

$-1 > -9$

-2 0

On the Job

-2 0 2

Underwater Investigators

Plotting Rational Numbers

Michelle R. Prather

Table of Contents

The Big Challenge.....	4
Significant Splashes.....	6
Scientific Diving.....	10
Underwater Photography.....	16
Shipwreck Hunting.....	20
Taking the Plunge.....	26
Problem Solving.....	28
Glossary.....	30
Index.....	31
Answer Key.....	32

The Big Challenge

The size of the ocean can be hard to understand. This is especially true if you do not study or navigate the ocean as a career. But the remarkable people who do may help put its size into **perspective**. The five major oceans, plus smaller bodies of water, cover 71 percent of Earth's surface. The ocean also provides 99 percent of **habitable** space on Earth.

Now try to guess how much of all that water humans have explored. Surprisingly, that number is low. Humans have surveyed only five percent of the ocean. That leaves a whole lot of unknown to discover.

Going into the deep ocean is complex. It is said to rival going to outer space. The deeper a person goes, the more the pressure of the water increases. And it gets markedly colder and darker. Only costly and technologically advanced **submersibles** can withstand this environment. But private individuals and corporations have begun to support the effort.

Some people aim to discover new depths. Others stay in shallower waters to observe, document, and build. But all who venture below the ocean surface are investigators. Every day, they shed new light on this little-known world.



LET'S EXPLORE MATH

Imagine a bird is flying 5 meters above sea level. Directly below the bird, a fish is swimming 5 meters below sea level.

1. What integers represent sea level, the bird's location, and the fish's location?
2. Plot and label sea level and the locations of the bird and the fish on a vertical number line like the one to the right.
3. What is the distance between the bird and sea level? What is the distance between the fish and sea level?
4. How can you determine the distance between the bird and fish?



Dumbo octopuses live in extreme depths.

Significant Splashes

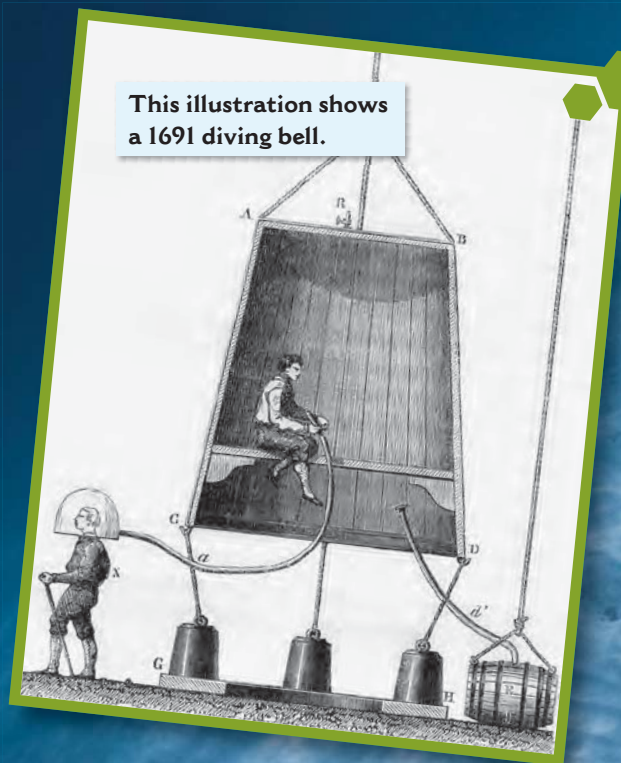
Great strides have been made in diving and deep-sea exploration. In ancient times, humans would freedive. This means they would jump in the water and hold their breath as they gathered food and other resources from the water. Sometimes, they would use things from nature, such as rocks, to weigh themselves down in order to go deeper. It's still a popular sport, but now people can also plunge to depths the human body cannot otherwise tolerate without special equipment. Divers can reach the deepest recorded points in Earth's oceans with special seacrafts.

People can thank those who have dreamed about what new discoveries the underwater world holds. They are scientists, engineers, and divers. They are also conservationists, photographers, and filmmakers. Even astronauts get in on the action. Testing tools in an undersea environment helps them prepare for space missions. Curiosity, mixed with courage to face the unknown, makes all the difference.

The Diving Bell

Early freedivers could explore shallow waters for only short periods of time. The invention of the diving bell, an early seacraft, changed things. It held a supply of air, so dive times were lengthened. As the bell-shaped vessel went into the water, the pressure of the water pushed the air into the top of the bell. It's a fairly old idea. The Greek philosopher Aristotle referred to it in 360 BC.

This illustration shows a 1691 diving bell.



A freediver in a blue wetsuit is shown underwater, swimming over a sandy bottom. The diver is in a streamlined position, with arms extended upwards and hands clasped. She is wearing a black diving mask, a black wristwatch on her left wrist, and a black belt with a yellow tag. Her legs are straight, and she is wearing large black fins. The water is clear and blue, with sunlight filtering down from the surface, creating a shimmering effect on the sandy bottom. In the top right corner, there is a faint, stylized graphic of a hexagonal grid with lines and dots. In the bottom right corner, there is a green hexagon containing the number 7.

A freediver holds her breath as she swims over a sandy bottom.

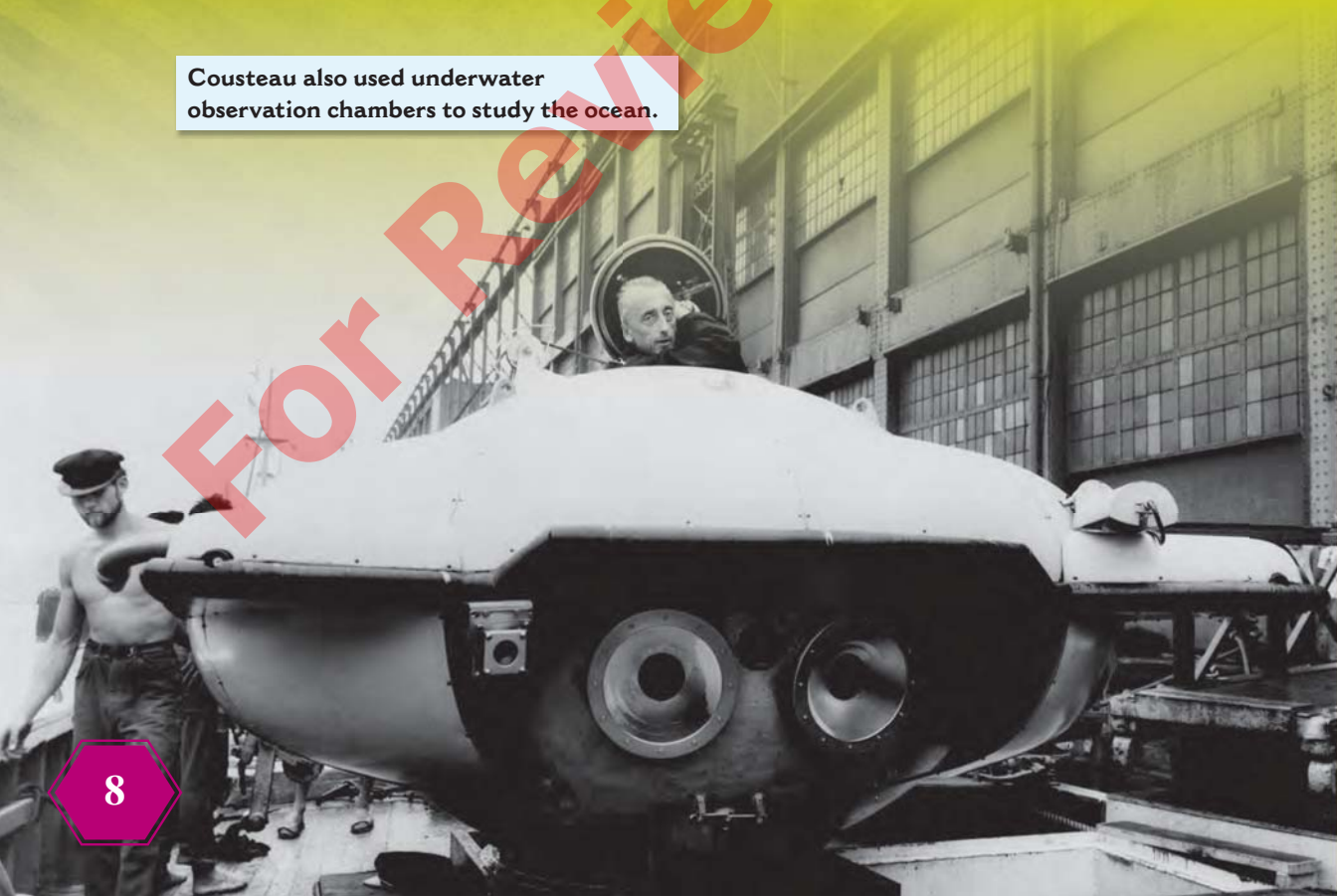
The Bathysphere

The invention of the bathysphere changed everything. It was a sturdy orb with **portholes**, lowered into the ocean by a **winch**. It gained world fame in 1934 when William Beebe and Otis Barton got inside and went 3,028 feet (923 meters) below the surface. No human had ever reached such depths. Beebe was an explorer and **naturalist**. Barton was an engineer and inventor. Both grew up longing to view the depths of the oceans. Only after they collaborated did they realize their dreams.

The Aqua-Lung

Jacques Cousteau (JAWK koo-STOH) was a French naval officer who yearned to know what secrets the ocean held. But Cousteau could only see so much with goggles and fins. So in 1943, he and engineer Emile Gagnan (eh-MEEL gah-NYAHN) developed a new device, the Aqua-Lung. This was the first self-contained underwater breathing **apparatus** (scuba).

Cousteau also used underwater observation chambers to study the ocean.



Deepsea Challenger

The *Deepsea Challenger* is a submarine (“sub”) designed to reach the deepest point on Earth. In 2012, it reached the Mariana Trench in the eastern Pacific Ocean. The deepest part of the trench is called Challenger Deep. It’s nearly 7 miles (11 kilometers) from the surface of the ocean. When *Deepsea Challenger* reached Challenger Deep, people were excited. The sub’s pilot set a record for the deepest a person had ever gone alone.



the “pilot sphere” on
the *Deepsea Challenger*