

Beach Days – Shark Spies

The following is a transcript for the comic book Beach Days – Shark Spies. This comic is available at the Shark Lab's Beach Safety Comic Book Program.

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Panel 1: Two years later...

Panel 2: Catalina and Nick are running towards the beach. While running Nick says, *"I can't wait to catch those waves,"* and Catalina says, *"It's been all summer since we've been together."*

Panel 3: Catalina and Nick reach the beach. Nick says, *"Beach City never changes! Look at all these beautiful waves."* Kai responds to that, *"You talk like a real Beach City Native"*. From afar they hear someone saying, *"I owe a lot to this city...."*

Panel 4: The day is perfect for the beach and umbrellas and surf boards are visible everywhere. Someone says, *"Ugh! What's taking them so long?"* And another person replies, *"Would you relax? They're not even late."*

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Panel 1: Ashley is standing up and says, *"They'll be here. Nick and Catalina just arrived this morning from surf camp."*

Panel 2: Chad with annoyed face says *"Yeah. Well... It's just been lonely without all of you here this summer."*

Panel 3: Chad says, *"I've had to play Knight soul all alone,"* and Ashley winks at him and says, *"Ha! I can do level 5 run-through without even -"*

Panel 4: Nick waves and says out loud *"Heyyy!"*

Panel 5: Ashley and Chad turn back to see who is screaming Panel 6: Chad says, *"huh..."*

Panel 7: Nick is smiling and says, *"Chad! Ash!"*

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Panel 1: Ashley runs towards Catalina and hugs her. Ashley says, *"OMG!"*

Panel 2: Chad runs towards Nick while saying out loud, *"Nick!!!"*

Panel 3: BOOM! Chad gets to Nick and finally hugs him.

Panel 4: Both guys fall on the sand, and the girls look at them with surprise. Nick is on the ground. He looks like he is in pain after the fall and says, *"Hey Chad..."* Chad is on his knees and says back to him, *"I've missed you dude! Did you get taller?"*

Panel 5: Kai comes closer and says, *"Yo."* Panel 6: Chad looks up

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Panel 1: Chad smiles and says, *"Kai! I almost didn't recognize you!"*

Panel 2: Kai takes a sip of his drink and replies, *"It's the new hair-do! You like it?"*

Panel 3: Catalina says to Kai, *"Yeah! Your hair looks so luscious. What's the secret?"*

Panel 4: Nick is still on the ground. Now on his knees, he says to Kai, *"Man... might need some hair advice later."*

Panel 5: Kai smiles, makes the peace sign with his right hand and says, *"I got you."*

Panel 6: Catalina changes conversation by saying *"You ready to hit the waves?"* Panel 7: Ashley with a big smile says *"He might not want to mess up his hair."*

Panel 8: The five friends look at the waves while hugging each other. After appreciating the waves and the sun, Chad breaks the ice and says, *"NONSENSE! We've been waiting for this all summer."*

Panel 9: Catalina points at the waves and says out loud, *"Surf's Up!"*

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Panel 1: Catalina, Kai, Ashley, Nick, and Chad are on their boards ready to catch the next wave. Chad says, *"Nick! Show us what you've learned at surf camp this summer."*

Panel 2: A lifeguard on a jet-ski approaches the shark lab boat. The lifeguard says *"Alright now. Y'all be careful"*. Three people from the Shark Lab are on the boat. Dr. Chris Lowe, Patrick Rex and Emily Spurgeon. Dr. Chris Lowe says to the lifeguard,

“Yes. Thank you again Sasha.”

Panel 3: Patrick is holding the drone control. He says *“Chris, drone is airborne.”*

Panel 4: On the boat- Patrick is sitting on the bow and Emily is driving the boat. Chris is standing up and says to Patrick *“Great! Let’s see what’s in store for us today.”*

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Panel 1: The drone is in the air surveying the beach.

Panel 2: Catalina is on her board and spots a drone in the air. She says, *“Huh? What’s that?”*

Panel 3: Ashley, Catalina, and Nick look at the drone and see the shark lab boat from afar. Catalina says, *“Who’s that?”* Nick says, *“It’s a drone,”* and Ashley says, *“I wonder what they’re doing…”*

Panel 4: Back on the boat, Patrick is controlling the drone and surveying the beach. Chris says, *“Let’s hope we’re lucky today”*. Emily says to the lifeguard, *“Sasha, any sightings this past week?”*

Panel 5: The lifeguard replies, *“There were some juvenile great white sightings on Tuesday.”* Chris replies from the boat, *“Nice! That’s promising news.”*

Panel 6: The lifeguard smiles and says, *“It’s so interesting what you all do. Working with sharks is so fascinating.”*

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Panel 1: The kids approach the Shark Lab boat. Chad says out loud, *“Shar- SHARKS?!”*

He is a little bit concerned. Catalina with a calmer voice says, *“Helloo..”*

Panel 2: Dr. Lowe sees the kids and says to them, *“Hey kids! We are trying to tag juvenile white sharks that are out at the beach.”*

Panel 3: Nick is curious and asks, *“Tag? With what?”*

Panel 4: Emily is holding a pole spear on the boat. She answers Nick’s question by saying, *“We are trying to determine why sharks are hanging out at the beach. How long they will be there, and what they are doing.”*

Panel 5: Emily continues her explanation, *“This is what we use to tag sharks, and at the tip, we attached an acoustic transmitter.”* *“Using a pole spear, we can dart the*

transmitter into the shark's back near the dorsal fin and it will hang off like an earring."

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Panel 1: The drone is still surveying the beach. From the drone you can see the beach, the wave-break and a lot of sharks near shore.

Panel 2: Dr. Chris Lowe explains acoustic telemetry to the kids. He says, *"Acoustic sound waves travel well through water, so if a tagged shark is within 500 yards of an underwater receiver, it will log the time, date, and ID number of the shark" - "Some of the transmitters even have water temperature and depth sensors on them, so we know how deep the shark is swimming and temperature of the water when transmitter pulses"*

Panel 3: All the kids are sitting on the boards looking at the Shark Lab work. They approach them and Catalina says, *"That's so cool"*. Nick says *"How can we know more about this?!"* Kai seconds him by saying, *"Yeah! How?!"*

Panel 4: Chris says from the boat, *"I'm Dr. Chris Lowe! This is Emily and Patrick. You all should come to the University Shark Lab tomorrow!"* Emily says, *"We can show you all the cool tech we have!"*

Panel 5: The lifeguard still on the jet-ski says, *"I have to head back to the tower. Stay safe out there and remember to let us know if you spot any sharks. No need to worry, it's their home and we're just visitors."*

Panel 6: The lifeguard heads back to shore. The Shark Lab boat continues their work. As they drive away, Dr. Chris Lowe says, *"C'ya tomorrow!"* Catalina waves and says, *"Yeah! Thank you!"*

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Panel 1: The next morning, the kids arrive at the university. They greet Dr. Lowe by saying, *"Good morning, Dr. Lowe."*

Panel 2: Chris sees the kids and welcomes them, *"Hello kids, welcome to the Shark Lab."*

Panel 3: Kai, Nick, Catalina, Ashley, and Chad enter the lab. They are all amazed and surprised. Catalina, Kai, and Chad say, *"Wow!"*, Ashley makes a sound *"EEEEK!"* and Nick is speechless.

Panel 4: The lab set up is amazing. The space has a lot of desks and tanks with live animals in them. The kids are so excited and say, *"This is awesome!"* *"Let's check it out!"*

Panel 5: Ashley, Catalina, and Nick run to check the big circular fish tank that is in the middle of the lab. Ashley says, *"I'm going to sketch this out."* Dr. Chris Lowe says to them, *"We study shark biology and their behavior."*

Panel 6: Inside the tank, there is a leopard shark and a stingray. While the kids admire the animals in the tank, Dr. Lowe continues his tour to the lab by saying, *"We do this to understand why they do what they do," "But that requires the use of special shark tech."*

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Panel 1: Dr. Chris Lowe shows the kids some old and new technology. First, he shows them an old underwater paper chart thermometer. Basically, an old PVC cylinder. Then he shows them the new technology and says, *"Look at how far we've come since the old days when we built our own transmitters."* The new transmitters are smaller devices that can be held in the palm of your hand.

Panel 2: Nick takes one of the transmitters and says, *"Hey Cat. Do you know what this is?"* Catalina looks at the device clueless and only says, *"Hmm"*. Dr. Lowe answers the question by saying, *"That's a transmitter for sharks."*

Panel 3: Catalina asks, *"How does it work and allow you to track sharks?"*

Panel 4: Chris, loving the curiosity of the kids, answers, *"We actually use several different types of transmitters to track sharks, each helps us to answer different questions." "But, basically, think of a transmitter as a beacon that we can put on or in the shark that emits a signal the shark and other marine life can't hear. We can then use a special receiver to tell us where that signal is coming from – we call this technology 'Telemetry.'"*

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Panel 1: Ashley asks, *"How many types of transmitters are there?"*. Dr. Chris Lowe smiles and answers, *"Well, there are satellite transmitters and acoustic transmitters. Each is used to answer different questions about where sharks go and what they experience during their journeys."*

Panel 2: This answer intrigues Ashley even more about how transmitters work, she asks Chris, *"So how do they work?"*. Chris answers, *"This is a great question and I wish more people would ask it. Interested in learning more? Talk to Darnell, Shark Lab's engineer and computer scientist!"*

Panel 3: Chris then walks the kids over to where Darnell is working on a big yellow buoy. Chris calls out to Darnell, *"Hey Darnell, I brought some visitors!"*. Darnell looks back from his work with a smile and replies, *"Hey Chris! Heya folks!"*

Panel 4: Darnell then sets down his work to give the kids his full attention and asks, *"So kids tell me, what brings you to the Shark Lab?"*

Panel 5: Catalina answers excitedly *“Dr. Lowe said you could explain how the transmitters work.”*

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Panel 1: Darnell explains to the kids, *“Here at the Shark Lab we want to know where the sharks are going and what they are doing; but because they live in the ocean, that makes it a lot more challenging.”* Chad looks down at his phone in confusion and says to Darnell, *“Why not just put a GPS tracker on sharks like we have on our phones.”* Catalina rolls her eyes and Darnell chuckles, *“Ha-ha! I wish it were that simple.”*

Panel 2: Darnell continues his explanation to the kids. *“The challenge is the GPS uses radio signals sent from satellites in space around the earth, but those radio signals can’t travel through seawater. So, if we put a GPS receiver on a shark, it wouldn’t be able to detect the radio waves sent by the satellite.”*

Panel 3: Catalina considers the two types of transmitters Dr. Chris Lowe told them about, acoustic and satellite. She then asks Darnell, *“But don’t you use a tag called a ‘satellite transmitter’ to follow sharks?”* Darnell seems pleased by this question and answers, *“Right you are! We use several types of satellite transmitters that we can out on the sharks to track them. But they are designed to only transmit when their antennas break the surface of the water. These transmitters send a signal to satellites orbiting the planet and can then send us the data back.”*

Panel 4: Darnell continues his explanation. *“One type of satellite transmitter we use is called a SPOT tag, which gets attached to the top of the shark’s dorsal fin, so that every time the shark’s fin breaks the surface the transmitters send a radio signal to satellites in orbit. This technology can give us a pretty accurate location latitude and longitude for where and when the shark is at the surface. Allowing us to track them across an entire ocean.”*

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Panel 1: Ashley asks Darnell and Dr. Chris Lowe, *“Do sharks spend that much time on the surface? Won’t their dorsal fins dry out?”*

Panel 2: Darnell smiles while Chris responds, *“Actually, that is one of the problems with that technology, the sharks actually don’t spend that much time at the surface, so we don’t get that many locations.”*

Panel 3: Chris continues, *“But, the other transmitter that we use is called a pop-off archiving satellite transmitter, or PAT tag, which gets darted into the sharks’ back and it carries it like an earring. This transmitter can collect data on water temperature, depth, and light level as the shark moves throughout the water. Then it pops off and floats to the surface, where it will upload all the data to a passing satellite. Then it just sends me an email with all that information.”*

Panel 4: All of the kids have looks of wonder, and Catalina exclaims, *“That’s so rad.”*

Panel 5: Chris grins, and says *“This is how we figure out sharks’ favorite water temperature and depth. The problem is it’s not very accurate in terms of where the shark is or how close it is to the beach.”*

Panel 6: In confusion, Kai responds, *“So how can you tell if they are close to a beach and how much time they spend there?”*

Panel 7: Darnell says, *“This is where we use acoustic telemetry, which uses lower frequencies of sound waves rather than radio waves. Lower frequency sound waves travel much farther and faster through saltwater. Let me show you how it works…”*

Panel 8: Darnell and the kids gather around a chalkboard, where Darnell holds up a piece of chalk. *“I’ll draw a graph to help explain this better,”* he says. The kids look at him with rapt attention.

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Panel 1: Darnell draws two different sound waves on the chalkboard, depicting the frequencies of the two different transmitters. *“The waves that are closer together are a higher frequency, used in satellite transmitters,”* he says. *“The lower frequency waves are used in acoustic transmitters,”* he explains, referencing the lines that are further apart.

Panel 2: Darnell continues, *“Their performance and limitations are simply based in physics – something every marine biologist should know.”* There is a picture of a shark with a satellite tag and an acoustic tag. The satellite tag has a high-frequency, close-together wave that is connecting to a satellite in the sky. The acoustic tag has a low-frequency, further-apart wave that is connecting to an acoustic receiver underwater.

Panel 3: Catalina asks, *“So if the satellite telemetry transmitters can’t tell you exactly where the sharks are when they aren’t at the surface, how can you tell if they are hanging out at my beach?”*

Panel 4: Dr. Chris Lowe responds, *“That’s a great question and is why we use this other technology called ‘acoustic telemetry’ - which uses sound waves rather than radio waves to transmit information underwater.”*

Panel 5: An acoustic tag transmitting sound waves to an acoustic receiver.

Panel 6: Darnell continues, saying *“The receivers can only hear the transmitters if they are within 500 yards, so the receivers are placed close to the beach.”*

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Panel 1: Nick grins and says, *“Cool! But how do you get the data back?”* Dr. Chris Lowe responds, *“That’s a great question.”*

Panel 2: Dr. Chris Lowe continues, *“We actually have a team of divers that go to the seafloor to collect ‘em.”*

Panel 3: He explains, *“The diving team needs to go get the receivers that are secured to the seafloor all along the beaches. Then they can bring them up and download them to a cell phone, which then sends the data to the ‘cloud’ where we can later access it.”*

Panel 3-7: Two SCUBA divers pick up receivers from the seafloor, swim them back up to the surface of the water, and download the data to a cell phone. The cell phone then uploads the data to the ‘cloud’.

Panel 8: Chris says, *“The problem is, we have over 100 of these receivers out there... And that can take over a month to download them all.”*

Panel 9: Ashley responds, *“Wow, that sounds like a lot of diving in the same water the sharks are hanging out in. Aren’t your students scared of getting bit by the sharks?”*

Panel 10: Chris smiles and says, *“We never see the sharks when we’re diving for the receivers – we know the sharks are there, but they don’t come close enough for us to see them.”*

Panel 11-15: Darnell chimes in, *“Now, we have a new variation of that technology, that uses an anchored floating buoy that has a receiver attached to it and a built-in cell phone. So when a tagged shark swims by, it will automatically send the detection information to the ‘cloud’ and then the lifeguards get a text alert telling them which tagged shark is swimming off their beach.”* A shark swims past a floating yellow buoy at a beach, sending an alert to a lifeguard cell phone. The lifeguard blows a whistle.

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Panel 1: Kai says, *“Now that’s super cool! But can the sharks hear the transmitter? I would think that could get annoying.”*

Panel 2: Dr. Chris Lowe faces the kids and says, *“Another good question – but sharks can’t hear sounds at that high a frequency. So, it really is like spy technology for tracking sharks!”*

Panel 3: Catalina asks, *“So how do you get these transmitters on the sharks?”*

Panel 4: Chris smiles, saying *“We have a couple different ways to tag sharks, but first*

we need to get close enough to catch them. How would you like to watch us tag sharks next week?"

Panel 5: The kids all grin with shock and excitement. Kai says, *"What no way?!"*, Nick exclaims, *"That would be so cool!"*, Catalina shouts, *"Yes!"*, Ashley asks, *"Seriously?! We can?!"*, while Chad looks a bit ill and says *"No..."* Chris says *"Yeah! That way you can get the first-hand experience. Why don't you meet us at the marina at 6am."*

Panel 6: The following week: the kids are walking along the marina. Catalina says *"This is so exciting! I really think I want to be a marine biologist. I love learning about the animals and how they interact and survive when everything is constantly changing."*

Ashley replies to her, saying *"After learning about the technology Dr. Lowe and Darnell are using, I think I want to be an engineer. Can you believe how they make new technology to help them study sharks? You guys know how I love messing around with electronics and computers!"*

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Panel 1: Chad looks upset, and Nick looks over at him. Panel 2: Nick, with concern, *"Hey Chad – you okay?"*

Panel 3: Chad quickly says *"What?... Yeah... Totally fine..."*

Panel 4: As they walk to the end of the dock, the kids approach Dr. Chris Lowe and a couple of his graduate students. *"Good morning kids! Are you ready for an adventure?"* asks Dr. Lowe. *"Good morning, Dr. Lowe! We are so excited!"* the kids reply.

Panel 5: Chris grins. *"Great! Elizabeth and Lauren will help you get on the boats,"* he says.

Panel 6: Lauren, on the boat, looks at Ashley. *"Hey! I'm Lauren. Are you ready to catch some sharks?"* she asks. Ashley replies, *"Hi Lauren! I'm Ashley. And yes! So eager to start."*

Panel 7: Lauren and Elizabeth hold their hands out to Catalina and Chad, who are stepping from the dock onto the boat. *"Come on in everyone, be careful,"* says Lauren. *"Three of you will be here, two of you can go with Dr. Lowe,"* Elizabeth adds.

Panel 8: The kids, Dr. Lowe, Lauren, and Elizabeth are distributed between two

SharkLab boats and start to head offshore. Catalina exclaims, *"This is great!"* while Chad groans, *"Oh man... my stomach!"*

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Panel 1: While on the boat, Kai says to Lauren, *"This is so cool that you get to do this every day."* Lauren replies with a smile, *"Yeah it is, but it's also a lot of work. We need to prep gear the night before, wait for the sharks to show up, and then collect data."*

Panel 2: Chad then looks over to Elizabeth and asks, *"How much data do you actually get and how do you manage it?"* Elizabeth replies, *"I think that is the fun part... with all of this new technology, we get HUGE amounts of data, sometimes over a million data points in a single day."*

Panel 3: Looking down at a large, yellow piece of equipment, Ashley asks with a chuckle, *"Dr. Lowe, what is that big yellow torpedo in the boat? Are you trying to blow up the sharks? Haha."*

Panel 4: Dr. Chris Lowe replies, *"No, that is our AUV."*

Panel 5: Gesturing to the torpedo-looking equipment, Dr. Lowe explains, *"It's the Autonomous Underwater Vehicle that we can program to map the water conditions at the shark nursery all on its own."* AUV (Autonomous Underwater Vehicle).

Panel 6: The AUV is placed in the water. *"It is programmed to follow a lawn mower pattern and move up and down through the water. The front has a bunch of sensors that measure water temperature, water depth, oxygen, chlorophyll, and murkiness. It even has video cameras and a hydrophone, so it can detect tagged sharks."*

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Panel 1: Ashley says, *"Wow! That is the coolest thing ever. How much did that cost?"*

Panel 2: Dr. Lowe says, *"Lets just say a lot, but it can collect huge amounts of data and map ocean conditions equal to 400 football fields in about 6 hours."*

Panel 3: Dr. Lowe says, *"It helps us figure out what conditions sharks at these nurseries prefer."*

Panel 4: With the drone overlooking the boat, Ashley asks, *"Hey Dr. Lowe, what is Patrick doing?"* Dr. Lowe replies, *"Patrick is our licensed drone pilot and will use the drone to find sharks swimming at the surface that we can either catch in our net or sneak up on and dart a tag in their back. Check it out – he's already found one."*

Panel 5: Patrick says, *"We've got a shark about 8ft long 100 meters off our bow."* Dr. Lowe responds, *"That's a little too big for us to catch, but lets dart an acoustic transmitter into its back and see where this shark likes to hang out."*

Panel 6: *"I see it! We just need to get a little closer,"* says Patrick, looking down at the silhouette of the shark in the water.

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Panel 1: Pole spear sounds *"CLACK!"* as Patrick shoots to tag the shark.

Panel 2: People on the boat scream *"Wow!"* Dr. Lowe says *"Nice! Let's make sure we record the sex of the shark."* Two other sharks swim near the boat.

Panel 3: Patrick says, *"Dr. Lowe! We have another shark! This one is about 5 ft long. Just a baby."*

Panel 4: Dr. Lowe replies, *"Let's try to catch that one with the net!"* Panel 5: Lauren says, *"Got it!"*

Panel 6: A strike net is suspended between the two boats which surround the shark to catch it. Dr. Lowe says *"Careful. Steady."* Someone on the boat screams *"It's coming!"*

Panel 7: The shark swims towards the net.

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Panel 1: Looking at the shark over the boat, Catalina screams *"Wow! Look at that!"* as Lauren holds the net where the shark is getting tagged.

Panel 2: As she manipulates the shark Lauren says, *"Catalina be careful with your hands."*

Panel 3: The shark lies calmly on its back.

Panel 4: Catalina says, *"Aren't you all afraid it can turn around and bite you?"* Elizabeth replies, *"Once you flip the shark on its back, it will kind of go to sleep."*

Panel 5: The shark has been brought onto the boat. As Dr. Lowe holds it down, he says, *"But we're still very careful and want the shark to remain calm."*

Panel 6: Chad says, *"Now that you've caught the shark, what are you going to do?"*

Panel 7: Dr. Lowe responds, *"We're going to surgically implant a transmitter in its body. This transmitter will last 10 years!"* A diagram shows how Dr. Lowe cuts through the shark skin, implants the transmitter in the shark cavity, and sutures the wound to help the shark heal. Dr. Lowe says, *"Then we're going to take a small tissue sample and blood, which we will take back to the lab and study it."*

Panel 8: Dr. Lowe continues to explain *“We’re going to clamp this smart tag on its dorsal fin just like a little backpack.”*

Panel 9: Dr. Lowe says, *“When Elizabeth first started – she thought it looked like something right out of a sci-fi movie.”* Elizabeth responds, *“I’ve never seen something look so cute on a shark!”*

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Panel 1: Dr. Lowe continues, *“But think of this Smart tag like a shark fitbit. It measures every motion the shark makes 30 times a second, its depth, and the water temperature. It has a built-in compass, and a tiny video camera so we can see what the shark sees. After 24 hours the tag will fall off and then we can go pick it up and download all the data. But we’ll have to follow this shark for 24 hours from the boat.”*

Panel 2: Kai, mystified, says *“That is the ultimate shark spy technology.”* Lauren exclaims, *“I can’t wait to get my hands on those data!”*

Panel 3: The shark is released from the boat, *“Take care little guy!”* Panel 4: 24 hours later the tag pops off the shark....

Panel 5: The smart tag pops up to the surface near the boat.

Panel 6: Elizabeth grabs the floating tag from the side of the boat, *“Got’cha!”*

Panel 7: An exhausted Elizabeth yawns, *“I’m so tired, I feel like I could sleep for a week...I can’t wait to download and see what that shark did last night.”*

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Panel 1: Two days later. Nick says, *“Hi Dr. Lowe! So... did you get the tag back?”*

Panel 2: Nick continues, *“What was on the video?”* Dr. Lowe responds, *“Wow - I love your enthusiasm! Yes, we got it back and there was TONS of data to analyze.”*

Panel 3: Dr. Lowe says, *“One of my students, Yamilla, is going through it now. You should go talk to her.”*

Panel 4: Nick, from behind Yamilla, says *“Excuse me? Yamilla? We hear you’re working on the data from the Smart tag. How’s it going?”* Yamilla says *“Huh?”*

Panel 5: Everyone stares at the computer while Yamilla says, *“There is just so much data here. We’re using the Shark Lab server to speed things up.”*

Panel 6: Yamilla asks, *“Do you guys know how to ‘code’?”*

Panel 7: Ashley answers, *“I’m learning how to program in Python in school.”* Yamilla says, *“That’s great. I wish I learned that as early as you.”*

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Panel 1: Yamilla examines the data and says, *“Looking at the acceleration data and seeing some interesting patterns, but we don’t really know how to find all of them in this gigantic data set. I think we’re going to need some help.”* She continues, *“Dr. Lowe said he’s calling his friend Dr. Viany Leos-Barajas, who’s a mathematician really interested in sharks.”*

Panel 2: Dr. Lowe opens the door to the classroom, revealing Dr. Viany Leos-Barajas, and exclaims to the group, *“Hey, look who’s here to save the day!”*

Panel 3: Yamilla gushes, *“Hi Dr. Leos-Barajas, this is such a big data set with lots of possible patterns. Can you help us figure out how many different behaviors the sharks might be showing?”*

Panel 4: Dr. Leos-Barajas sits down and says, *“Okay, let’s take a look.”* As she looks over the data she exclaims, *“Wow! You have so much, it’s a mathematician’s dream! Let’s work on this together and see what we can find. Sharks are my absolute favorite animal and I love working with my fellow scientists to learn more about them.”*

Panel 5: The group clamor around Dr. Leos-Barajas and ask, *“What does the data say? We’re so curious.”* She replies, *“Haha! Just give me a quick minute...”*

Panel 6: Perplexed, Dr. Leos-Barajas says, *“Well, that was unexpected... the shark seems to be swimming in tight circles for about 20 minutes and then changed direction again about every 20 minutes over a 4 hour period.”* She adds, *“There was nothing on the video, so it looks like they were just swimming in circles.”*

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Panel 1: Chris states that, *“Maybe they were sleeping.”* He adds, *“Some birds are known to shut off half their brain and fly in circles...”* Dr. Leos-Barajas includes, *“They even reverse direction when they turn off the other half of their brain.”*

Panel 2: Two sharks swim in a circle like what the data set shows. That is how scientists think they sleep, so maybe that is what the sharks are doing!

Panel 3: Nick exclaims, *“No way! You can see that just in the math?!?”* Kai exclaims, *“Rad!”* Catalina adds, *“That’s so cool.”*

Panel 4: The group stands in front of the data set and Dr. Leos-Barajas says, *“Yup.”*

There is clearly a mathematical pattern here. That is the cool power of math – we see it in virtually every biological function.”

Panel 5: Kai admiringly says, *“They’re amazing creatures.”* Dr. Leos-Barajas replies, *“There’s just so much to learn about sharks.”*

Panel 6: Dr. Lowe sends off the group, *“Thanks for stopping by kids.”* They reply, *“Thank you all for having us!”*

Panel 7: Dr. Leos-Barajas replies, *“It was a pleasure!”* and Dr. Lowe adds, *“It sure was! Hope to see you all soon!”*

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Panel 1: As the group walks out of the university Kai states, *“I think I know what I want to do now.”* He continues, *“I want to be a mathematician that studies sharks! It just makes sense to me and I love solving problems.”* Ashley replies, *“Yeah! You’ve helped me and cat all the time with our calculus homework.”* She finishes, *“I can’t wait to work with you studying sharks in the future!”*

Panel 2: Kai brags, *“I’m just that amazing!”* As the rest of the group rolls their eyes he continues confidently, *“It’ll be a privilege to work with me! HA!”*

Panel 3: Catalina comments on his outburst to Ashley, *“Yeah, okay. I bet he’ll be too busy eating fish tacos in college that his results will come out ‘fishy’.”* Ashley laughs, *“Hahaha! I bet you’re right!”*

Panel 4: Kai sulkily replies, *“Ha-ha. Real funny.”*

Panel 5: Chad looking defeated, talks to himself, *“Guess I’m the only one who’s not really sure what to do after graduation yet.”*

Panel 6: As he finishes his sentence, *“I’m not good at anything…”* a hand reaches towards his shoulder.

Panel 7: Chad is shocked to feel a ‘pat’ on his shoulder.

Panel 8: As Chad turns around towards the gesture, Nick says, *“Hey man! We’re not supposed to have everything figured out yet.”* He adds, *“You’ll figure it out.”* Chad looks back and anxiously says, *“You think so?”*

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Panel 1: Ashley chimes into the conversation, *“You’re pretty good at video games! I’m sure there’s something out there that involves hours of that.”* Catalina adds in, *“Yeah!”*

Maybe develop a game? Maybe about a day in the life a shark?" Chad not super convinced begins, "That's so lame Who would want to play a game about a day in the life of animal."

Panel 2: Ashley still trying to cheer up Chad replies, *"Well whatever it is, you will rock at it!"* Catalina adds, *"We'll always support you!"* Chad, overwhelmed by his friends' kind words replies, *"Geez...thanks gang."*

Panel 3: With his friends support Chad says, *"I guess I'll just explore around until I find something that I love to do."*

Panel 4: With his friends circling around him, Ashley says *"We'll be here for ya!"* Catalina adds, *"Always!"* and Nick chimes in, *"and forever."*

Panel 5: Kai screams, *"Group hug!!!"* As they all embrace Chad smiling says, *"Ha-ha! You guys are so cheesy!"*

End of the comic book.