

#### THE 2023 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

### THE CINDY NEUSCHWANDER AWARD (THE 12-15 YEARS OLD CATEGORY)

#### **LONGLISTED**

'Algae-Bra' by Lily Gottlieb (12 years old) at St Paul's Girls' School (UK)

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

www.mathsthroughstories.org/ymsa2023

**#YMSAMaths** 

## ALGAE-BRA

## BY LILY GOTTLIEB ST PAUL'S GIRLS' SCHOOL



Rumbling, shell-cars and shell-coaches pulled up in front of the school. A flood of young fish streamed out and swam into the building. Then, the cars and coaches drove away and the bikes and the scooters arrived next. Jumping off, the children waved goodbye and, like the others, swam into school. Quickly after, the ones who swam there hugged their parents and rushed off inside. As the clocked ticked away, the vehicles became less frequent, but the children became more excited. "It's Trip Day!" everyone called out. "I know! Almost time now," they replied. The playground buzzed with chatter and anticipation. The seconds passed by slowly, but finally, the teacher picked up the bell, and shook it. For a moment, everything was silent; the only thing you could hear was the shrill ringing of the bell. Just as the bell rang, the last car parked up outside. A little fish leapt out, waved to his Mom, and sped into the school.

"Okay! Everybody, listen up!" a teacher called out, "As you all know, it's trip day!"



"Your teachers are going to come around to take the registers and then, everybody needs to go out to the bus. Please remember to let the little ones on first!" another teacher said.

Stirring into action, the rest of the teachers swam to the lines of students and began to call out names. "Yes!" and, "Here!" and, "Good Morning, Miss!" were shouted in response.

Slowly, the line began to move, slithering through the school and outside onto the bus.

Meet Bubbles: a little fish who was almost always late to school. He was last in the queue, and therefore last on the bus, because of this unfortunate habit. This meant that he had to sit at the front, in the dreaded window seat.

Despite its reputation, he didn't mind it that much, as it was usually where he sat on school trips. No one wanted to sit there, or near it, because it was the school bullies' target seat. It was near the teachers, but not too near the teachers, so the bullies could pretend like they were the victims. It was also near a window – windows were bad news for their victims. Today, the bullies were bored. And when the bullies were bored, they were angry. And when the bullies were angry, they attacked.

"Well, well, lookie here, friends!" Bubbles heard a voice say.

"What do we have here?" another one exclaimed.

"Looks like a small, lone fish who needs some friends," said another.

"We'll be your friends, Bubbles!" they all said, mockingly. Bubbles turned slowly and cautiously. He shut his eyes and then opened them reluctantly. He sighed when he saw them. The pufferfish. There were three of them, all from different families, but they looked so alike most people thought they were triplets. They were the meanest, harshest bullies you would ever encounter, and they went to extreme lengths to get things done.

"Hello," Bubbles squeaked, attempting to sound strong.

"Aw, hello, little guy, we've come to keep you company!"

"Yeah, we just want you to do something for us!"

"What now?" Bubbles asked, annoyed and frightened.

"Oh, just a small favour. We only want you to take the blame for what's about to happen!" Bubbles stiffened and gripped the seat.

He took a deep breath, and then, "No," he said, "I won't. Go bully someone else."

"Oh, is our little friend talking back?"

"I think so! And he knows what we do when that happens!" The tallest, Splosh, snatched Bubbles' bag.



"Want it back?"

"Then agree!"

"No!" Bubbles stood his ground, he wasn't going to let them win. At least not this time.

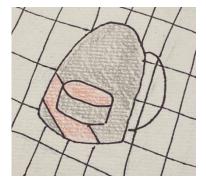
"Okay then, you asked for it!" Splosh said, as he tossed the

bag out of the open window. The trio swam away.

"No!" Bubbles cried out, "My bag!". He reached out, trying to pull it back, but it was too far. Suddenly, his anger took over and he stretched so far, he felt as if his arm would fall off. He brushed the strap of the bag and reached further, closing his hands around it, but he fell. He tumbled out of the window and fell. Quickly, he shot through the water, plummeting to the sea bed. As soon as Bubbles was gone, the bullies claimed the seats and sat down.

Bracing himself to hit the floor, he curled up. Just as he was going to crash, he felt something catch him. He opened his eyes, and saw a net engulfing him. For a moment, he breathed a sigh of relief and sank back into it. Then, he sat up again. His heartbeat quickened. "A net," he muttered, "Oh no! A fishing net." He shot up.

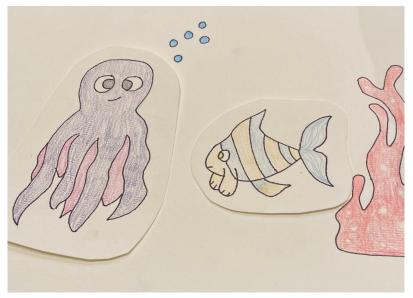
Frantically, he swam around, trying to escape. It was no use, and the net was closing fast. He was about to give up, when he spotted a hole in the net not so far from him. He began to race towards it, but then he remembered his bag. Looking back, he stopped. Should he retrieve his bag first? What if there wasn't enough time? He turned again, deciding to abandon it, and he squeezed out through the hole. Watching as the net rose higher and higher, he stared at his bag nestled among the ropes. Soon, the net disappeared.



Bubbles looked around. Where was he? He didn't recognise anything, but surely he hadn't fallen that far from the bus, hadn't he? He swam over to a patch of coral to sit down at catch his breath. His head was spinning; his thoughts were a tornado. He rested for a while, trying to calm himself. Bubbles forced his mind to settle a little, so that he could think. He desperately tried to work out what had happened. He tried to use speed/distance/time calculations, but it was no use. He didn't know how to. At last, he came to a conclusion. He was lost.

He was lost. He had to repeat it a few times before it fully sank in. He was lost. He didn't know where to go or where he was. He began to panic,

breathing fast. His head spun, thoughts merging. Luckily, at that moment, an octopus rounded the corner. She spotted him and made her way over. "Hi! Are you okay?" she asked, gently. Bubbles started sobbing. "It's okay! I'm friendly, I promise," she encouraged him.



"I'm lost," he cried, upset and scared, "I don't know where I am."

"It's okay! I'll help you," She replied, kindly.

Before she could even mention her name, a shadow passed over everything. It became dark. Bubbles looked up at the octopus, petrified. The octopus crouched, and motioned for him to come next to her. "A shark. Be very still and very quiet." she whispered. Bubbles obeyed, not daring to breathe. Slowly, the shark moved along and the light shone once more. He took a small breath. Then, the shark

looked at them. "Uh oh. Not good." the octopus whispered. But, she didn't move. It swam nearer until it was only a few metres away.

"Hi!" It said to them. They didn't reply.

"Please don't be afraid – I won't hurt
you!"

"You are a shark, our lives are as good as over." the octopus spat.

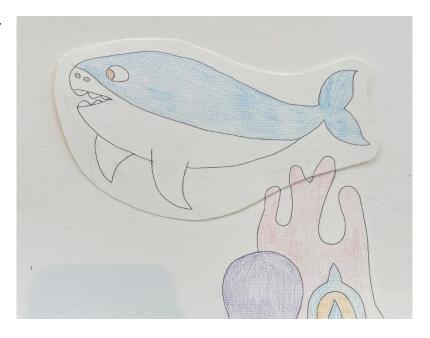
"No! I'm not like the others. I swear!"

"Yeah, sure! I'll just fall into your trap. Nice try, but we're not fooled."

"No, really! Don't my species travel in groups? I'm alone-"

"So?" the octopus interrupted.

"So, as I was saying, I have no friends because no one likes me. No one likes me because I'm kind to the other species. I swear! I'm not lying!"



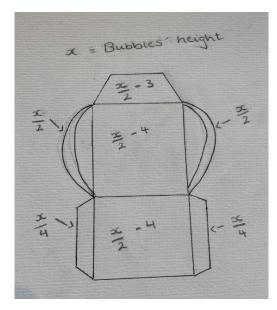
"Okay, fine. But how do we know you are telling the truth?"

"I tell you what, you look like you need some help. I'll help you if you will be my friends – deal?" The shark watched them as they glanced at each other. Bubbles nodded, gently and cautiously. The octopus narrowed her eyes.

"Deal. But on one condition – if this is a trap, promise you won't hurt the little one. Let him be free, and eat me instead, I'm much bigger."

"I promise I won't! I keep telling you!" the shark sighed, and nodded in agreement; she was tired of arguing. The octopus gave a satisfied smirk.

"Okay, now that you two have stopped fighting, I'll explain." The little fish spoke up. He then proceeded to tell them the events of that morning and how he came to be there. Once he was done, he leant back into the coral and began to sob again.



"Oh, no! Don't cry, we'll help you!" the shark exclaimed, patting his shoulder with her fin. He looked up at her, through small, scared watery eyes and he smiled, grateful.

Next, they introduced themselves. Shelly the shark, Octavia the octopus, and Bubbles the fish. Then, they discussed how to help Bubbles. He explained that he needed to go to the museum for their school trip, and he also needed a bag.

"Why don't we just find your old bag?" Shelly asked.
"He had to leave it in the net, remember?" Octavia replied.

"Oh, I remember now." she muttered. They looked at each other, trying to come up with something. After a bit of pondering, Octavia had an idea.

"What if we make you a bag?" she exclaimed, proud of her idea. Bubbles nodded, visualising it in his head.

"But, how?" he said.

"Well, my parents own a store, and sometimes I help them make items to sell! I can probably work out how to make a bag!"

"Okay!" Bubbles eyes lit up; he was finally getting somewhere! Octavia sat still, focusing on her thoughts. Suddenly, she cried out, "I've got it! We'll use algae as fabric and little bits of coral to hold it together!" She was about to set off to find these materials, when Shelly interrupted her. "How much do we need?" She asked. Octavia stopped, and opened her mouth to answer, but she realised she didn't know.

"I don't know," she muttered, glaring at Shelly.

"Don't worry, I know! We just need to use maths to help us!" Shelly said.

Bubbles groaned, "I hate maths."

"Trust me, maths is fun!" Shelly told him. Reaching for a piece of coral, she smoothed out an area on the floor. Deep in thought, she drew out numbers, and diagrams, and calculations.

After some time, she lifted her head and dusted her hands off. "OK. Done."

Bubbles and Octavia (reluctantly) gathered around her work. "Wow," Bubbles whispered.

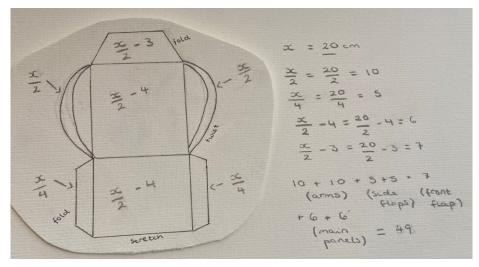
"What does that nonsense even mean?" Octavia burst out.

"It's not nonsense, it's the solution! It's called algebra, and it's a method used in maths to help solve problems. We need to find out how much algae we need for the backpack. In order to do so, we need to know the measurements. That's what x is for. Then, depending on what the measurements are, we can work out what we will need by using this formula!" Shelly replied.

"Now, we just need to take those measurements." She motioned for Bubbles to stand up straight. "Okay. Got it. I see. One last one! And... Done!" She mumbled, using some kelp as a measuring tape. "Now if I just add that to my diagram...". As she scratched the measurements in, Bubbles stared in amazement at the solution forming.

"How did you do that?" He asked, gasping.

"Oh, I just created a formula for each measurement and then I applied the measurements to the formula, to get the answer! It's algebra, remember?"



"Algae-bra!" Bubbles exclaimed, laughing.

"Yes! Algae-bra! Shall I give you another example?"

"No, thanks. We should probably get going soon anyways." Bubbles said. Shelly nodded and added up how much algae they needed.

"Got it! We need to collect 49 pieces of algae to make it. We should split up, though. Bubbles, you go over there, Octavia, you stay here, and I will go that way!" She said, pointing to the various locations.

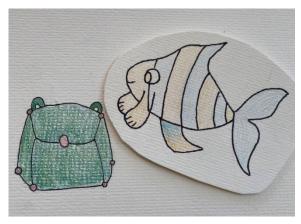
Eventually, they had picked up enough algae to begin.

They all gathered again, with all of the algae. Shelly began to explain, but Octavia cut her off, taking charge of the situation. "I thought I was the one who knew how to make it?" She asked, smirking. Shelly stopped talking, embarrassed. "That's better," Octavia said, glaring at her. She then proceeded to explain and demonstrate how you create a bag. Shelly and Bubbles watched in awe as she folded it together. "Can someone pass me a piece of coral — not too big, preferably?" She asked, holding two bits against each other. Shelly passed a small one to her, smiling. She snatched it. "Thank you," She murmured. With the coral, she poked a hole in the two pieces and then pushed the coral through. Twisting the pieces around, she wrapped them over it to secure them together. She put it down, "Okay. First bit done."

"Can I have a go now?" Bubbles asked, timidly.

"Sure." She motioned him to come beside her, and she passed it over.

Carefully, he copied her actions, weaving it in and out, and folding it accordingly.



"Good!" Octavia commented every now and then, guiding him when he got stuck. Eventually, the bag was finished. Bubbles held it up to show the others.

He beamed as he pulled it over his shoulder onto his back, proud. He swam around with it, posing. Shelly laughed. But, as he took it off, it snapped.

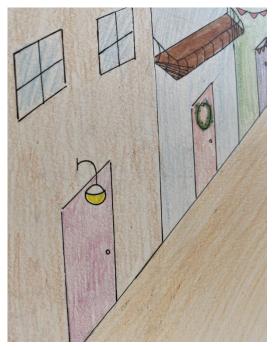
The algae came free of the coral, and it ripped a hole in the side. Bubbles smile disappeared immediately. He lifted it up and looked at the hole, trying to fix it. However, it only made it worse, and soon enough the bag ended up a pile of algae and coral on the floor.

Bubbles stared at it for a long time. The girls were quiet, they weren't sure what to say. Then, it looked as though Bubbles had started to cry. Shelly opened her mouth to say something, but he just turned away and left. Confused, the two glanced at each other. What was he doing? Slowly, Shelly began to inch forwards. Quickly, Bubbles became just a little dot in the distance. Shelly broke into a sprint, Octavia close behind. "Bubbles! What are you doing?" She shouted. When they could no longer run, they stopped to catch their breath. "Where did he go?" Shelly asked, panting.

"I don't know," Octavia grunted.

"Hold on – I see him!" And Shelly was off, swimming away. Abruptly, she stopped. "Oh." Her face fell, "Guess not." Once Octavia had caught up, she exclaimed, "Look!". Shelly looked up. There was a village. But there was nobody there.

The girls swam forward, through the rows of houses, admiring it.



lowered its head and started weeping again. "No, it's okay! You don't need to cry!"

"Wh...Who are you?" The little fish stammered.

"I'm Octavia. This is my friend Shelly." She pointed behind her. The little fish began to shout.

"There's a shark behind you!" It called, petrified.

"No, no, don't worry. Shelly is a shark. But she's nice, I promise!" The little fish wasn't so sure, but it stopped shouting anyways.

Bubbles appeared in the doorway, "What's going on?". The girls turned. "Bubbles?" they said in unison.

"Oh! Hi, Connor," He smiled at the fish.

"Hi," Connor replied with a shy wave.

"You know each other?" Octavia asked.

"Yeah, Connor goes to school with me." Bubbles replied, "Are you okay, Connor?"

"Oh. Um, I'm alright. I'm just trapped. Can you move the sofa so I can get out?"

"Oh! This makes me think!" Shelly began, "There's a problem which Mathematicians cannot solve... It's called the Moving Sofa problem! It's about trying to fit a sofa around a corner. The point is to work out what the biggest sofa that will fit is!" She then went on about the problem, babbling, until Octavia jumped in.

"Hello? Shelly? There is still a fish stuck behind the sofa!" She said, and Shelly stopped rambling, embarrassed. They sprang into action, pushing the sofa away, freeing Connor.

"Thanks," He swam free, "Umm, can you help me find my parents please?"

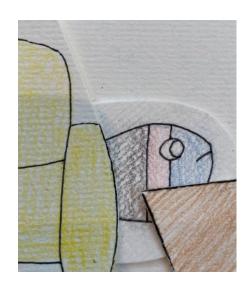
"It's so beautiful! But no-one is here!" Octavia whispered, as if just by talking, she would destroy it.

"It seems so alive, though," Shelly replied, "It's as if the villagers just left for a few minutes."

The two wandered around for a bit, marvelling at its amenities.

While they were staring at the village hall, they heard a cry. "Did you hear that?" Octavia asked, cautiously. Shelly nodded and turned around. She pointed to a building on her right and swam slowly and quietly towards it. Glancing at the octopus, she put her ear against the wall. Certain, she nodded. "This is where it's coming from." She whispered. Octavia gently pushed the door with her tentacle. Peeking inside, the girls saw a small fish and a bunch of furniture. The fish looked distressed; it was sobbing and moaning.

Silently, Octavia opened the door wider and entered. "Hello?" she said, "Are you alright?" The fish peered up at her, but then



"Actually, we were just going to the museum to meet the school trip. Want to join us?" Bubbles offered.

"Sure, thanks."

"What happened to you?" Octavia asked.

"A few hours ago, someone came and knocked on our door. They told us there was a shark, and everybody evacuated, but I got trapped here trying to get out. There was so much chaos and everybody was scrambling to get out. In the process, the furniture got shoved around. Everyone left and I was stuck here."

Connor started towards the door. "Oh, I still need a bag." Bubbles said, upset. Connor spun and left the room quickly. He was back in a few seconds, with two bags. Connor handed him a tattered, old one. "Sorry, it's the only spare one we have."

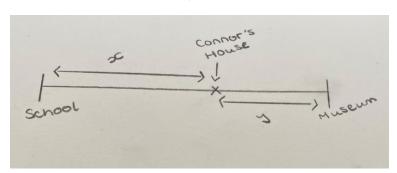
Grateful, Bubbles took it, "That's fine. Thank you so much!" Connor smiled. The boys swung their backpacks over their shoulders.

"Okay! Let's go!" Shelly exclaimed.

"Hold on. How far do we need to go? I'm not sure how much force this backpack can take..." Bubbles said.

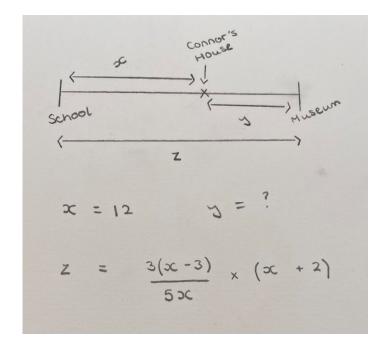
Shelly's face lit up, "We can use algebra!"

"Okay!" Bubbles said, excitedly. He reached for the pen and paper on a nearby table. "So, if we know school is here and the museum is there, and we are there..." He muttered, drawing the different locations, "And we have travelled x distance, and we have y distance left..."



Shelly took over from there, "Yes, that's right. We know that x is 12 – we've travelled 12 kilometres. Now, I know the distance between the school and the museum, but I'm not going to tell you. I'll give you a problem to solve!"

Bubbles laughed, eager. Once Shelly had drawn it out, he set to work solving it.



After a couple of minutes, he put the pen down and triumphantly called out, "Done!". Shelly checked it over, and then read his answer.

$$\frac{3x - 9}{5x}$$

$$\frac{36 - 9}{60} = \frac{27}{60} = \frac{9}{20}$$

$$x + 2 = 14$$

$$\frac{9}{20} \times \frac{1}{1} = \frac{63}{10} = 6.3$$

$$\frac{2}{10} \times \frac{1}{10} = 16.3$$

$$\frac{2}{10} \times \frac{1}{10} = \frac{16.3}{10}$$

$$\frac{2}{10} \times \frac{1}{10} = \frac{16.3}{10}$$

"Okay! That's really good! We can also use algebra to solve different kinds of problems that need us to figure out different things – sometimes the problems will ask you to find x rather than to solve an equation!" She exclaimed and turned to face the door, "Looks like we have 4.3 miles to go, then!"

Connor lead the way out of the little village, and soon they were among others again. After they had been swimming for a while, Bubbles began to slow.

"How much longer?" he whined, "My fins hurt."

"It's not very long." Octavia muttered.

"We've been swimming for so long, though!" Bubbles moaned.

"It's really not that long at all," she replied, annoyed.

"Yeah, but you have 8 tentacles!" He swam ahead.

"Okay, okay, stop fighting!" Shelly jumped in, "You can ride on my back."

"Really? Thank you!" Shelly bent down and he hopped up onto her back.

"Hey!" Connor said, "That's not fair!" Shelly sighed, but helped him up as well.

The boys sat there, grinning and smirking at Octavia, as she trudged along, pretending to not care. They glanced at each other, and shared quiet laughs and smiles.

"Well, it looks like you two are having a great time now," Octavia snapped. Much to her annoyance, the boys nodded in agreement, smiling innocently. "Can I come up too?" She said, quietly and hesitantly, "Please?"

"Alright," Shelly said, generously bending over to let her on. Octavia scrunched her face up. "What are you doing?" Shelly stood up again, horrified.

"I'm smiling!" Octavia proudly stated.

"Oh." She bent over once more. As she climbed up, Connor and Bubbles made faces at her.

"Hey! Why are you making faces?" Octavia obliviously asked.

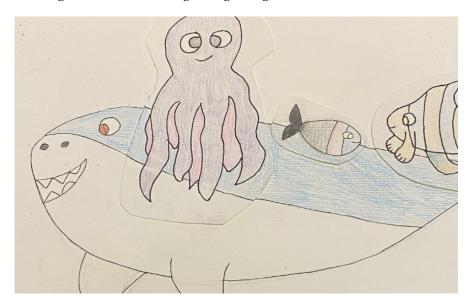
"Oh! We're not making faces," Connor began.

"Yes! We are smiling at you!" Bubbles finished. Both fish burst into laughter. Octavia looked away, embarrassed. Once the boys' laughter had ceased, they turned to Octavia, who was attempting to twist her face into a smile. Holding back their laughter, Bubbles started to apologise. She jumped, startled. "Sorry – I didn't know you were there."

"We just wanted to say sorry for laughing," Connor mumbled. Octavia nodded, at first unsure. She shut her eyes as, hesitantly, her lips curled upwards.

"You're smiling!" Shelly exclaimed, rotating to join their conversation. Octavia beamed at them; she looked genuinely happy!

"Alright, alright! It's not that big a deal!" She told them, blushing. Bubbles and Connor proceeded to chat away, babbling on about random things. The girls began to chat as well.



After some time, Shelly halted abruptly.

"Why did you stop?" The boys asked. They glanced around. "Oh! We're here!" They exclaimed, jumping up. Shelly crouched down again. Octavia was first to jump off. She then helped the boys off, lifting them down, and Shelly straightened up, stretching.

"Okay! We made it!"
Octavia said, "Where do you
two need to go?"

"Just over here," Connor mumbled, chasing after Bubbles, who had already bounded off.

"Wait for us!" Shelly called, laughing. Then, Octavia and Shelly raced towards them. Once they had caught up, the girls snuck up behind the fish and grabbed them.

"Ha! We caught you!" Octavia announced. The boys giggled, squirming. "Okay, we'll let go. But, no running off!" Slowly, they released them, and the boys backed away.

"We just need to go in here," Bubbles told them, pointing to an entrance. Shelly and Octavia followed the fish as they swam over to the door.

"Okay! I see my class!" Connor said, waving and turning to go inside. Before he disappeared, he thanked them and smiled. And then he was gone.

"Me too." Bubbles said, sadly.

"Why are you sad, Bubbles?" Shelly asked.

"Oh. It's just that I will miss you," He mumbled.

"We'll see you again!" Octavia reassured him.

"Okay, if you say so!" He smiled.

"Bubbles, is that you?" A voice called from within the museum. He glanced back.

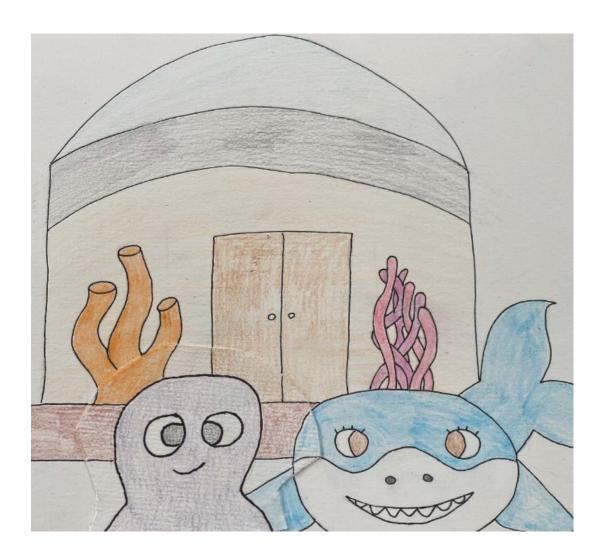
"Well, I've got to go now. Thank you for all your help!" He waved, and swam inside. The shadows swallowed him up. The girls smiled. Suddenly, a little head appeared in the doorway. It smiled. Bubbles ran towards them. He embraced them in a hug, wrapping his arms as far as they would go around them. "Thank you," He whispered, and then he was engulfed in the shadows once more.

The octopus and the shark just stood there for a while, staring at the door.

Then, Octavia began to chuckle.

"What's so funny?" Shelly asked, smiling.

"Remember how Bubbles called it Algae-bra?" She said, bursting into laughter.



Most people haven't gotten lost on any school trips. But, most is not everyone. In a place, underwater, there lived a young fish named Bubbles. Bubbles was on the school coach, like everybody else, but fate (and being late!) were just not on his side. Before he knew it, the school trip had become disastrous, and there was danger ahead.

# Follow Bubbles on his journey and learn alongside him!

