There are about 400 species of sharks in the oceans.

Sharks are carnivores, which means they are meat-eaters. They eat fish, mollusks, crustaceans, corals, other sharks, and even marine mammals. They eat only about every 2 to 3 days, but they can fast for months, living off of the fat reserves in their huge liver.

Sharks are found in seas and oceans all over the world. They can be seen in the open ocean, coral reefs, surf zones, shallow lagoons, coastal waters, harbors, and sandy bays.

The fins on a shark are well-developed to provide swimming power and stability. Each fin has a particular function:

- **Caudal (tail) fin**
  This fin helps a shark to swim quickly through the water.

- **Dorsal (back) fins**
  Sharks use these fins for balance. Some sharks have one dorsal fin; others have two.

- **Pelvic fin**
  This fin helps balance the shark.

- **Pectoral (side) fin**
  This fin is used for turning and steering.

- **Anal fin**
  This fin helps balance the shark.

**Cartilage** is an elastic, connective tissue that makes up the skeleton of a shark. Skates and rays also have a skeleton made of cartilage. Human skeletons are made of bone. Fish with cartilaginous skeletons are referred to as **elasmobranchs**. Cartilage allows for increased flexibility, provides protection and support of body tissues, and reduces overall total body mass. Our nose and our ears are made of cartilage. Sadly for paleontologists (people who study fossils), cartilage does not preserve well and therefore fossil skeletons of elasmobranchs are rare.
**SHARKS CAN GET BIG**

Sharks come in a large variety of shapes and sizes! The smallest shark is the 9.5 inch (24cm) pygmy catshark. The largest shark is the whale shark, which grows to 45 feet (14m). That is larger than your school bus!

This picture shows a whale shark in comparison to a human diver and a pygmy catshark.

**HOW FAST CAN SHARKS SWIM?**

The mako shark is the fastest shark, swimming at speeds up to 60 mph! Blue sharks can swim up to 43 mph, and great white sharks can swim up to 25 mph!
When we think of sharks, we usually think of razor-sharp teeth. However, there are many shapes and sizes of shark teeth, and the teeth can tell you a lot about what the shark eats. Some sharks have small files and filters to trap plankton, while others have blunt, flat teeth to crush the shell of a crab, shrimp, or lobster. Others have razor sharp teeth to tear through fish and marine mammals.

If you lose a tooth as an adult, that's it! You either get a false tooth or leave a hole in your gums. Not so with sharks: their teeth are endlessly replaceable. If one tooth falls out, another grows to replace it!

Shark teeth are in rows - anywhere from 5 to 20 rows of teeth at a time.

Sharks may have up to 3,000 teeth at any given time. A single shark may go through 50,000 teeth in its lifetime.

Notice all of the rows of teeth in this close-up of a sand tiger shark mouth?

The arrow is pointing to a tooth that is ready to fall out. After it falls out, the tooth right behind it will move into the front row. Sharks can replace their teeth about every 7 days. If you were a shark, you would never have to go to the dentist!

As an adult, you will only have 32 teeth! If you were a shark, each of your teeth would be replaced about 1562 times!
**SHARK SKIN**

Have you ever touched a shark? If so, did it feel rough...like sandpaper? Do you know why?

As if sharks didn’t have enough teeth...their entire bodies are covered with them! Hard, tooth-like scales called **dermal denticles** cover their entire bodies (denticle means “small tooth”). Much stronger and larger denticles form shark teeth. The skin of some sharks is so rough, it can even injure you if you touch it!

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**Did you know...**

In Japan, samurais would use shark skin for the handle of the swords because it would give them a good grip.

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**Greenland Shark Skin**

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**SHARK SKIN COLORATION**

Have you ever played hide-and-seek (when you try to hide from someone, until they find you)? Well, what if you were a fish in the ocean and you were playing hide-and-seek, only you were trying to hide so you wouldn’t be eaten? There’s a way that animals protect themselves in the ocean so that they are harder to find. It is by camouflage. **Camouflage** refers to ways animals blend into their environment to avoid being seen by predators or prey. Like many animals in the ocean, sharks are also camouflaged. Sharks are darker on top, so when an animal looks down at a shark, the shark blends into the dark ocean depths. Sharks are lighter on their bellies, so when an animal looks up at a shark, the light-colored belly blends in with the light from the sky above. This type of camouflage is called **countershading.**

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Darker on the top

Lighter on the bottom

Notice the countershading on this sand tiger shark.

Bottom-dwelling sharks, like this zebra shark, are camouflaged to blend into the sand, mud, and rocks of the ocean bottom.
SHARK SENSES

Sharks have very sharp senses....making them one of the most efficient predators on Earth.
There is little that escapes a shark’s attention.

Smell
This is the main sense that helps guide sharks to their prey. Sharks can smell the blood of a wounded animal from over a half mile away. They can detect a few drops of blood in a million drops of water!

Vision
Sharks have good vision. Even when there is very little light, sharks can still find their prey using their eyes. They can see well in low-light conditions. To protect their eyes from thrashing prey while feeding, some sharks will cover their eyes with a third eyelid, while others will roll their eyes back in their head!

Taste
Sharks have a good sense of taste. Sharks have many taste buds on the inside of their mouth. Some sharks will eat just about anything, but many sharks will spit things out if they do not like the taste.

Touch
The lateral line is a dark band running along each side of the shark’s body. It picks up vibrations in the water, so sharks can feel things that are moving nearby.

Ampullae of Lorenzini
If you look closely on the snout of a shark, you will see many small black pores, called Ampullae of Lorenzini. Every animal, including humans, produces electricity from their muscles and heart. The ampullae helps sharks hunt down their prey by picking up these electrical signals.

Hearing
Sharks have excellent hearing. They do not have external ears, but they do have sensitive internal ears that pick up sounds in the water. Sharks can hear sounds up to 0.6 miles (966 m) away, which is about the length of 10 football fields.
# Major Differences Between Sharks and Bony Fish

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Sharks</th>
<th>Bony Fish</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skeleton</strong></td>
<td>Cartilage only</td>
<td>Cartilage and bones</td>
</tr>
<tr>
<td></td>
<td>Take a minute and feel the tip of your nose or ears. Notice how they are soft and flexible? A shark’s skeleton is made entirely of cartilage, the same material in your nose and ears. They have no bones!</td>
<td></td>
</tr>
<tr>
<td><strong>Swimming</strong></td>
<td>Sharks can only swim forward</td>
<td>Bony fishes can swim both forward and backwards</td>
</tr>
<tr>
<td></td>
<td>Sharks have to turn around if they want to go in the opposite direction.</td>
<td></td>
</tr>
<tr>
<td><strong>Buoyancy (Floating)</strong></td>
<td>Large oily liver and cartilaginous skeleton</td>
<td>Gas-filled swim bladder</td>
</tr>
<tr>
<td><strong>Gills</strong></td>
<td>Gill slits but no gill cover</td>
<td>Gill slits covered by operculum</td>
</tr>
<tr>
<td></td>
<td>On a shark, you can see the gill slits behind the eyes. Most sharks have 5 gill slits, but some may have 6 or 7.</td>
<td>On bony fishes, you won’t see any gill slits. The gills have a covering (called an operculum) over them.</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>Rough, sandpaper-like skin</td>
<td>Slimy, overlapping scales</td>
</tr>
<tr>
<td></td>
<td>The skin of some sharks is so rough, it can actually cut you!</td>
<td>Have you ever tried to grab a fish with your bare hands? It's pretty slimy!</td>
</tr>
<tr>
<td><strong>Fins</strong></td>
<td>Relatively stiff and inflexible</td>
<td>Flexible</td>
</tr>
<tr>
<td></td>
<td>Most fins on a shark are very stiff and do not bend very much.</td>
<td>Many fish, like this bannerfish, have long fluttering fins that wave gracefully in the water.</td>
</tr>
</tbody>
</table>
Shark Reproduction

Sharks bear their young in various ways.

1. Some sharks, like bamboo sharks, package their young in leathery egg cases (like the picture to the right), and then abandon them at sea. Inside the egg case is egg yolk, which the developing sharks consume as they grow. After several months, one edge of the egg case comes apart and the tiny sharks emerge, alive and swimming. There is usually only one shark per egg case.

2. Other sharks develop within eggs inside of the mother’s body, feeding off of yolk sacs. Once they’ve depleted their yolk sacs, some feast on unfertilized eggs and even other siblings remaining inside the mother, with only the “strongest” surviving. Once all food supplies are gone, the sharks are born live, just like a mammal.

3. Some sharks develop like mammals, absorbing nutrients directly from the mother’s bloodstream through umbilical cords. At birth, the young pups emerge as exact replicas of their parents, only smaller.

When young sharks first swim out into the ocean, they must immediately take care of themselves. The adult sharks do not care for their young. The young sharks must find food, and hide from animals that may try to eat them.

Did you know...

Young sharks are called pups.

Sharks typically have gestation periods of a few months to two years. Litter size depends on the species. Average litter sizes are ten or fewer, but litter sizes from one to over 100 pups have been seen.
SHARK ATTACKS

SHOULD PEOPLE BE AFRAID OF SHARKS?

Are you afraid of sharks? Because of frightening shark movies, many people believe that sharks are eating and killing machines, always looking to attack and eat people. But the truth is... sharks rarely attack people! There are about 400 species of sharks in the ocean. Only about 30 species are known to ever attack people.

If a shark does attack a person, it is usually because of:

1. Mistaken Identity - the shark mistakes a surfer or diver for a sea turtle or sea lion.

If you were a shark in the ocean, do you think you could tell the difference between the sea turtle, the sea lion, and the diver?

2. Aggression - divers and swimmers threaten or harass the shark.

Did you know...

More people are killed each year by bees, lightning, or vending machines than by sharks!

Did you know...

There are fewer than 100 reported shark attacks per year!
Listed below are some staggering facts about the current status of sharks today:

* Humans are the greatest threat to sharks.
* For every human killed by a shark, 10 million sharks are killed by humans!
* As many as 100 million sharks were killed worldwide in 1989 alone!
* There are as many as 80 species of sharks threatened with extinction.

People kill sharks for their meat, skin, and oil. Their fins are used to make soup, their teeth are used as jewelry, and medicines can be made from their oil. Some sharks are hunted as trophies by fishermen, while other sharks get caught in fishing nets and drown.

Sharks are an important part of the ocean's food web. Sharks eat animals that are sick and injured, which keeps these animal populations healthy. Only through knowledge and awareness will people begin to appreciate and understand sharks.

DO SHARKS HAVE ENEMIES?

Because sharks are top predators, they have few enemies. Their main threats are humans, killer whales, sperm whales, and larger sharks. Because they have few enemies, they are usually at the top of the food chain, and they help maintain a balance by weeding out weaker and older members of a species. Larger sharks need little defense, and their teeth are sufficient to do the job. Smaller sharks, like this Port Jackson shark, need more than just sharp teeth to defend themselves. They have spines located in front of their dorsal fins which are extremely painful to predators.
Animal Riddles...

I am the top hunter, out in the sea.

Lots of people are afraid of me.

I have rows of teeth, and I can swim real fast.

If people keep hunting me, my species won’t last.

What animal am I?

Draw your answer below.