


"So the final thing is 3.75 × 10^3?" Tars got a nod. "That makes sense. But I still don't understand how it helps us."
"All in good time, Tars. But first we need to do the same with the distance. Why don't you give it a try?"
"Okay... our original number is 525,000, but first we need to make it a number between one and ten. So it would be 5.25. That's a lot of zeros that we just got rid of!"
"It is. But let's focus, we need to do this as quickly as possible."
"Right. So then we count the number of times the decimal moved forward, which was five, wow that's a lot too, and then we write it out in standard form. That would be 5.25 × 10^5."



"Let's keep this up!" Igmo exclaimed. She was like her own little maths spaceship, flying along at high speed.
"Now we need to actually use the numbers. Do you remember how to figure out the time if we know the speed and the distance?"
"Distance divided by speed is time," Tars said, nervous that the focus of the rampage was on division.
"Yes. So the equation we're working with is $(5.25 \times 10^5) \div (3.75 \times 10^3)$. But dividing in standard form is a bit different, as you've probably figured out. First we need to divide the numbers."
"Okay… 5.25 ÷ 3.75 = 1.4." Tars said tentatively.
"Very good. Now we need to use the law of indices on the powers."
"The what?"
"The 'to the power of' numbers are types of indices. When you are doing multiplication or division in standard form you instead add or subtract the indices, because they have the same base, which is ten."
"So… 5 - 3 = 2?"
"Yes. So what's the answer then?"
"1.4×10^2."
"Pardon?" Igmo was impatient.
"1.4×10^2 hours."
"Thank you."

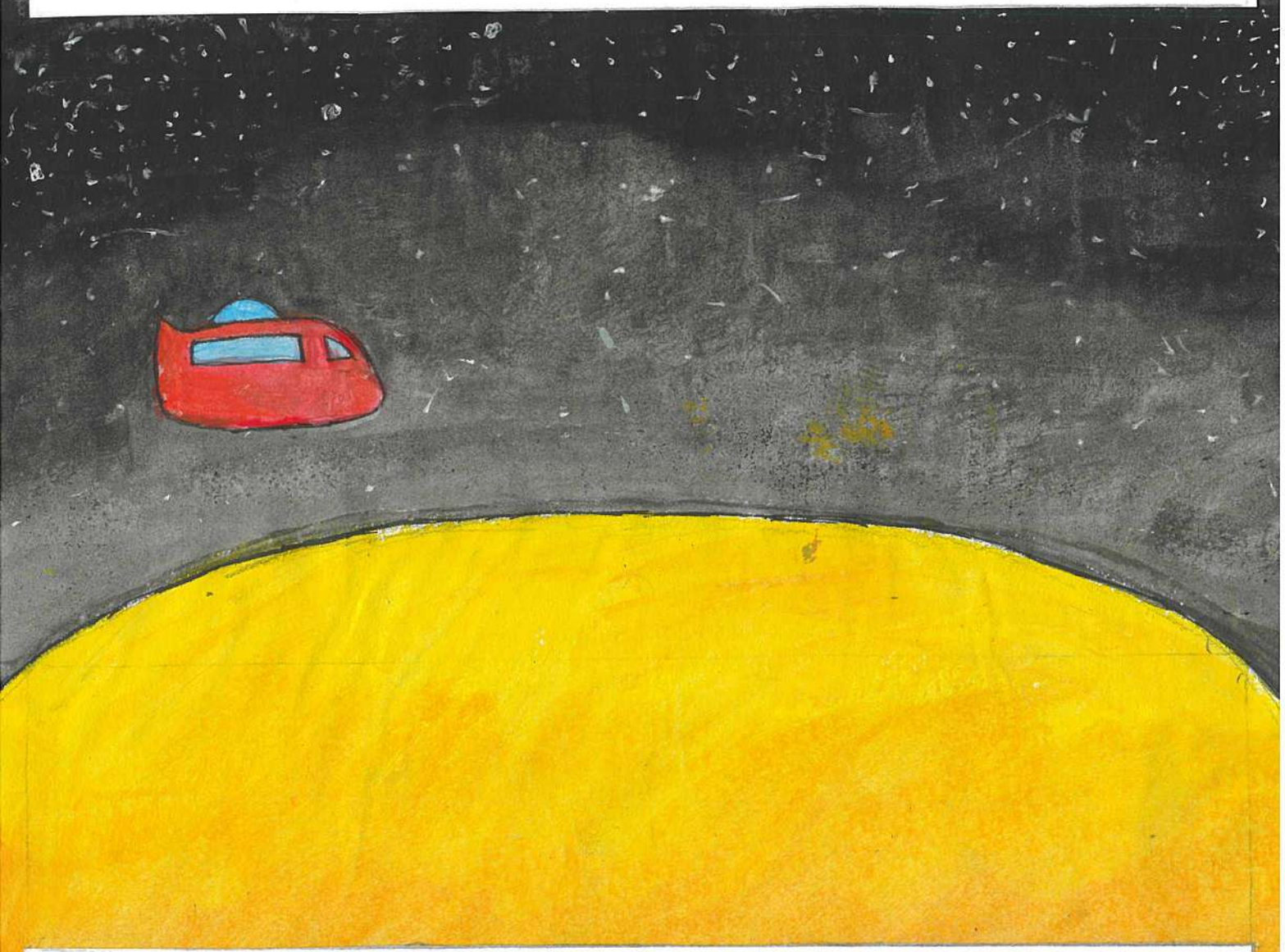
"Phew!" Tars said. That was a lot of maths!"
"We're not done yet!" Igmo responded.
"How?" Tars demanded, looking slightly agitated. "I just got taught how to use standard form in five minutes flat! I don't need more!"
"But we still need to figure out if we have enough fuel to take us to the planet, remember?"
"Okay, okay! We have enough fuel for 6.25 days, which means we need to now convert that into hours."
"Go on."
"There are 24 hours in a day, so 6 × 24 = 144 hours."
"Almost there. Come on, Tars!"
"Okay, then 0.25 is the same as 25%, and 25% × 24 is 6 Then 144 + 6 = 150."



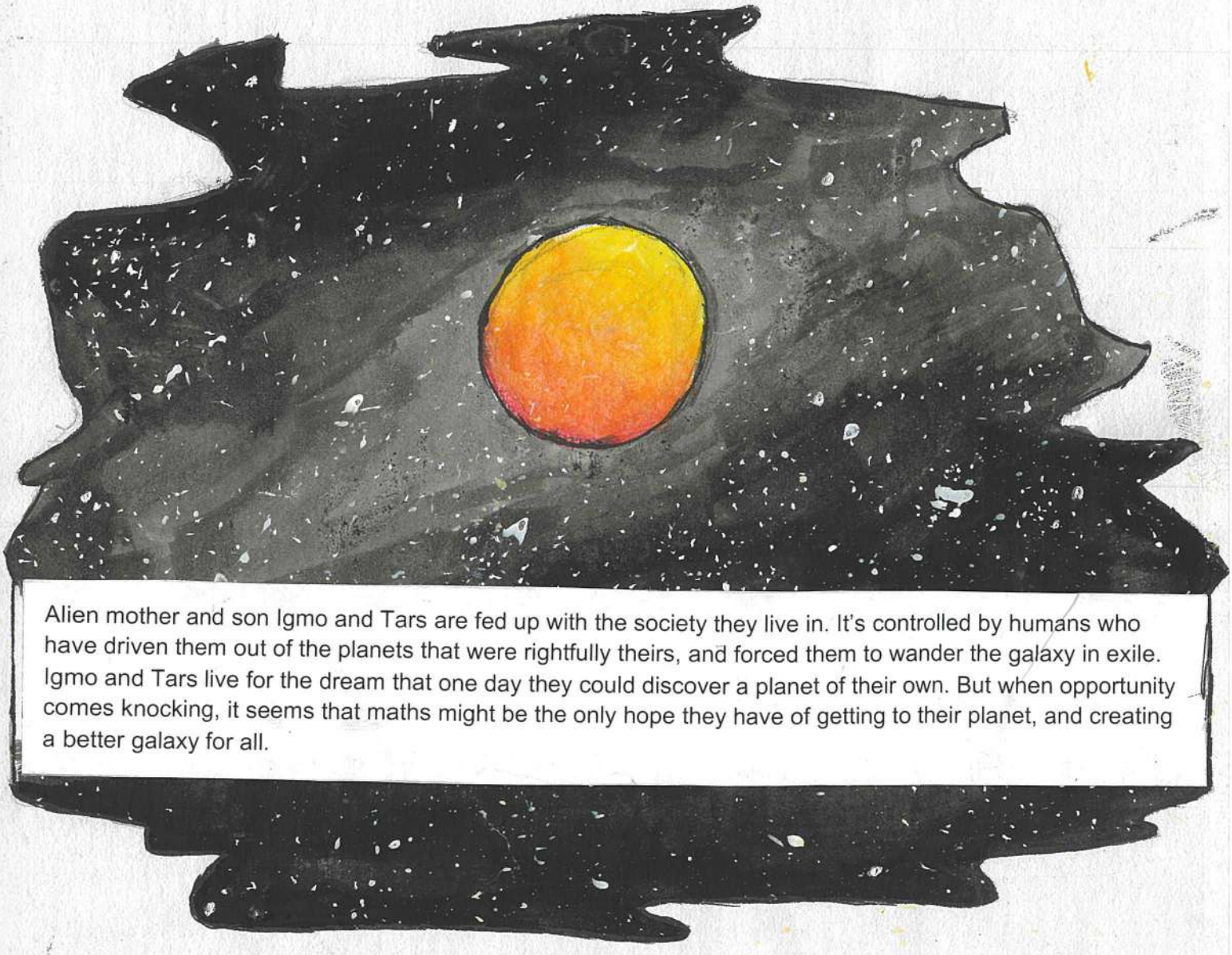
Fuel for 6.25 days
24 hours per day
$6 \times 24 = 144$
$0.25 = 25\%$
$25\% \times 24 = 6$
$144 + 6 = 150$
$= 1.5 \times 10^2$ hours

"Now into standard form." Igmo was almost jumping up and down, Tars noted. That was how much joy all this quick fire maths gave her.
"Okay, that makes it 1.5×10^2.
"Unit please?"
"1.5×10^2 hours. Wait... that means we have enough fuel! We can get to the planet!" Tars exclaimed elated with joy, but also very relieved that the rampage was over.
"Yes indeed!" Igmo could scarcely contain her own joy.
"Let's set the course for our new home!"

Six days later Igmo and Tars were jumping up and down with apprehension and excitement. Their planet was only minutes away now! They were only minutes away from the beginning of a better world for all of their kind! But Tars had a question. "Mum," he asked, "Because this is our planet, do we get to name it?"
"Why yes, I think we do," Igmo replied. "What do you want to call it?"
"I don't know," Tars said. "I feel like we need to come up with something pretty good. After all, this is going to be our home."
"How about we call it that?" Igmo suggested.
"What?"
"Home."
"I like that as a name for our planet," Tars conceded. "Home."



Soon their spaceship had landed, and Tars and Igmo were ready to set tentacle on the planet that was soon to be theirs. "But wait!" Tars exclaimed. "Who should actually get on the planet first? Whoever does it is the actual owner."
"I think you should do it," Igmo said.
"Me?" Tars was shocked. "Why?"
"Because if it wasn't for you, this planet would have become just another one controlled by the humans. It would have been another planet that enforced suffering for our kind. But your determination stopped that."
"Well… I guess I could…," Tars ventured, trying not to sound too hopeful.
"Oh, just do it," Igmo said, and promptly pushed Tars out of the ship.
And that was how Tars, first being on Home, came to be it's guardian. By falling flat on his face, the laughter of his mother vibrating throughout him.



Alien mother and son Igmo and Tars are fed up with the society they live in. It's controlled by humans who have driven them out of the planets that were rightfully theirs, and forced them to wander the galaxy in exile. Igmo and Tars live for the dream that one day they could discover a planet of their own. But when opportunity comes knocking, it seems that maths might be the only hope they have of getting to their planet, and creating a better galaxy for all.