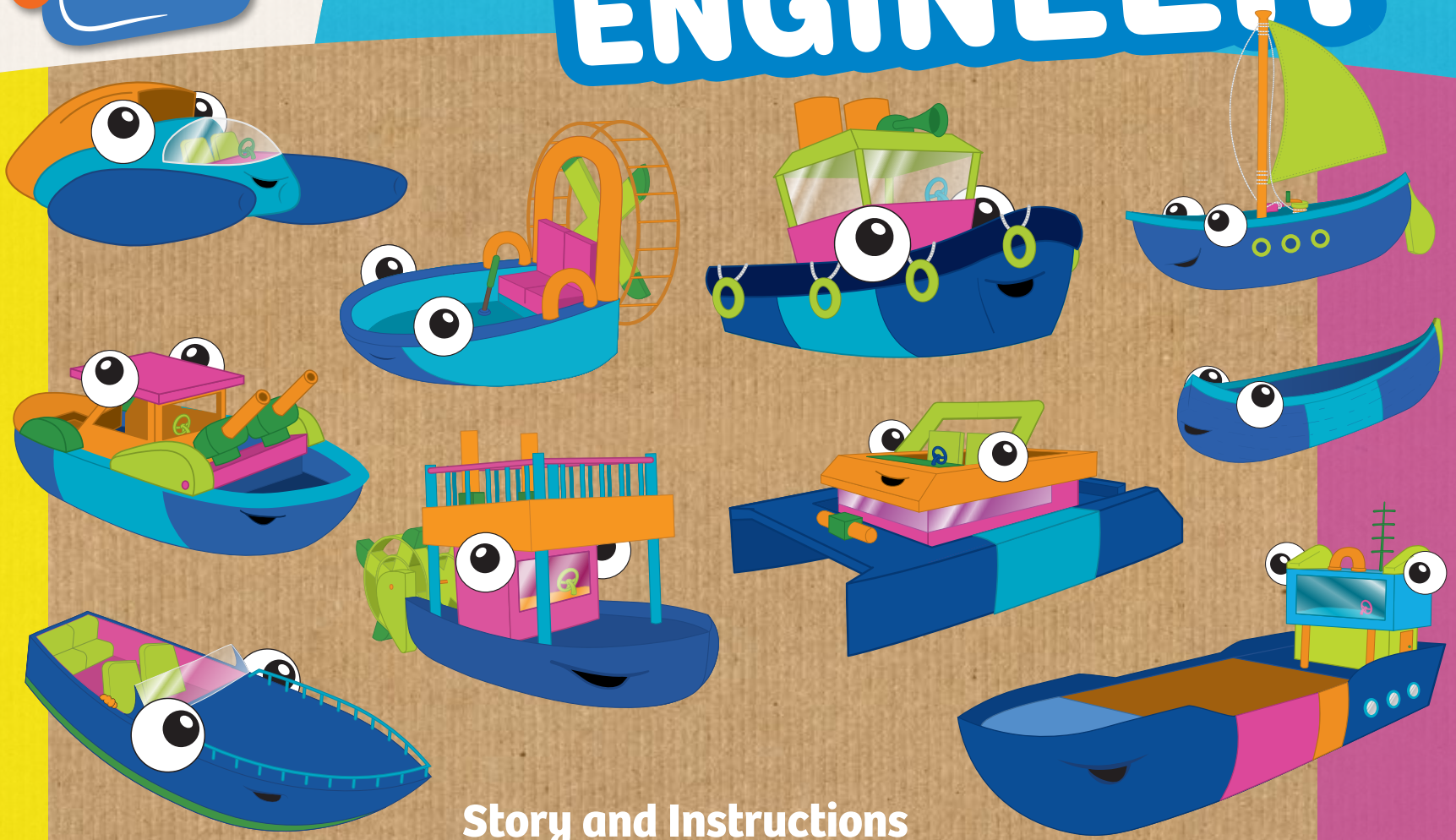
KIDS FIRST

BOAT ENGINEER



Story and Instructions

THAMES & KOSMOS

Dear Parents,

Engineering is an extremely exciting and vast field. This kit, along with its illustrated storybook and instruction manual, provides an engaging way to teach simple engineering concepts to preschool-age kids.

Read the story with your child and build the simple boat models that the main characters build in the story. Along their journey, the characters must build different boats to solve problems and complete tasks. As you follow the story, your child can build models of the ten boats that appear in the story with your help. The primary functional components of the boat models are floating hull pieces. Your child will be introduced to the scientific concepts of buoyancy, displacement, volume, and weight while building the models. They will also learn about different types of boats. Large, colorful plastic building pieces make it easy for small hands to put the models together.

The models are assembled step by step using a construction system. It will require a little practice and patience at first. Please assist your children when they need your help, but also let them try to build the models by themselves. Your children will be happy to have your help with the models or assembly steps that pose particular difficulties.

We wish you and your child lots of fun building, discovering, and learning!

Safety Information

⚠ WARNING:

CHOKING HAZARD — Small parts.
Not for children under 3 yrs.

››› **Warning!** Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

››› Keep the packaging and instructions as they contain important information.

››› Store the experiment material and assembled models out of the reach of small children.

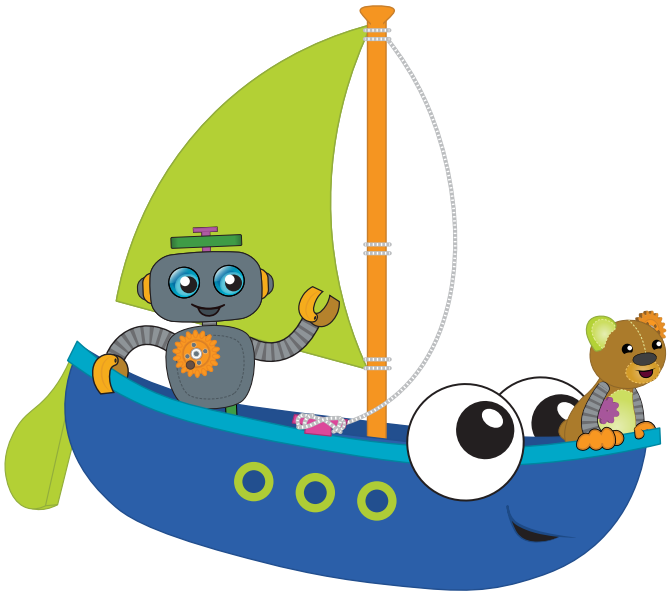
››› **Warning!** Only to be used in water in which the child is within its depth and under adult supervision.

After completing an experiment, dry all parts completely and return them to the box for storage.

BOAT ENGINEER

Story by
Dan Freitas and Ted McGuire

Illustrations by
Dan Freitas and Ashley Greenleaf



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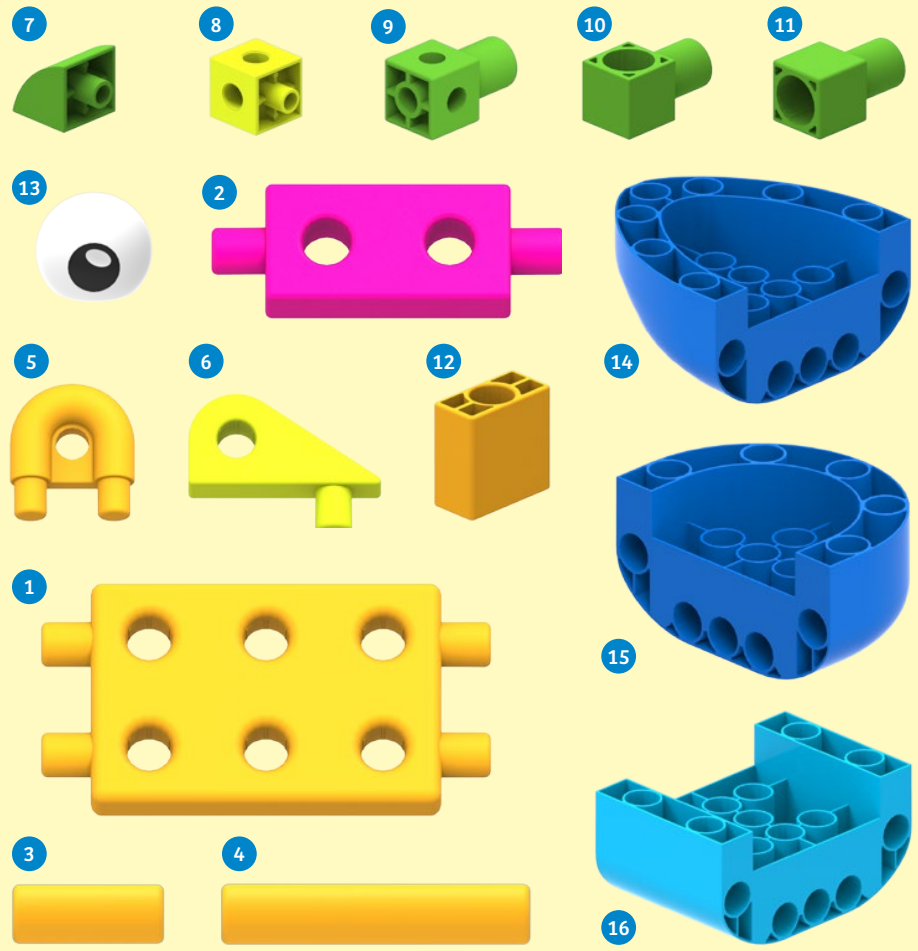
››› KIT CONTENTS

GOOD TO KNOW !
If you are missing any parts, please contact Thames & Kosmos customer service.

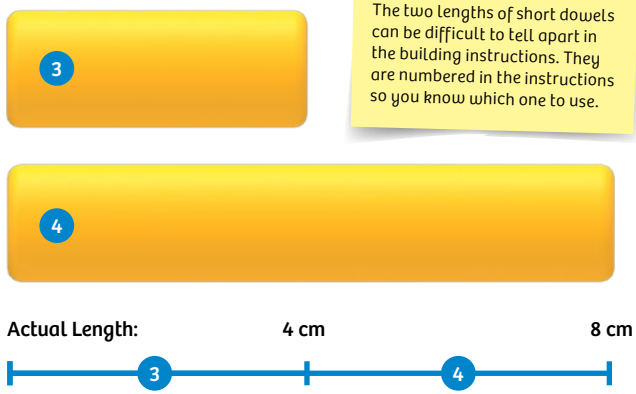
What's inside your kit:



Checklist: Find – Inspect – Check off

✔	No.	Description	Qty.	Item No.
❍	1	6-hole panel	1	7330-W85-C1O
❍	2	2-hole rod	2	7330-W85-H1K
❍	3	Dowel, 4 cm	8	7268-W85-B1O
❍	4	Dowel, 8 cm	2	7330-W85-A1O
❍	5	1-hole end track	1	7330-W85-P1O
❍	6	Flat triangle with peg	2	7330-W85-U1G
❍	7	Convex block	8	880-W10-R1G4
❍	8	Cube block	8	880-W10-A1YG
❍	9	Cube block with peg	2	7331-W10-D3G1
❍	10	Dowel block with side hole	4	7331-W10-M1G1
❍	11	Dowel block with top hole	4	7331-W10-D1G1
❍	12	Dowel connector	2	7331-W10-E1O1
❍	13	Eye	2	7261-W85-A
❍	14	Bow	2	7269-W10-A1B
❍	15	Stern	2	7269-W10-A2B
❍	16	Hull	2	7269-W10-B1B

NOTE !
The two lengths of short dowels can be difficult to tell apart in the building instructions. They are numbered in the instructions so you know which one to use.



Meet the Omega Family!

Ty and Karlie Omega are siblings. They live in a small city called Makersville. Ty and Karlie's dad is a writer. He writes science fiction stories. Their mom is a mechanical engineer. She designs big machines used in factories.

They live in an awesome warehouse filled with tools, equipment, and building materials. There are always a number of projects going on in the warehouse.

Ty loves figuring out how things work. Karlie loves building things.

When Ty and Karlie were little, Ms. O designed Huxley, a robot that can build just about anything. For one of his first projects Huxley converted Karlie's teddy bear, Remus, into a walking, talking science bear. Now Huxley and Remus are like members of the Omega family.

Huxley and Remus' Unexpected Boat Adventure Begins . . .

On a sunny summer day, Ty, Karlie, and their parents took a trip to the beach. Huxley and Remus decided to stay at home. They wanted to surprise the kids by putting the finishing touches on Ty and Karlie's latest robotic creation: Randy the Robot Fish.

"I think the robot fish is finished!" said Huxley triumphantly. "Let's bring him down to the river for a quick test swim."

Remus and Huxley brought the fish down to the river near their house, and gently placed Randy into the water for a trial swim.

As soon as Randy hit the water, his mechanical fins started flapping wildly. He dove under the surface of the water and swam rapidly away from Huxley and Remus.

"Wow! That's one fast fish," cried Remus, "but I think he's malfunctioning. He's not coming back. We need to help him! And we need to get him home before Ty and Karlie get back."

"Have no fear," said Huxley, "I installed a tracker on the fish for this very reason. He's headed down the river toward the swamp. Help me build a canoe and we will go pick him up."

KIMMY THE CANOE

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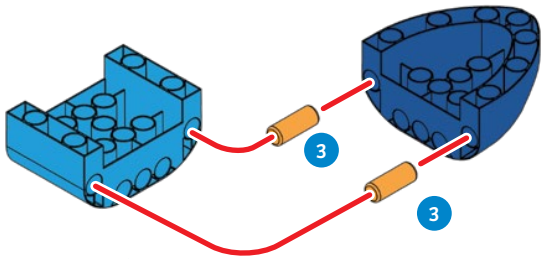

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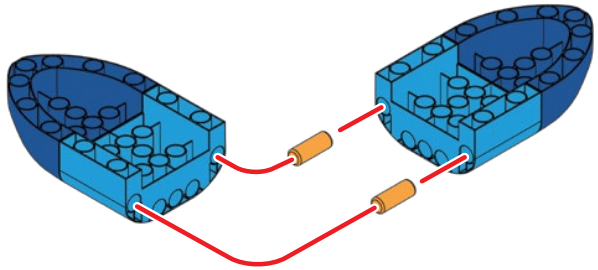

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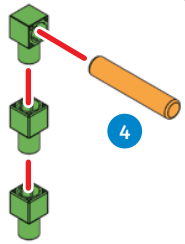

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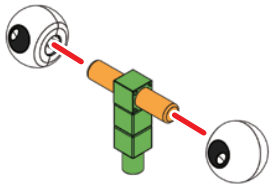

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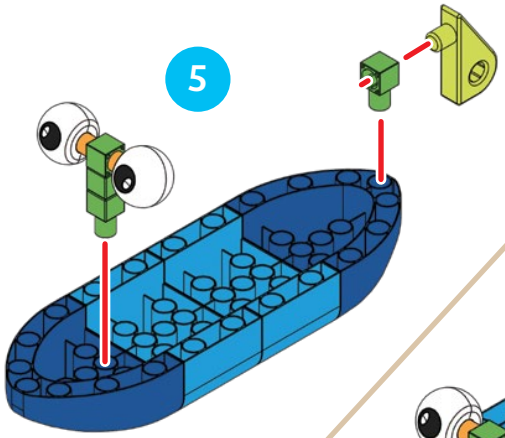

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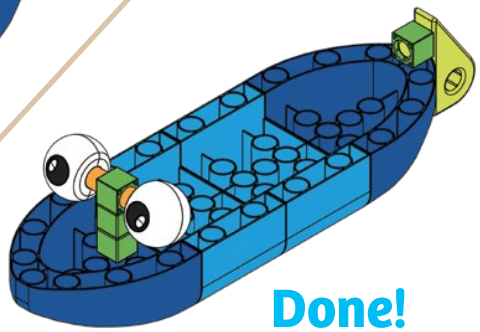

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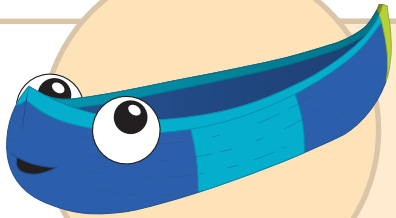


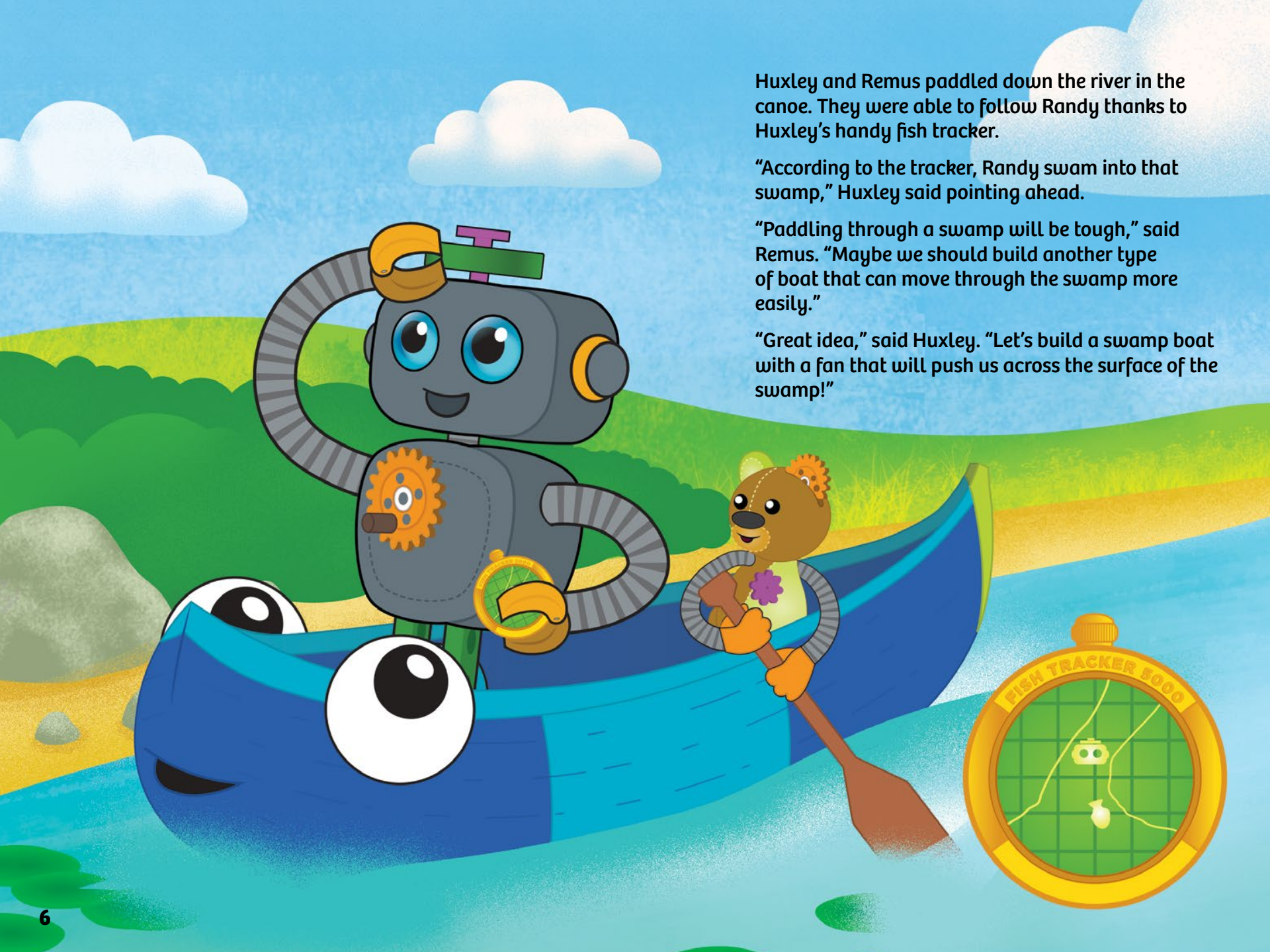
Huxley and Remus hurriedly built the canoe.

"Hi, I'm Kimmy the Canoe. Grab your paddles and let's get going!"

A canoe is a long, narrow boat with two pointed ends. The front of a boat is called the bow and the back is called the stern.

A boat's hull is heavier than water, but it does not sink. Because of its shape, the boat displaces (or pushes away) an amount of water greater than its own weight. Therefore, it floats on the water.

Try floating the canoe model in a sink or tub filled with water. Put heavy objects into the boat. What do you notice about the height of the boat in the water when you add more weight to the boat?



Huxley and Remus paddled down the river in the canoe. They were able to follow Randy thanks to Huxley's handy fish tracker.

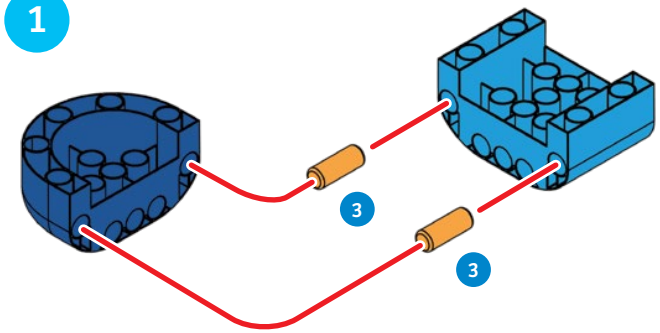
"According to the tracker, Randy swam into that swamp," Huxley said pointing ahead.

"Paddling through a swamp will be tough," said Remus. "Maybe we should build another type of boat that can move through the swamp more easily."

"Great idea," said Huxley. "Let's build a swamp boat with a fan that will push us across the surface of the swamp!"

STEVIE THE SWAMP BOAT

1



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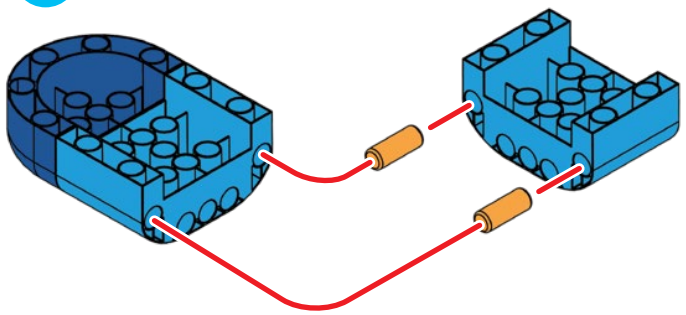

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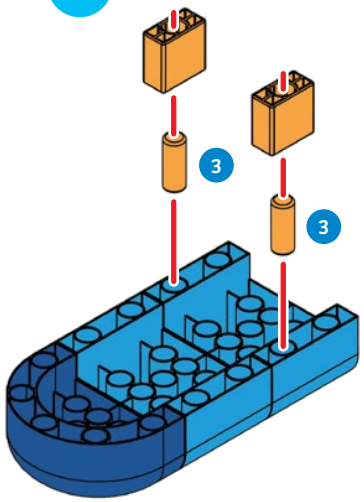

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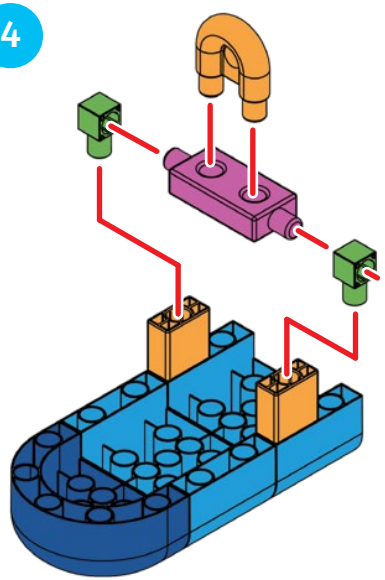

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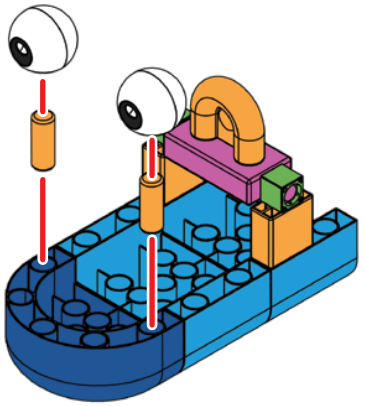

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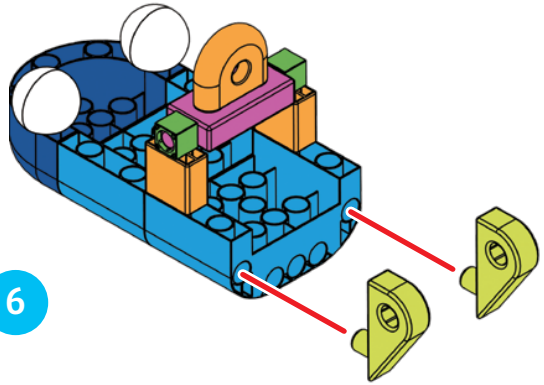

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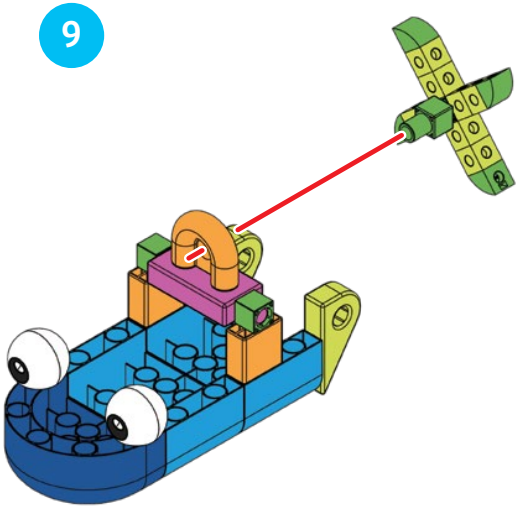

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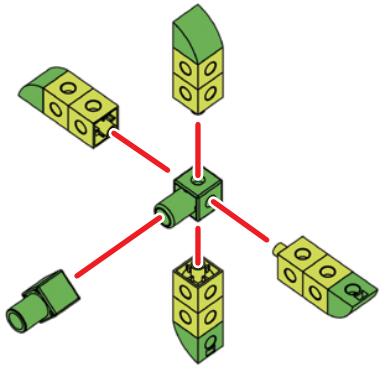
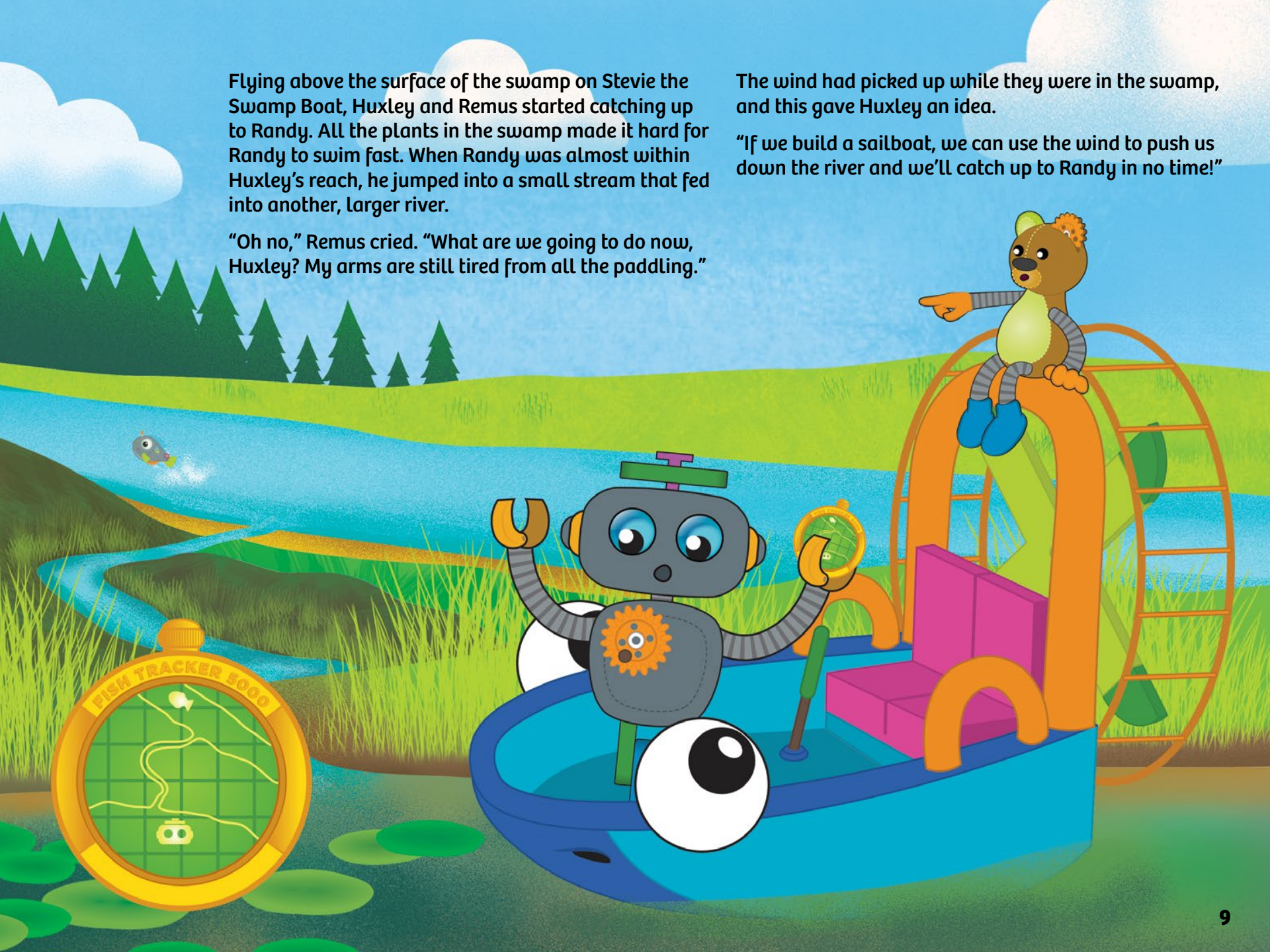


"Hi there fellas," Stevie the Swamp Boat said to Remus and Huxley. "I'm a special type of fan-propelled boat called a swamp boat, or airboat. I have a flat bottom so I can glide over shallow and marshy areas. And my propeller doesn't stick down into the water like on a normal boat, so it can't get caught in the mud or swamp plants. Instead, my propeller spins very fast like a fan and blows air backward. The force of the air blowing backward pushes me forward. And that's how I glide across the swamp. But don't forget your earplugs — my fan is really loud!"



Flying above the surface of the swamp on Stevie the Swamp Boat, Huxley and Remus started catching up to Randy. All the plants in the swamp made it hard for Randy to swim fast. When Randy was almost within Huxley's reach, he jumped into a small stream that fed into another, larger river.

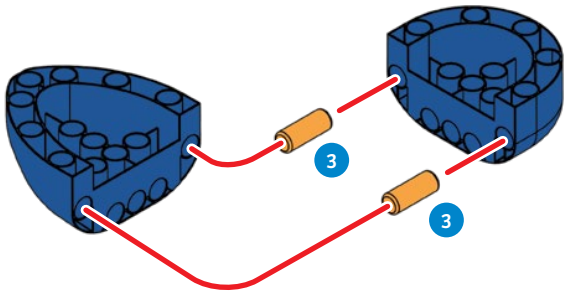
"Oh no," Remus cried. "What are we going to do now, Huxley? My arms are still tired from all the paddling."

The wind had picked up while they were in the swamp, and this gave Huxley an idea.

"If we build a sailboat, we can use the wind to push us down the river and we'll catch up to Randy in no time!"

SAMMY THE SAILBOAT

1



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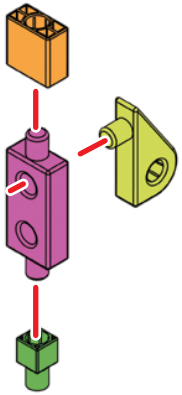

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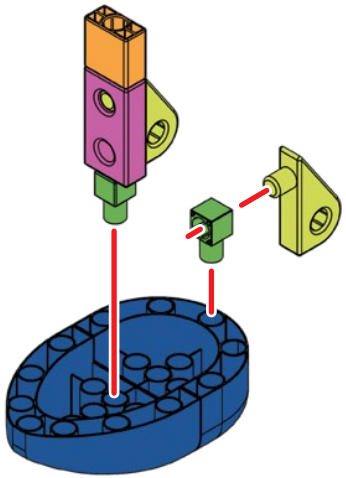

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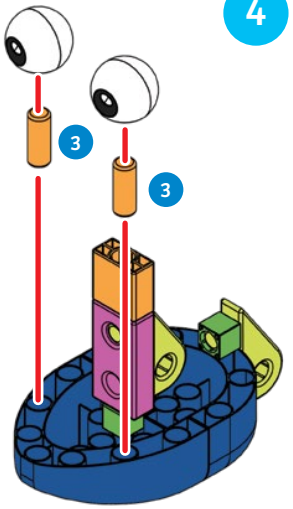

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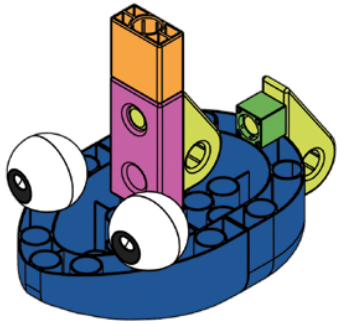

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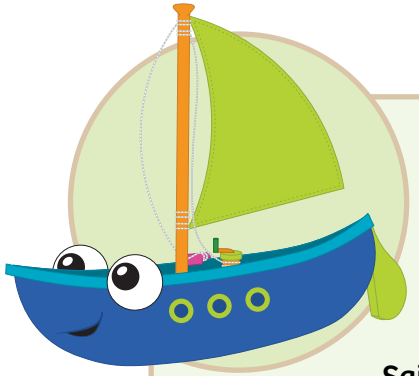
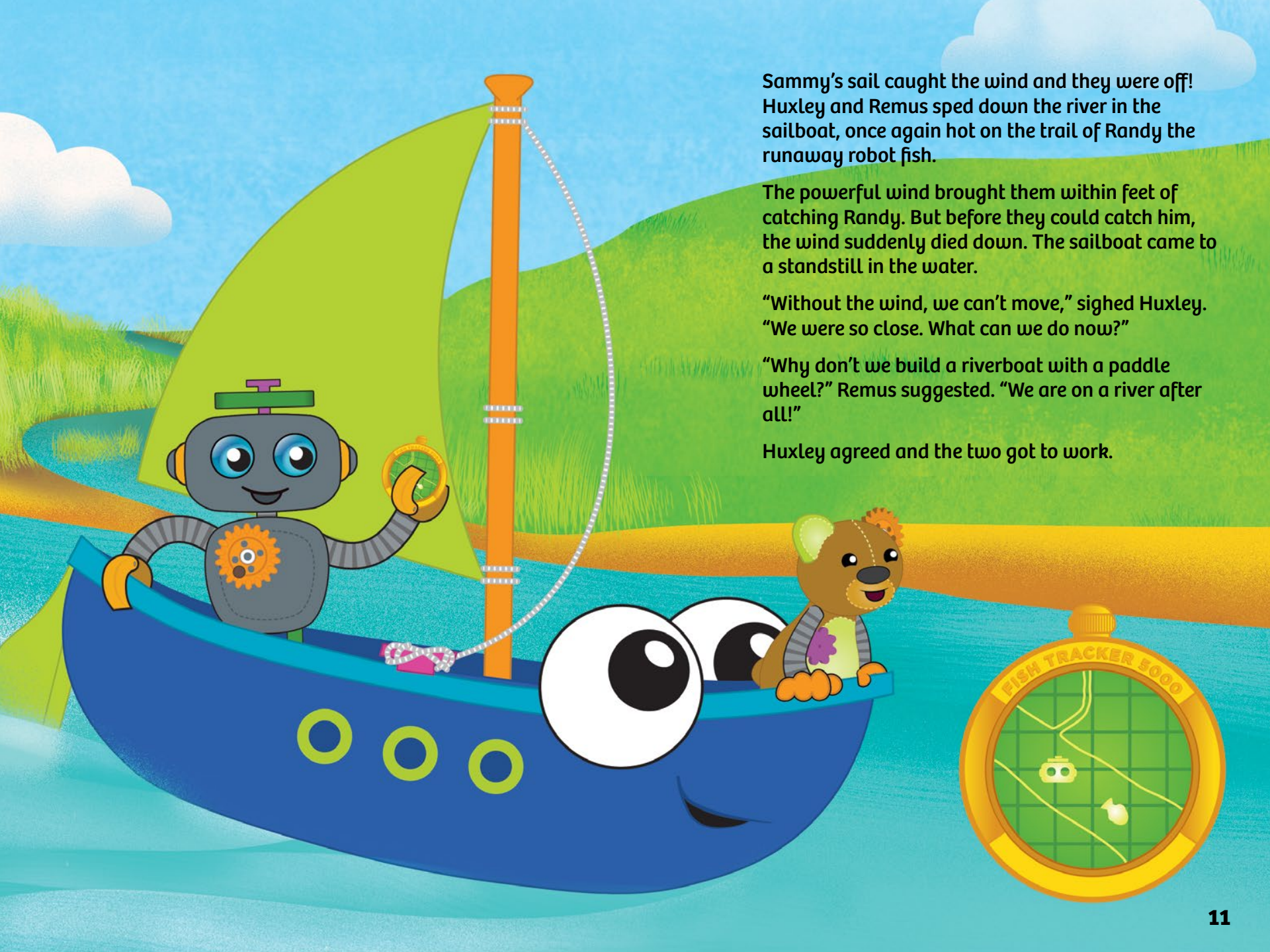


Huxley and Remus built the sailboat.

"Hi, I'm Sammy the Sailboat. The wind's blowin', let's get goin'," he said.

Sailboats are pushed through the water by their sails. There are many types of sailboats, from small single-person sailboats with just one sail, to huge sailing ships with many masts and many sails. Before steam engines and gasoline motors, sails were the primary means of powering boats.



Sammy's sail caught the wind and they were off! Huxley and Remus sped down the river in the sailboat, once again hot on the trail of Randy the runaway robot fish.

The powerful wind brought them within feet of catching Randy. But before they could catch him, the wind suddenly died down. The sailboat came to a standstill in the water.

"Without the wind, we can't move," sighed Huxley. "We were so close. What can we do now?"

"Why don't we build a riverboat with a paddle wheel?" Remus suggested. "We are on a river after all!"

Huxley agreed and the two got to work.

RUBY THE RIVERBOAT

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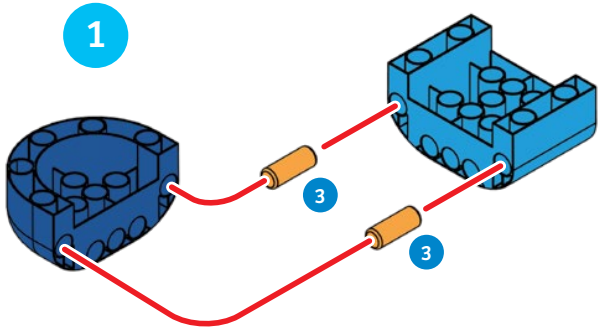

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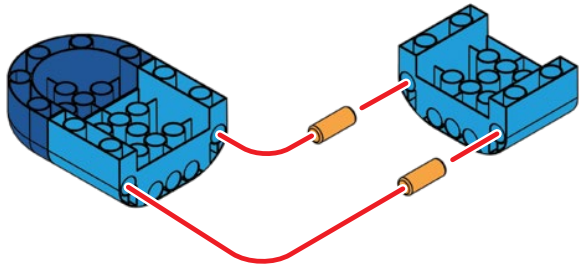

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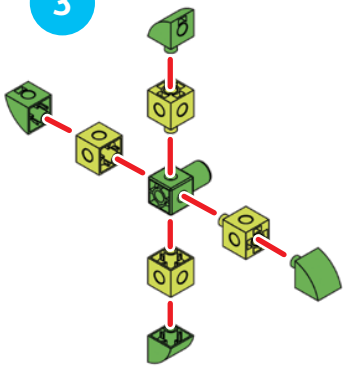

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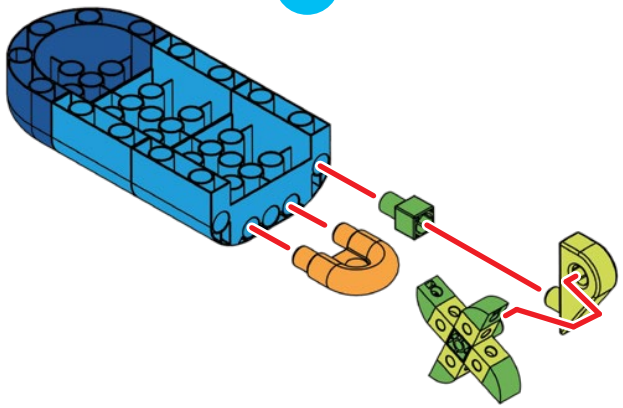

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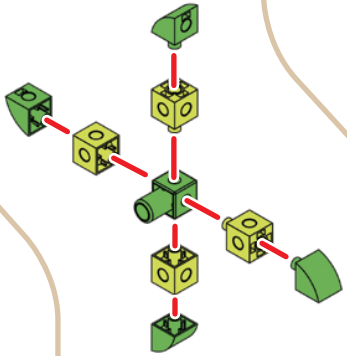

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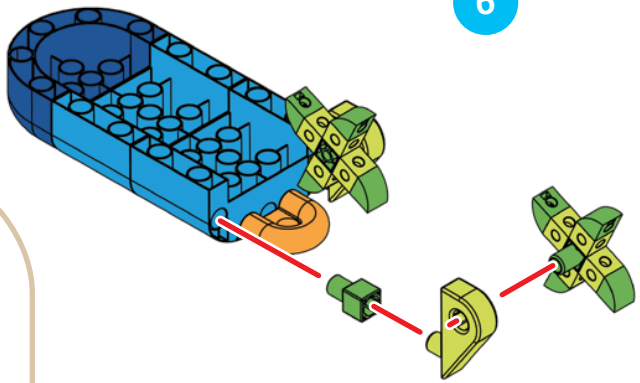

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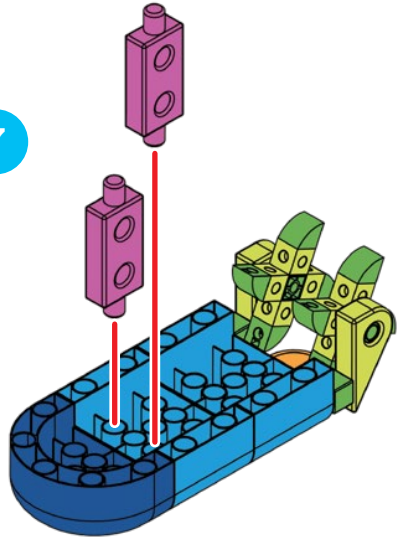

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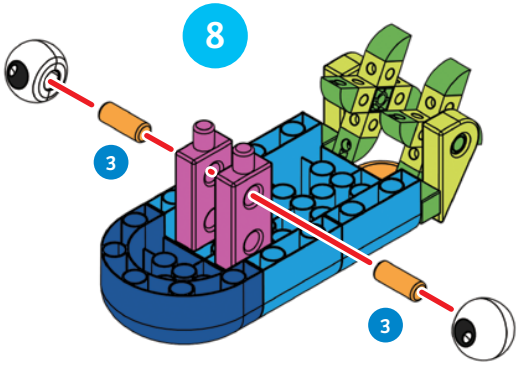

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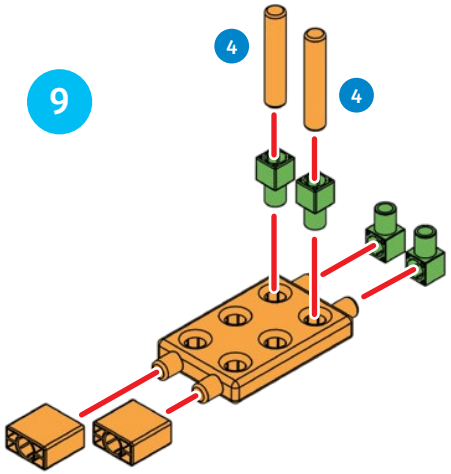

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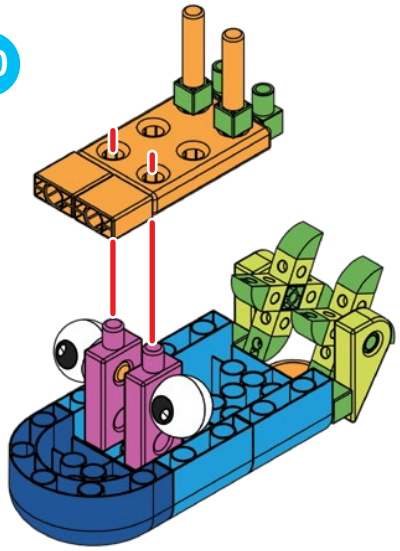

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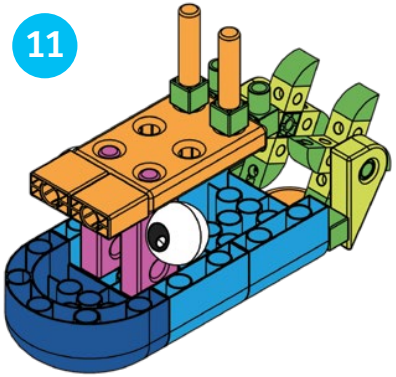

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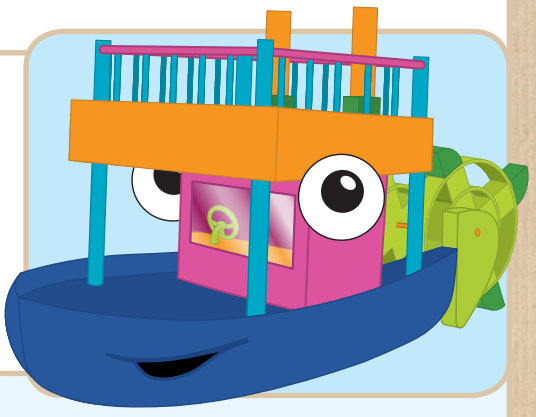
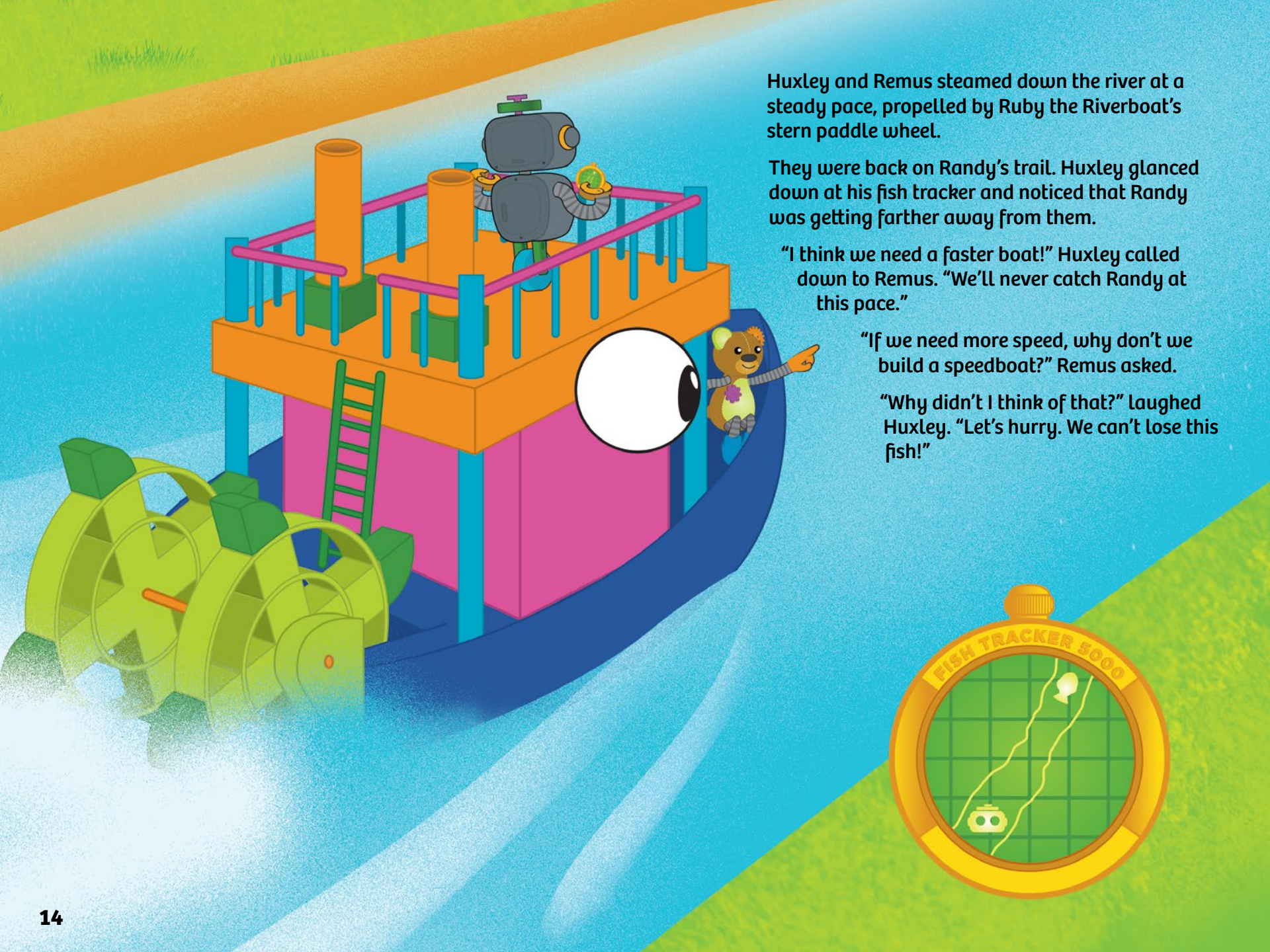


"Ruby the Riverboat, at your service," Ruby said to Remus and Huxley. "I have a large wheel on my stern with many paddles, or blades, on it. My steam engine makes the wheel turn, and one after the other, the paddles push into the water. They push backward against the water which pushes me forward through the water."



Huxley and Remus steamed down the river at a steady pace, propelled by Ruby the Riverboat's stern paddle wheel.

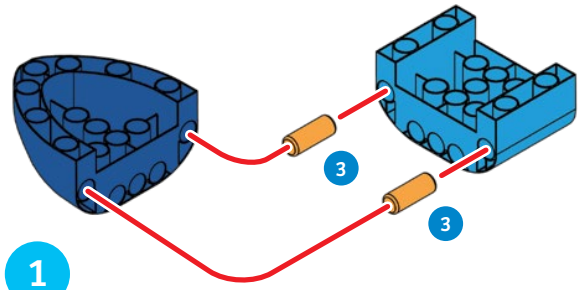
They were back on Randy's trail. Huxley glanced down at his fish tracker and noticed that Randy was getting farther away from them.

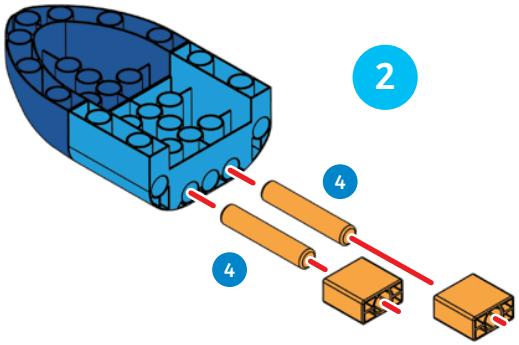
"I think we need a faster boat!" Huxley called down to Remus. "We'll never catch Randy at this pace."

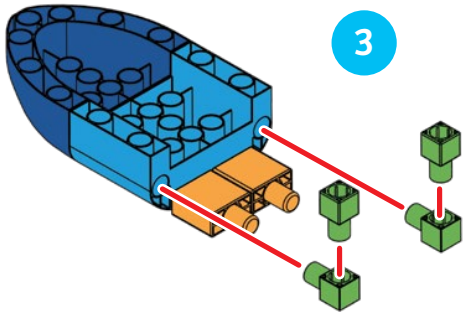
"If we need more speed, why don't we build a speedboat?" Remus asked.

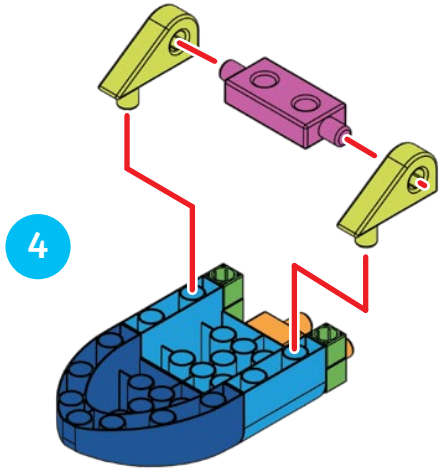
"Why didn't I think of that?" laughed Huxley. "Let's hurry. We can't lose this fish!"

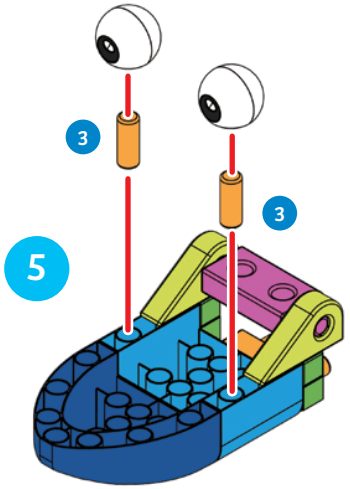
STU THE SPEEDBOAT

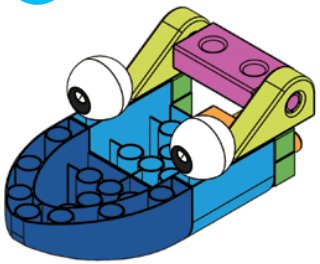












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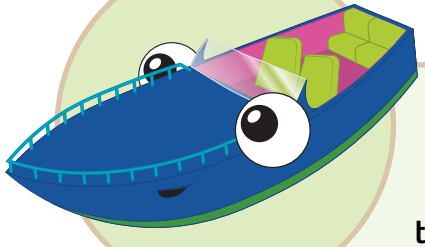
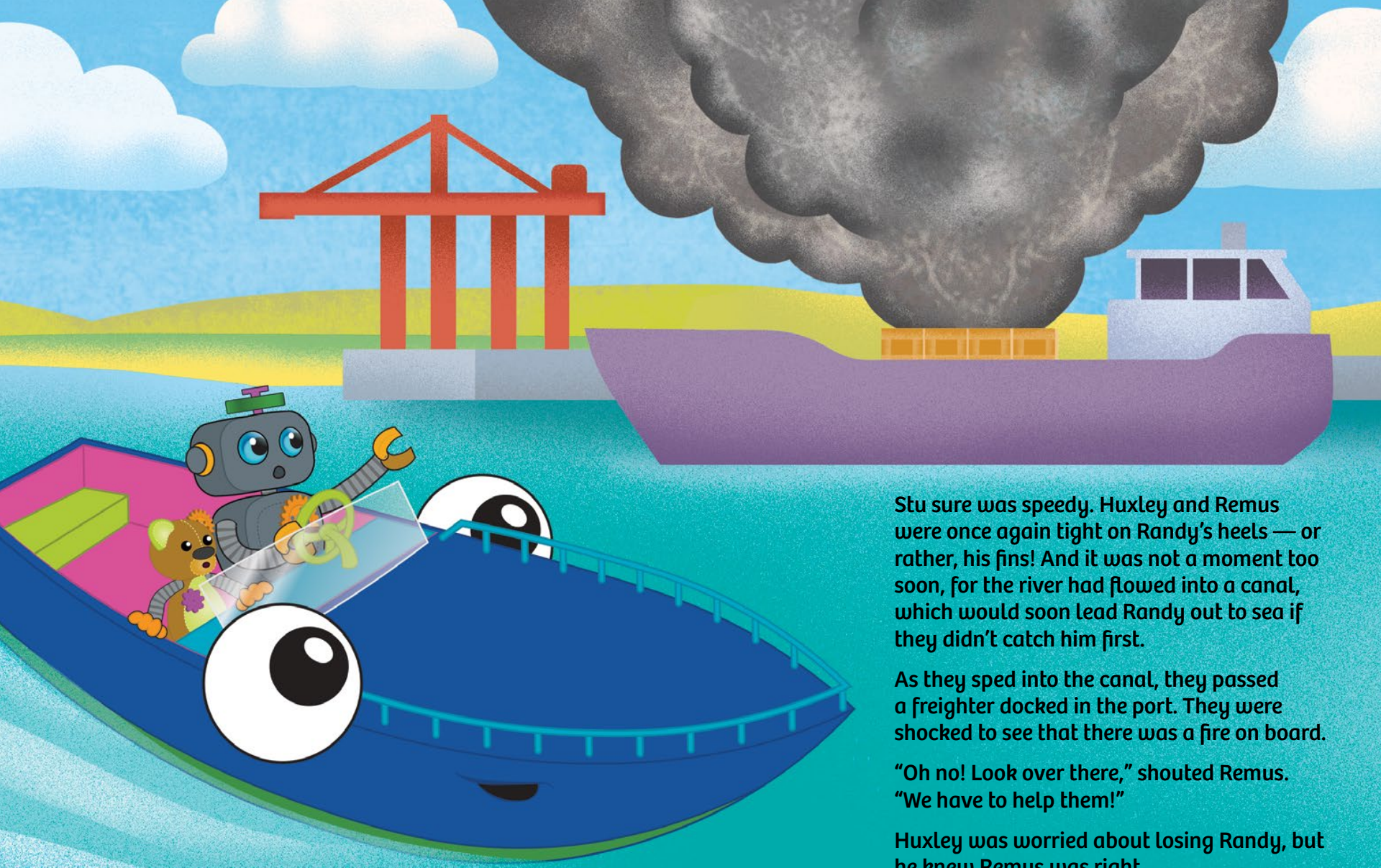


"Let's go!" shouted Stu the Speedboat excitedly. "I'm one of the fastest boats around. Speedboats like me are designed for speed. We can't carry too much weight and we aren't the biggest boats, but we can race through the water at tremendous speeds. We have propellers in the back that spin very fast and push large volumes of water out behind us, sometimes creating waves called wakes. So, let's motor!"



Stu sure was speedy. Huxley and Remus were once again tight on Randy's heels — or rather, his fins! And it was not a moment too soon, for the river had flowed into a canal, which would soon lead Randy out to sea if they didn't catch him first.

As they sped into the canal, they passed a freighter docked in the port. They were shocked to see that there was a fire on board.

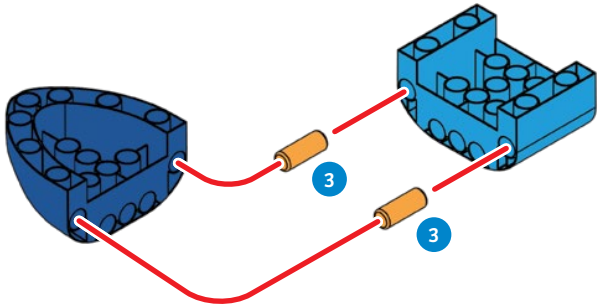
"Oh no! Look over there," shouted Remus. "We have to help them!"

Huxley was worried about losing Randy, but he knew Remus was right.

"Let's convert this speedboat to a fire rescue boat and see if we can help put out some of those flames," Huxley said.

FRANNIE THE FIRE RESCUE BOAT

1



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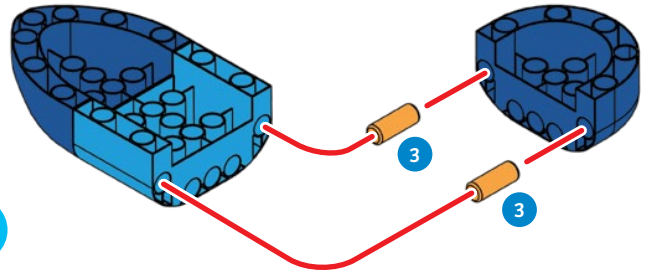

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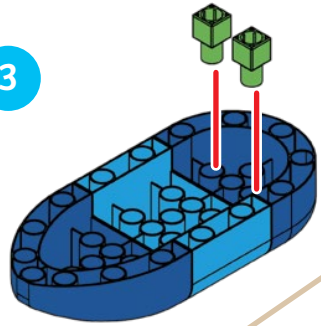

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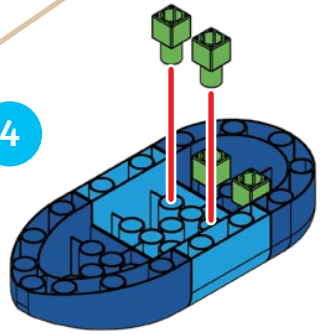

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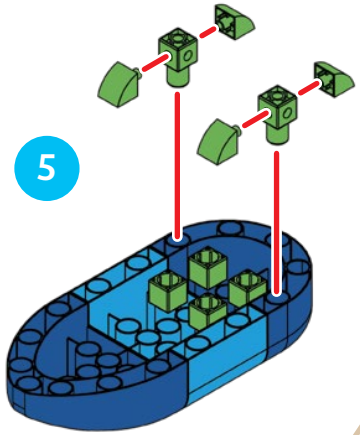

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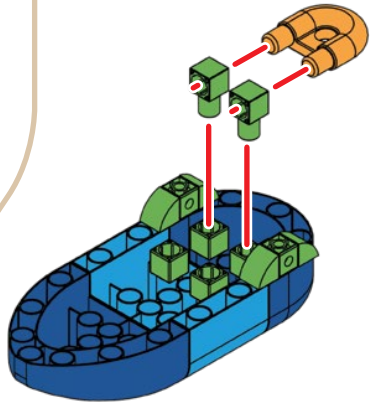

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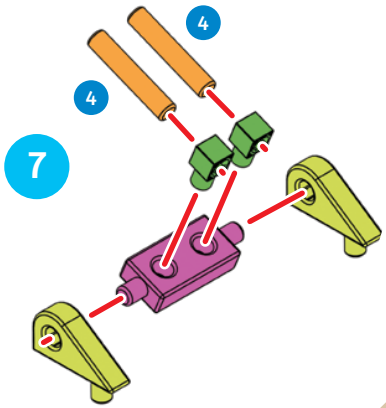

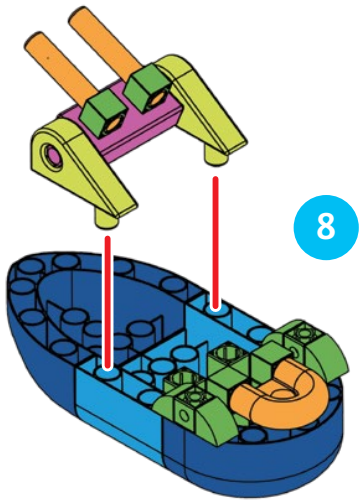

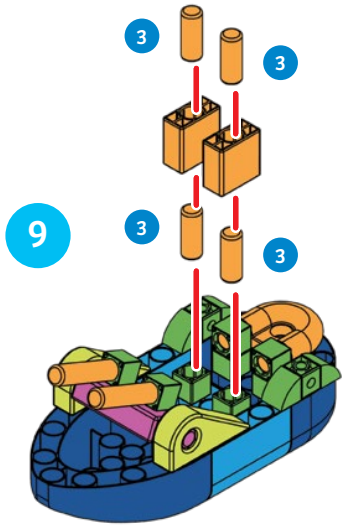

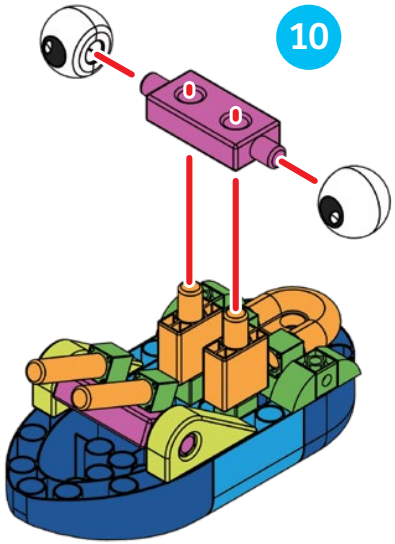

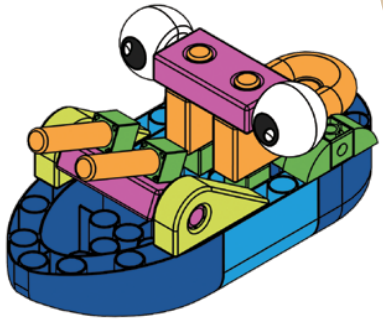

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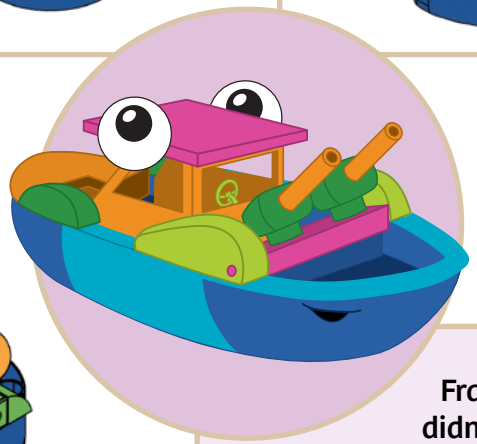
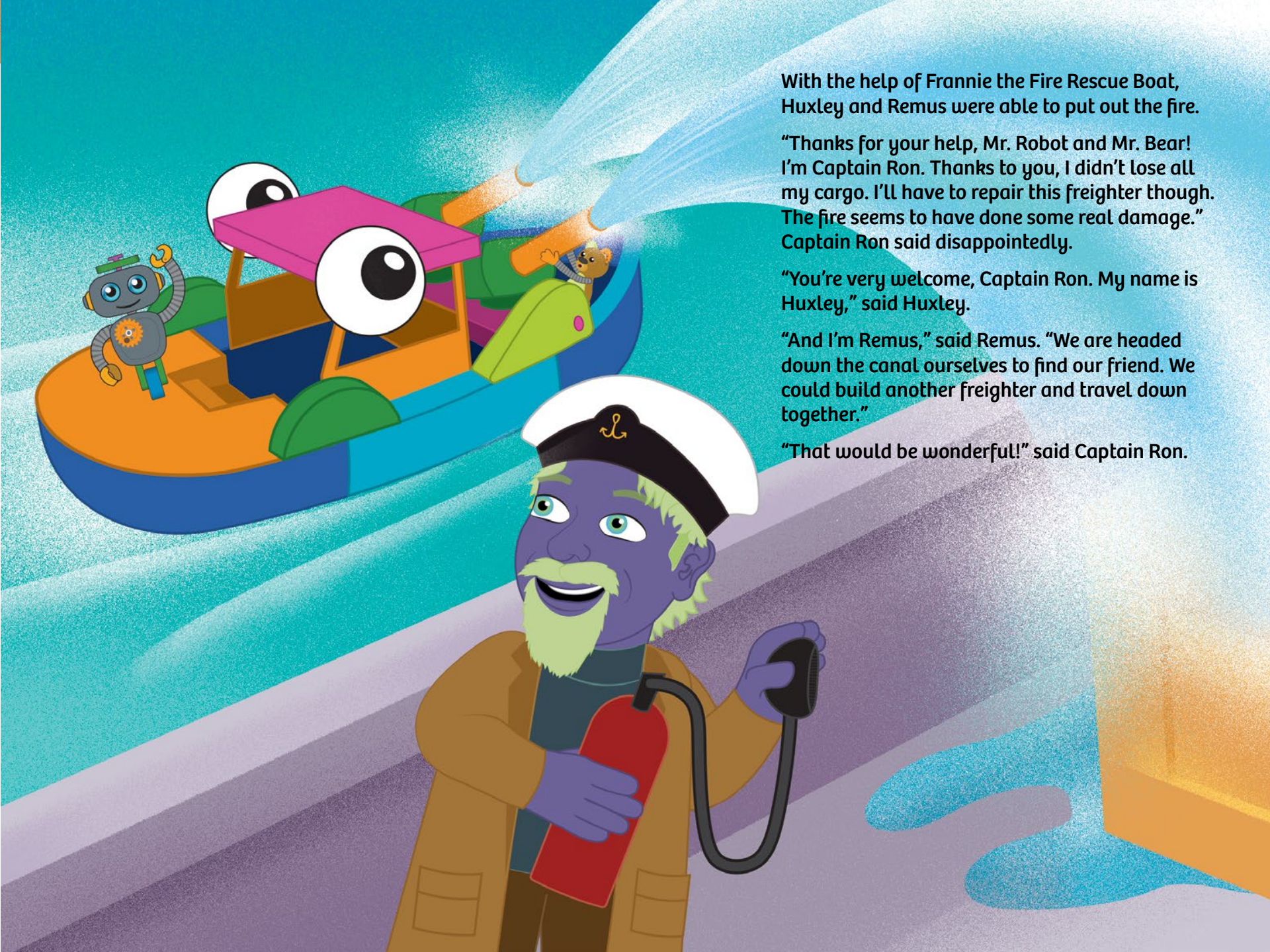


Frannie the Fire Rescue Boat didn't waste any time introducing herself. She immediately motored over to the blazing freighter and started blasting the fire with powerful streams of water from her nozzles. Fireboats have pumps that can take up water and spray it onto shoreline or shipboard fires. They can go where firetrucks can't go, and they never run out of water!



With the help of Frannie the Fire Rescue Boat, Huxley and Remus were able to put out the fire.

"Thanks for your help, Mr. Robot and Mr. Bear! I'm Captain Ron. Thanks to you, I didn't lose all my cargo. I'll have to repair this freighter though. The fire seems to have done some real damage." Captain Ron said disappointedly.

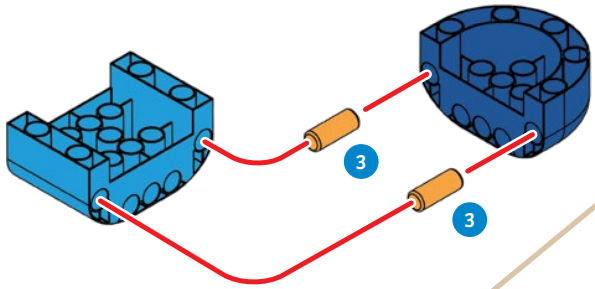
"You're very welcome, Captain Ron. My name is Huxley," said Huxley.

"And I'm Remus," said Remus. "We are headed down the canal ourselves to find our friend. We could build another freighter and travel down together."

"That would be wonderful!" said Captain Ron.

FREDDIE THE FREIGHTER

1



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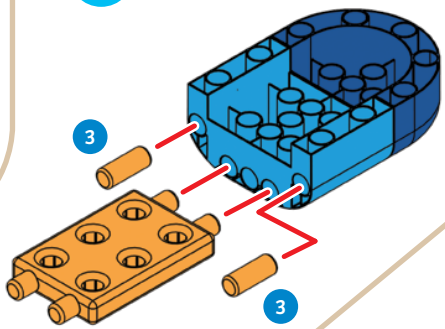

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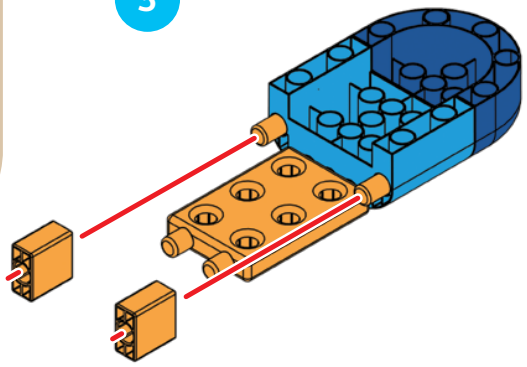

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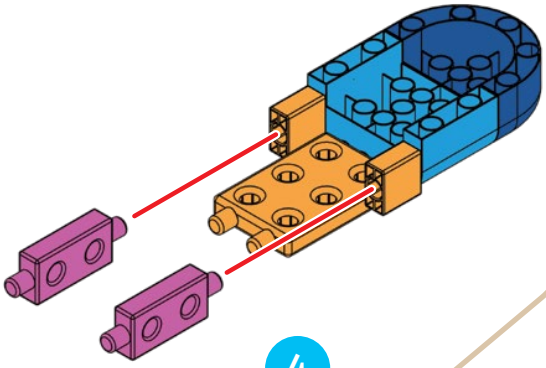

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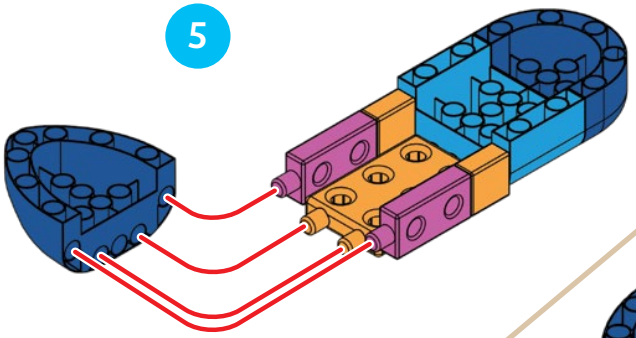

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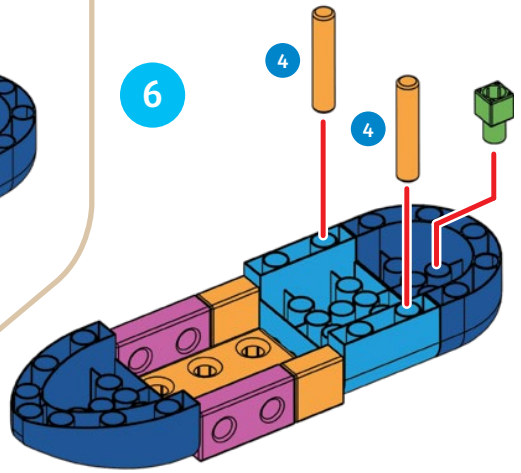

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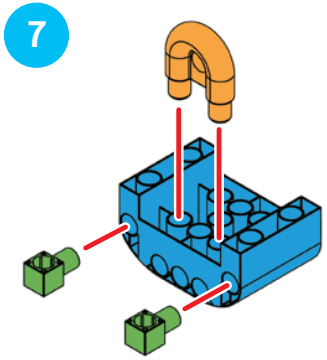

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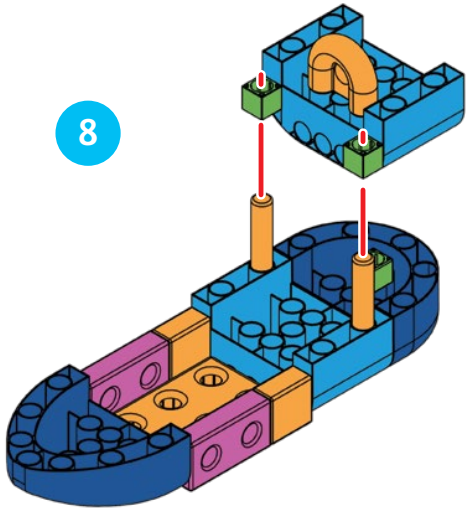

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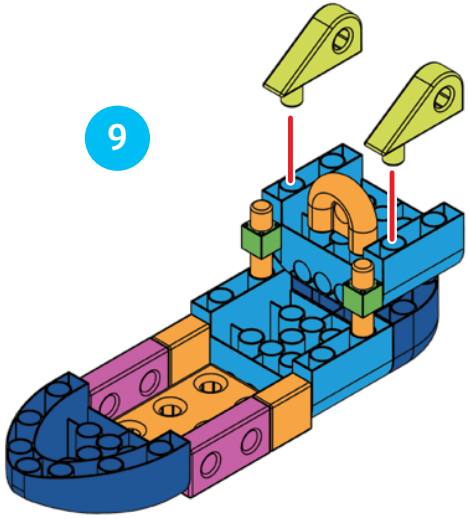

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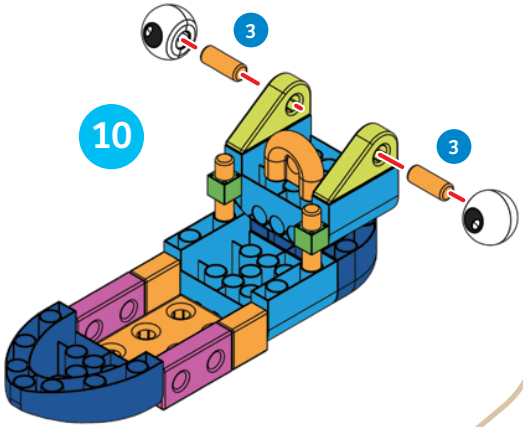

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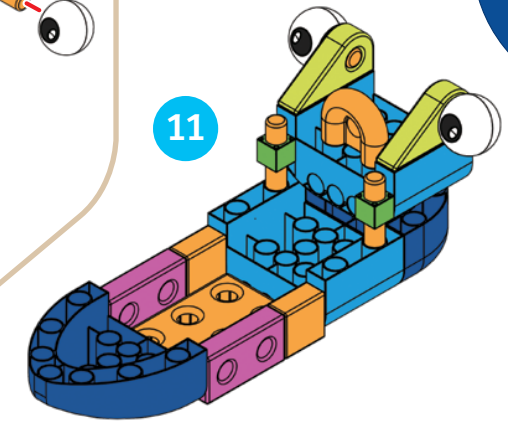

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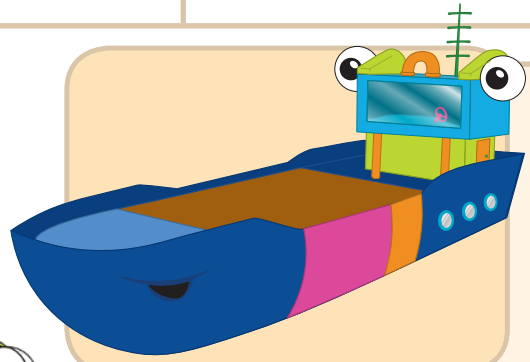
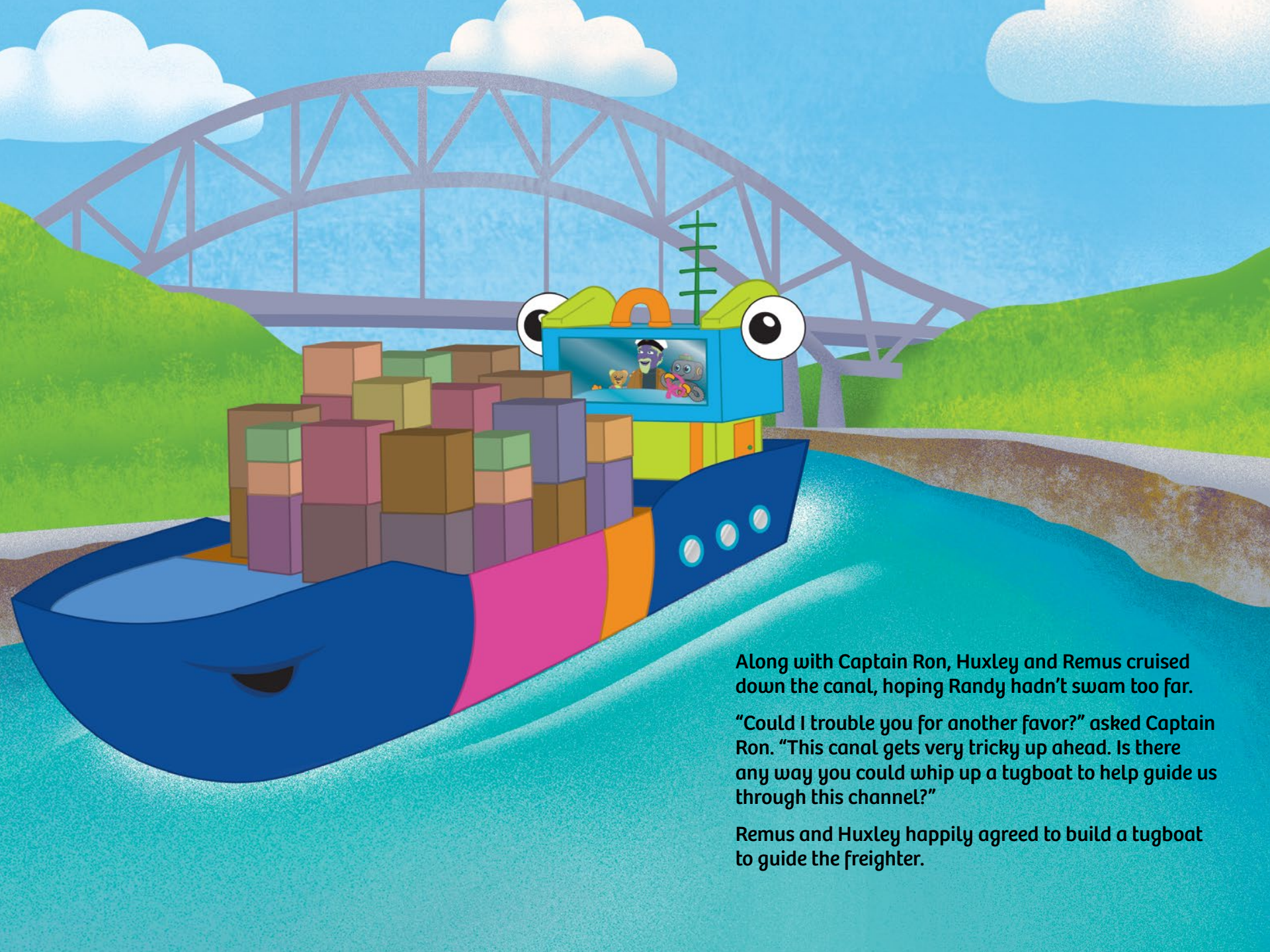


Huxley and Remus repaired the freighter.

"Ahoy! I'm Freddie the Freighter. Thanks for getting me back into tip-top shape. Freighters are huge ocean-going vessels that carry large amounts of goods around the world, between different ports. Most of your toys were likely transported part of the way from the places they were made to your home by ocean freighters like me. I weigh many thousands of tons, but because I displace a heavier amount of water, I won't sink, even when I'm loaded with cargo."

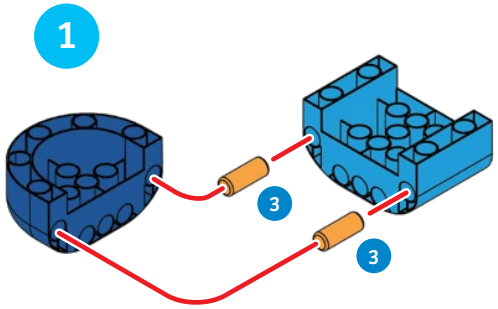


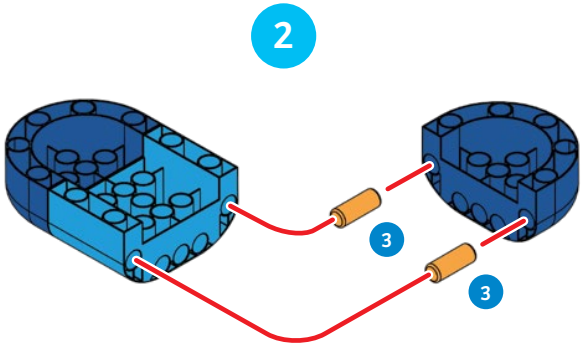
Along with Captain Ron, Huxley and Remus cruised down the canal, hoping Randy hadn't swam too far.

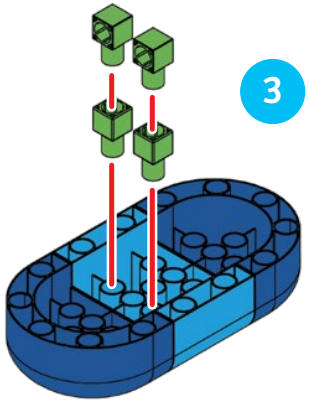
"Could I trouble you for another favor?" asked Captain Ron. "This canal gets very tricky up ahead. Is there any way you could whip up a tugboat to help guide us through this channel?"

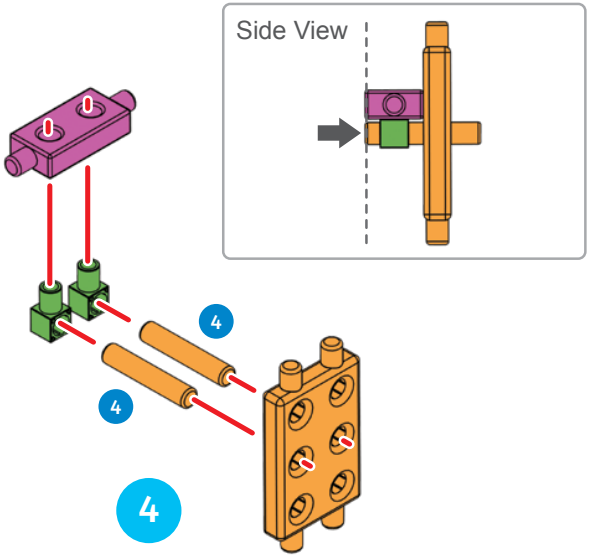
Remus and Huxley happily agreed to build a tugboat to guide the freighter.

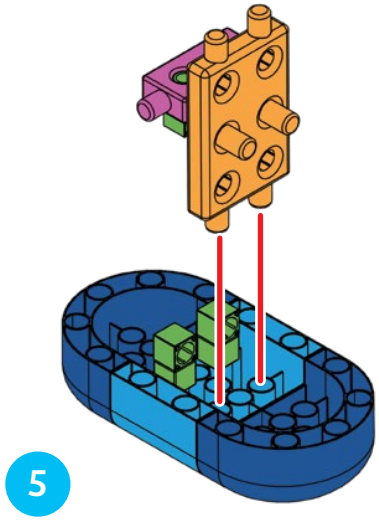
TAMMY THE TUGBOAT

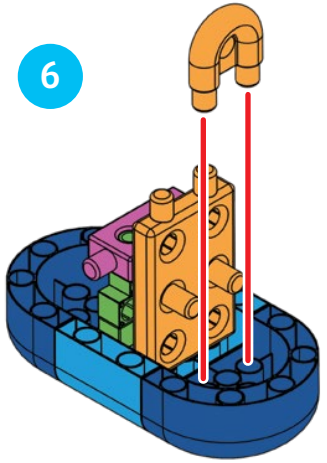












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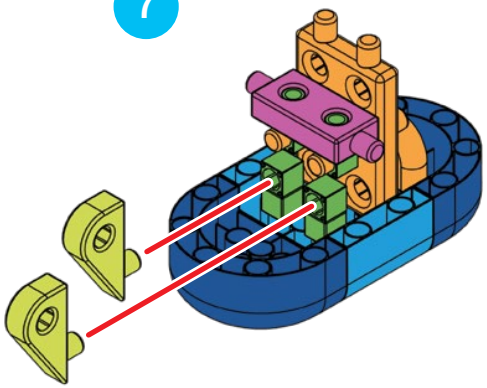

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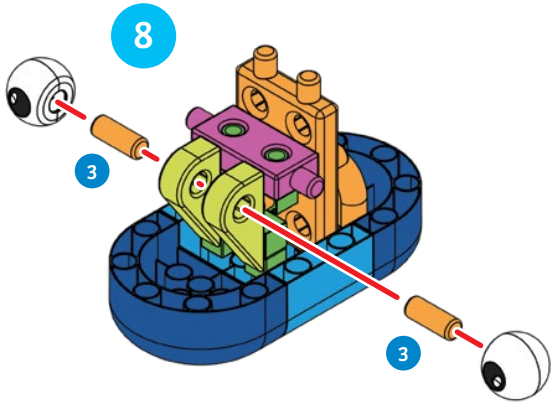

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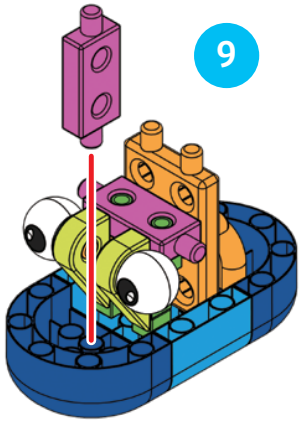

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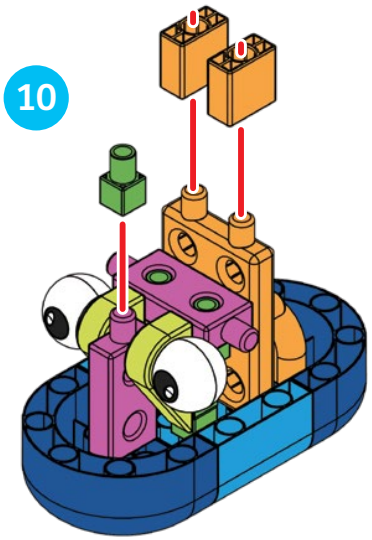

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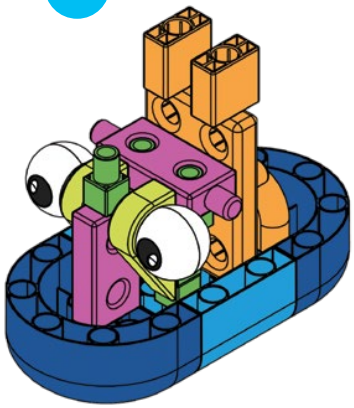
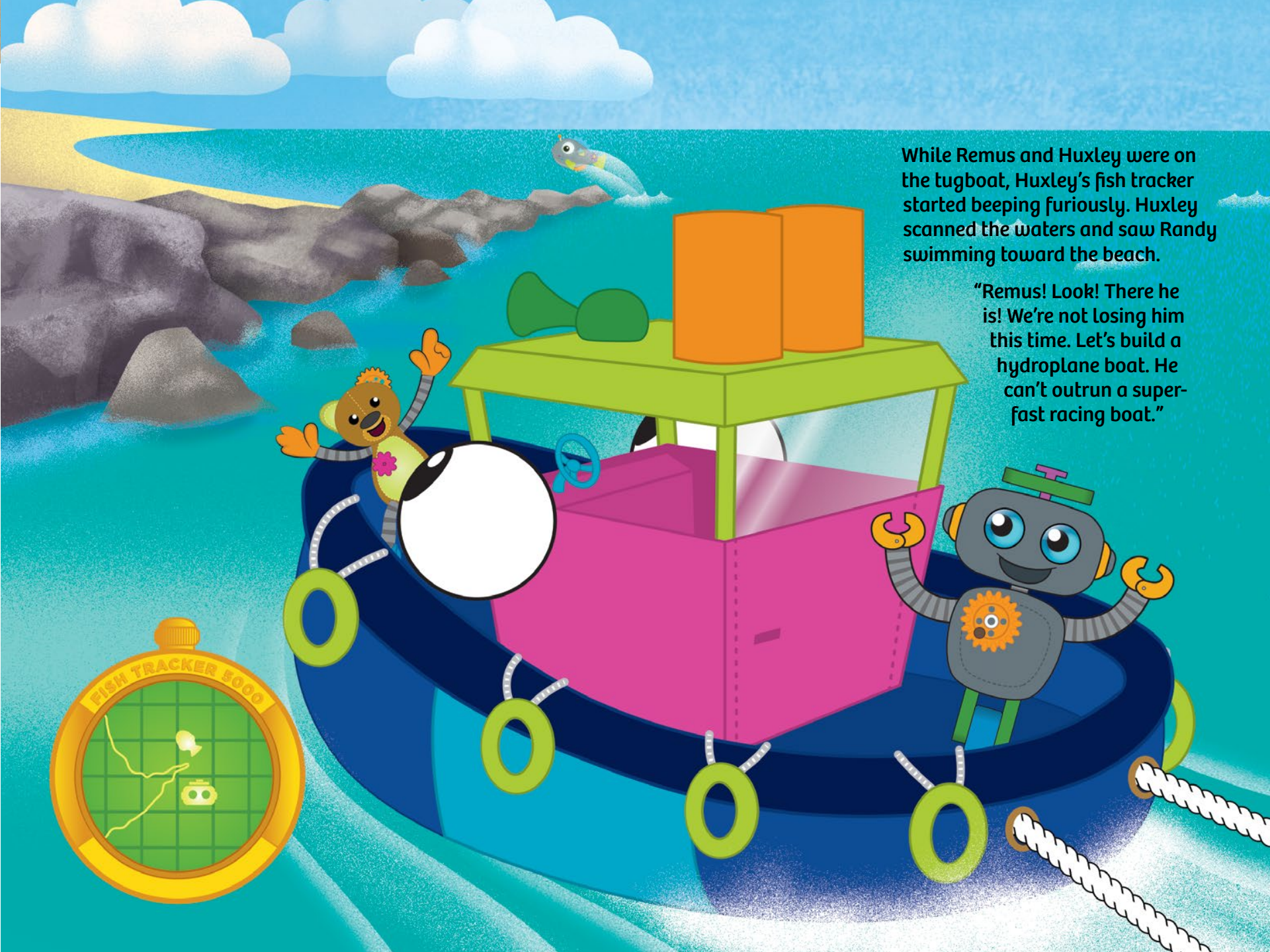


Done!

"Toot Toot! I'm Tammy the Tugboat!" Tammy called out. "I'm a small but very powerful boat that can push and pull large freighters and ships through narrow passages and crowded harbors. I have big bumpers all around me so I can push against the sides of huge boats and to protect me if I bump into other boats or piers. I also have a loud horn so I can tell other boats where I am."

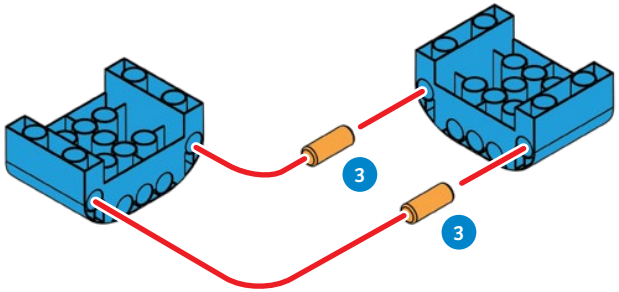


While Remus and Huxley were on the tugboat, Huxley's fish tracker started beeping furiously. Huxley scanned the waters and saw Randy swimming toward the beach.

"Remus! Look! There he is! We're not losing him this time. Let's build a hydroplane boat. He can't outrun a super-fast racing boat."

HUMBOLDT THE HYDROPLANE

1



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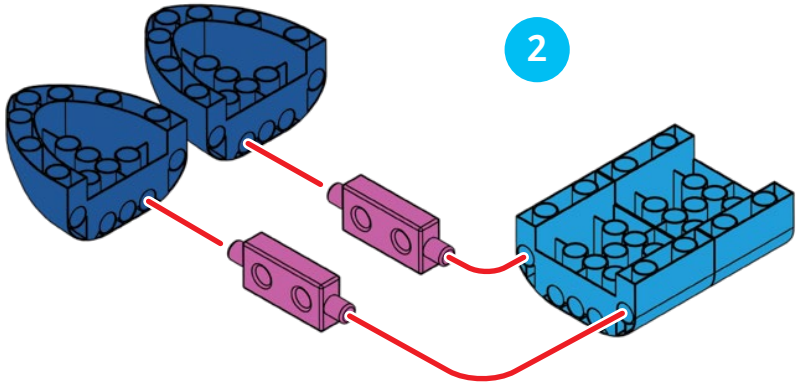

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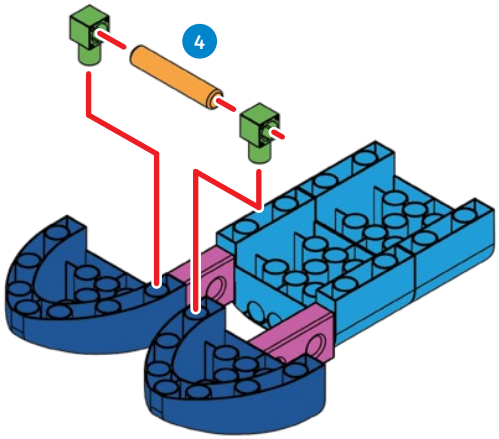

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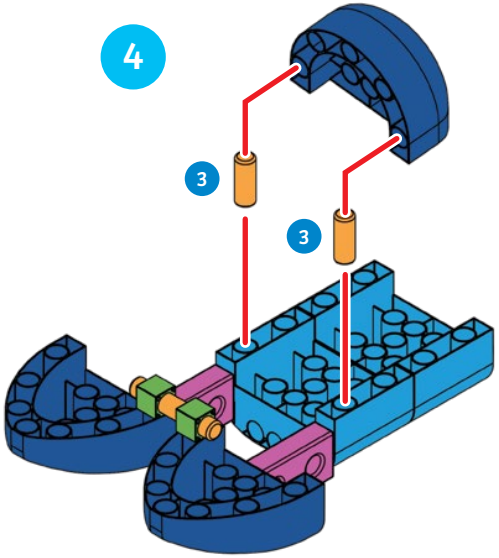

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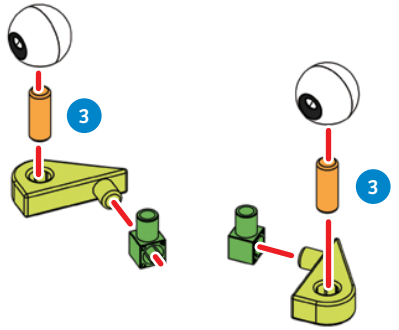

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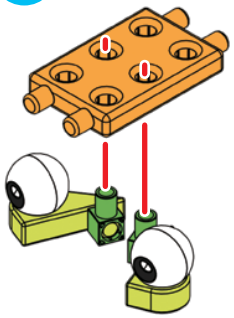

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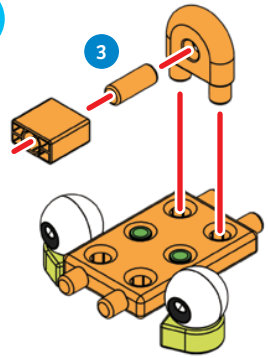

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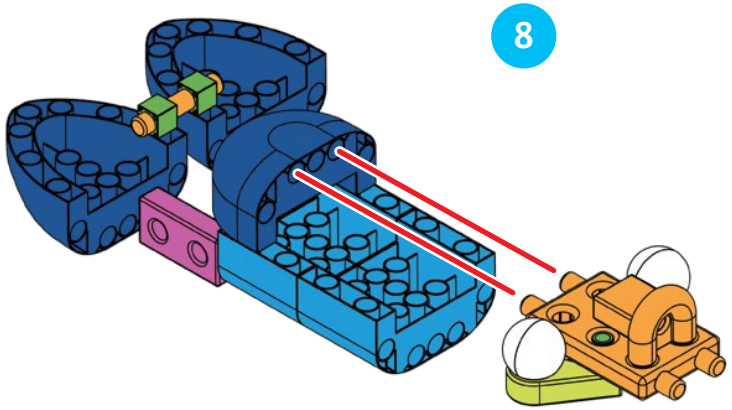

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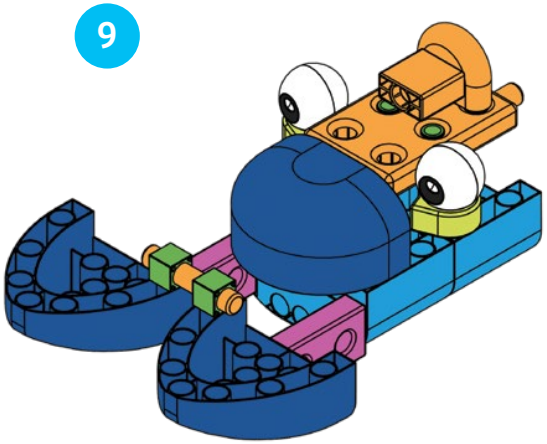

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"Howdy! I'm Humboldt the Hydroplane. I move at such great speeds that I'm actually a little bit more like an airplane than a boat! My hull is designed in a special way to create a special type of lift that pushes me up out of the water. When I'm moving fast enough, there are moments when I am completely up out of the water, flying through the air just above the surface of the water. This reduces the friction, or stickiness, with the water so I can move even faster with less resistance than a typical boat experiences. I love to race! Let's go catch up to your friend!"

"We've almost got him!" laughed Huxley as Humboldt the Hydroplane zoomed across the water just a short distance from the beach. "We have to get Randy back to the house so no one will know that he's missing."

"Uh, I think they are going to know," said Remus. "They are right over there, waving at us from the beach."

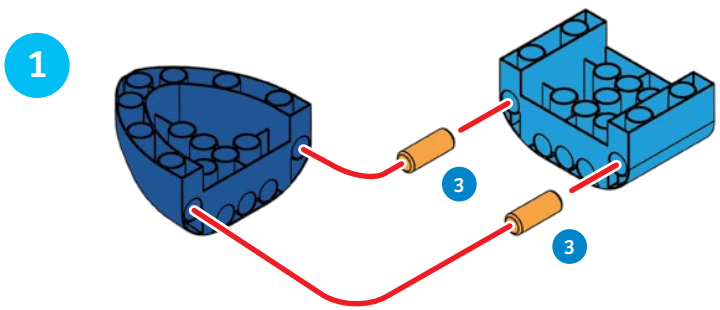
Huxley and Remus piloted the boat over to the Omega family, who were enjoying an uneventful, relaxing day at the beach. Huxley explained how they had tried to finish programming Randy, but that Randy had malfunctioned and swam away, and how they had chased him all the way from the river near the house.

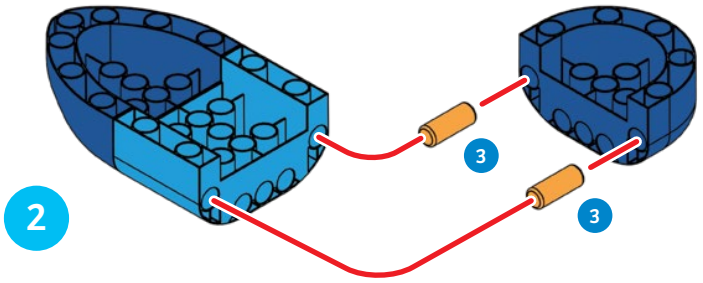
"Don't worry about it. New inventions usually don't work the first time you test them. It's normal to have to try many times before something works properly," said Ty. "You should have just told us what happened. We would have helped you catch him."

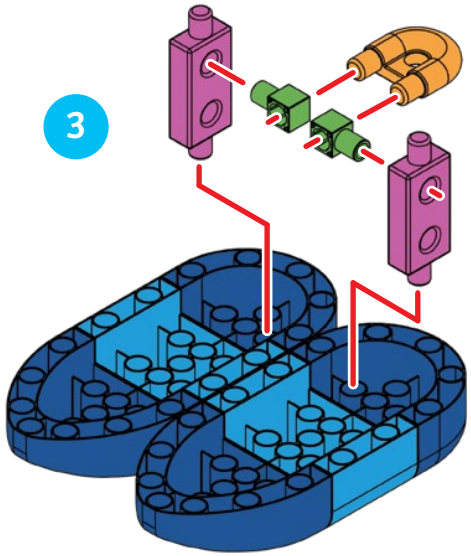
"Look!" Karlie interrupted. "Randy is headed out to sea. We need to make sure he's okay!"

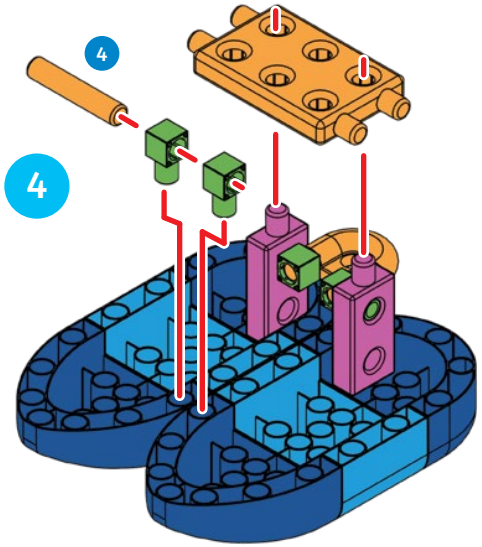
"Let's build a catamaran and we can all sail after him," Huxley said.

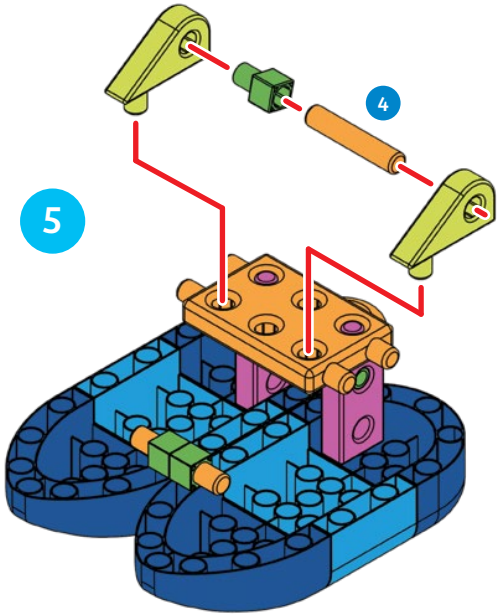
CARA THE CATAMARAN











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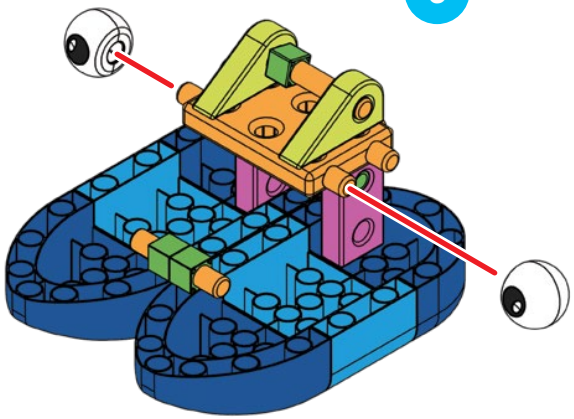

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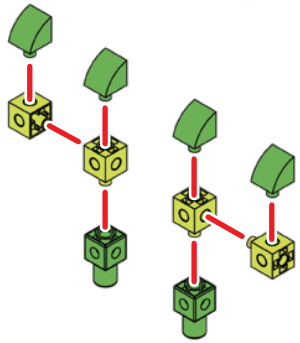

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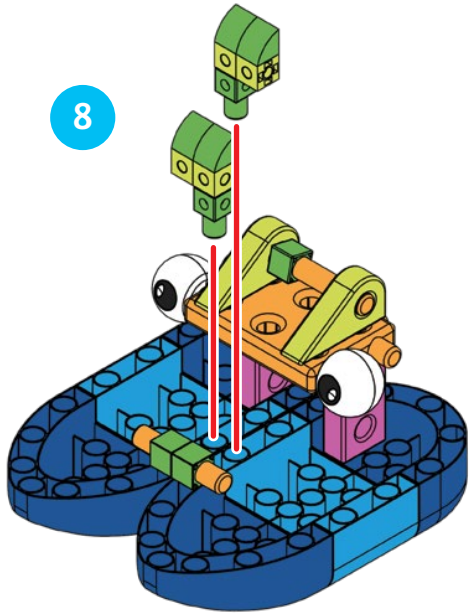

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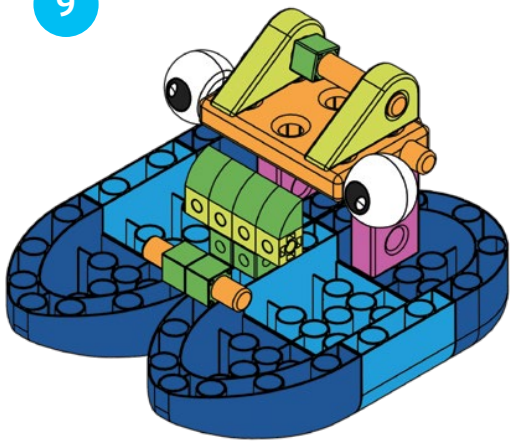

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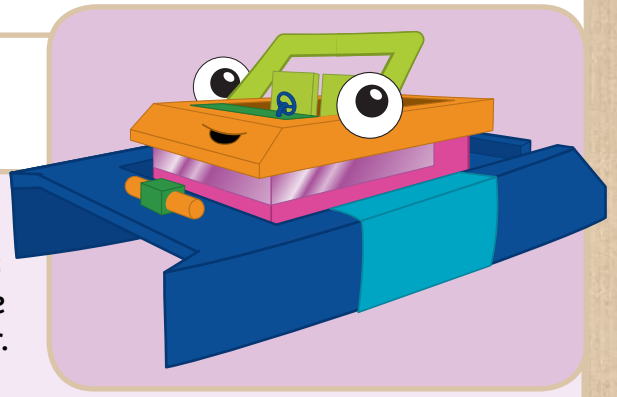


"Hello! I'm Cara the Catamaran. I have two hulls instead of one. This helps me stay very stable in the water. I don't need a long keel, which is the board that sticks down into the water to prevent a sailboat from tipping over. Instead, my stability comes from my wide beam. The beam is the width of a boat from one side to the other. In most cases, the wider the beam, the more stable the boat. So, hop aboard! The whole family can fit!"

As the Omega Family sped away from the beach on the catamaran, Huxley told Ty and Karlie about all the different types of boats they had built that day and how each boat was optimized, or made useful, for a specific function.

Everyone was relieved that it didn't take too long to catch up to Randy. When they finally found him, to their surprise, he was splashing and playing with some other fish.

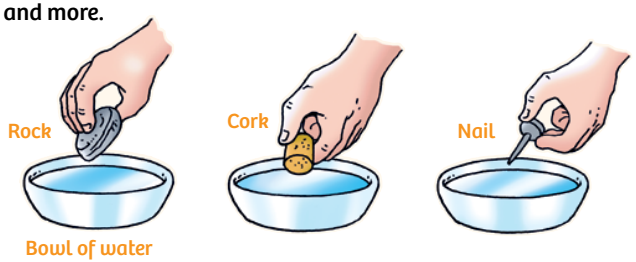
"He doesn't look like he's malfunctioning to me," observed Karlie.

"Yeah," agreed Ty. "He looks really happy."

The family coaxed Randy on board to give him a systems checkup and make sure he was okay.

BONUS EXPERIMENT 1: WHAT FLOATS?

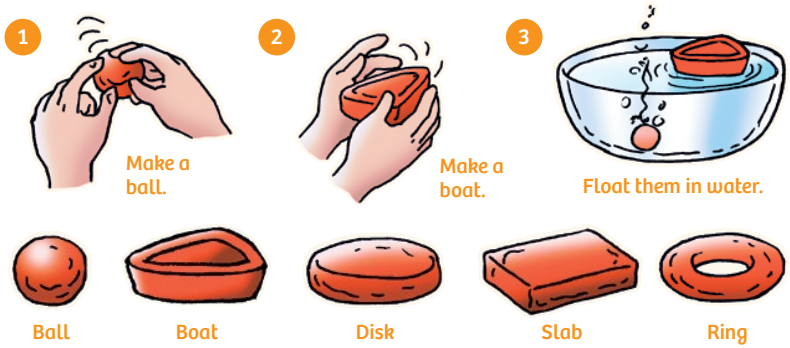
Test different objects to see whether they are able to float in water. You can test a rock, cork, nail, rubber band, feather, piece of yarn, plastic building block, and more.



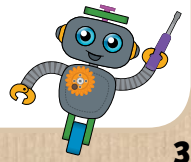
When an object sinks in water, it simply presses the water to its sides. It displaces the water. The amount of water an object displaces depends on its size and shape, not its weight. An object will sink if the amount of water that it has displaced (forced aside) weighs less than the object itself. If the displaced water weighs more than the object, then the water supports the object from underneath by pushing up on it, and that's how the object floats.

BONUS EXPERIMENT 2: HOW DO BOATS FLOAT?

Make different shapes with equal amounts of modeling clay, including ball and boat shapes. Test each shape to see if it floats in a bowl of water.



The clay boat and the clay ball weigh the same, but the boat displaces more water than the ball. Consequently, more water molecules press against the bottom of the boat, and it floats.



When Ty and Karlie inspected Randy, they couldn't find anything wrong with him.

"He seems perfectly fine to us," the kids said, much to the relief of Huxley and Remus. "You did a great job programming him."

After seeing how happy Randy was with his new friends, the kids asked Randy if he would like to stay out in the ocean with them. Randy nodded, flapped his fins, and quickly jumped off the deck of the boat and resumed playing with his new friends.

"I guess that's a 'yes'," said Karlie.

As the fish swam away, Ty called out, "Come back and visit whenever you want. Thanks to Huxley and Remus, you know the way home!"

The family all laughed and began the journey back to shore.

The End

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Story: Dan Freitas and Ted McGuire
Graphics and packaging: Dan Freitas
Illustrations: Dan Freitas and Ashley Greenleaf

Manual assembly instruction diagrams: Genius Toy Taiwan Co., Ltd., Taichung, Taiwan, R.O.C., and Thames & Kosmos
Photos: Genius Toy Taiwan Co., Ltd., Taichung, Taiwan, R.O.C., and Thames & Kosmos

Distributed in North America by Thames & Kosmos, LLC. Providence, RI 02903
Phone: 800-587-2872; Web: www.thamesandkosmos.com

Distributed in United Kingdom by Thames & Kosmos UK, LP. Goudhurst, Kent TN17 2QZ
Phone: 01580 212000; Web: www.thamesandkosmos.co.uk

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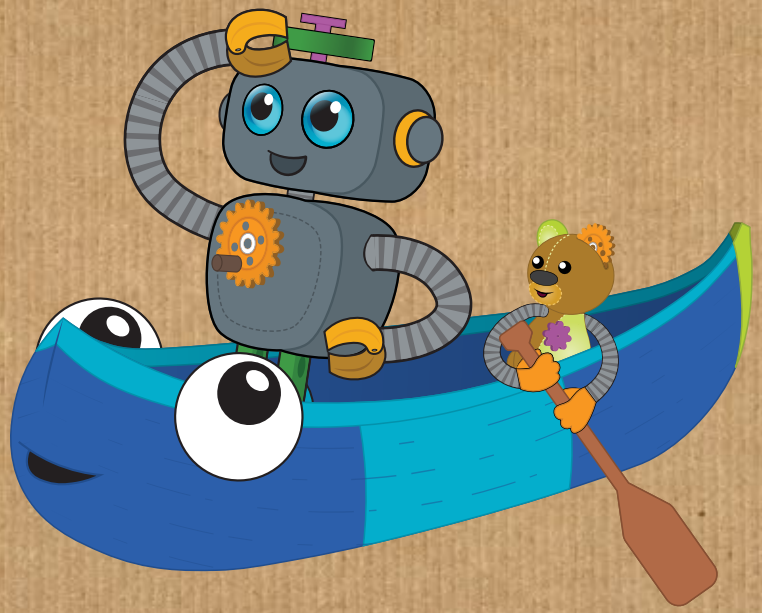
Printed in Taiwan / Imprimé en Taiwan



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