

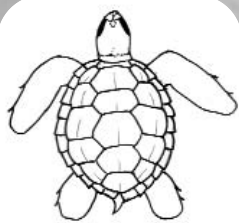
Sea Turtles, A Journey of Survival

An Educator's Guide to Sea Turtles



The Seven Species of Sea Turtles

There are currently believed to be seven species of sea turtles inhabiting the oceans and seas of the world. Though they share many common characteristics, the seven types of sea turtles are each unique and have adapted specific strategies for survival. Migratory routes, nesting habits and locations, feeding techniques and diet, and physical traits all help to distinguish between the different species.



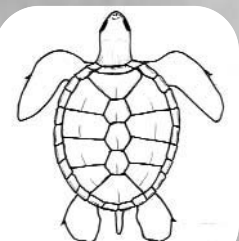
Loggerhead

The **Loggerhead** sea turtle is the one of the more recognized sea turtles and is listed as threatened in the US. It frequents estuaries, coastal plains and bays for feeding. Adults tend to be close to mainland shores, but may transit an ocean following migratory paths thousands of years old. They do this by using environmental cues such as the Earth's magnetic poles. The Loggerhead was named for the size of its head, which houses a large set of powerful jaw muscles used for cracking hard shelled prey. The carapace has a reddish-brown color. This coloration is also found on the top side of its flippers and head, while the Loggerhead's underside is pale yellow to dull brown in color.



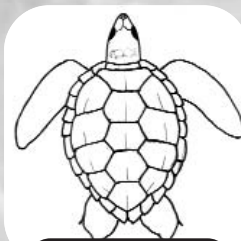
Leatherback

The **Leatherback** sea turtle is the largest turtle alive and is the only sea turtle without a hard shell. Instead of a shell, it has tough, rubbery skin. The black carapace, reinforced by thousands of tiny bone plates, has seven ridges marked with white spots running lengthwise. The plastron can be white to black in coloration. The head houses a fine knife-like beak, which the Leatherback uses to pursue its favorite meal, jellyfish. Food items such as crabs and mussels would damage the delicate jaw. Leatherbacks can tolerate cold water and are the most widespread of the sea turtles. These turtles are usually found in the open ocean coming to shore only to lay eggs. The Leatherback holds several sea turtle records: the largest, up to 10 feet in length; deepest diver, up to 3,000 feet; and the heaviest, weighing up to 2,000 pounds. This animal is endangered.



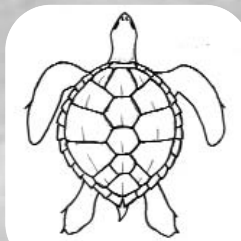
Flatback

The **Flatback** sea turtle is somewhat of a mystery as its restricted range is prohibitive of extensive research. Flatbacks are only located off of the northern Australian coast. The name "Flatback" refers to its compressed body. Like the Green sea turtle, this turtle has four lateral scutes. Each scute is an olive color with a brown to yellowish outer margin. The flippers are cream to white in color and have a single claw. Though information about this turtle is limited, it seems to prefer coastal waters, coral reefs and grass beds. Diet consists of softer animals such as jellyfish, sea cucumbers, prawns and seaweed. The IUCN lists flatbacks as "data deficient" because they are poorly understood. They are protected in Australia.



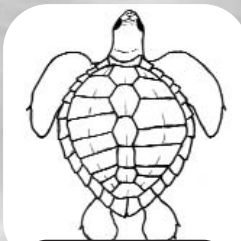
Green

The **Green** sea turtle does not get its name from the color of its shell, which is usually black, brown or gray, but from the color of its fat. The adult Green sea turtle is a strict herbivore, eating only sea grass and seaweed, which gives the fat its green color. Young Green sea turtles will eat crustaceans and worms as well as grass and seaweed, but they stop this omnivore behavior as an adult. Green sea turtles have serrated beaks, which aid in tearing plants and algae. Usually found near mainland coastlines or islands, they are indigenous to all temperate and tropical waters. They are the second largest sea turtle, averaging sizes over three feet in length and well over 300 pounds. Some populations of Green turtles in the eastern Pacific are known as Black turtles, due to their darker pigmentation.



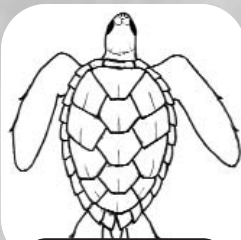
Kemp's Ridley

The **Kemp's Ridley** sea turtle received its name from a researcher who was studying it, Richard Kemp. Ridley comes from the word riddle, as no one was sure what kind of turtle it was, and some thought it to be a cross between a loggerhead and a green. Nesting behavior was also a puzzle until 1947 when their lone nesting beach was finally discovered at Rancho Nuevo in Mexico. The Kemp's Ridley is the most endangered and the smallest of the sea turtle species, reaching an average length of two feet and a weight of about 100 pounds. The carapace is olive green while the plastron is yellowish. Kemp's Ridelys are carnivores, dining on crabs, clams, mussels, jellyfish, urchins and shrimp. Never venturing far from North America, this turtle ranges from the Gulf of Mexico to along the eastern U.S. Atlantic coast. Occasionally, they are found in European waters. Ridley turtles, Kemp's and olive, will lay approximately two clutches of about 100 eggs each. Both species participate in mass synchronized nesting called arribadas. However, the Kemp's nests during daylight; all other sea turtles nest at night.



Olive Ridley

The **Olive Ridley** sea turtle, named for the olive tone of its carapace, is very similar to the Kemp's except it travels in the open ocean waters of tropical Pacific, Atlantic and Indian Oceans. Olive Ridelys are more abundant than the Kemp's, but are still on the endangered species list because only a few nesting sites remain worldwide where they can congregate for the arribada.



Hawksbill

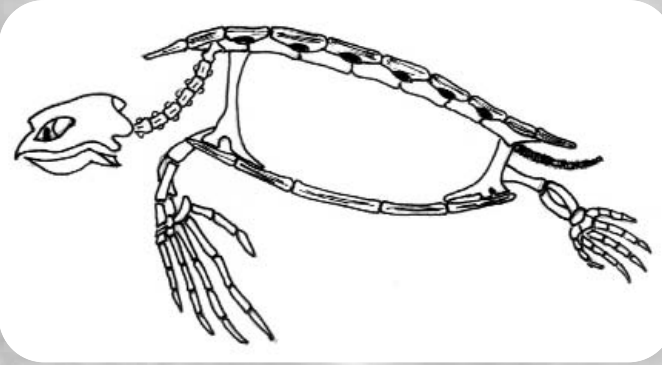
The **Hawksbill** sea turtle is so named because the shape of its head and beak resemble a hawk. They are usually found around rocky bottom areas and coastal reefs as well as in estuaries and lagoons in the tropical waters of the Atlantic, Pacific and Indian Oceans. Hawksbill sea turtles are endangered. They have been hunted for their shells to make jewelry and other personal items such as combs, brushes and eyeglass frames. The Hawksbill is slightly smaller than the Loggerhead, with an average length of 36 inches and weight of 150 pounds.

Turtle Parts

The Body

Most notably, sea turtles have shells. The shell encloses and protects the soft, inner body parts. From the shell, the head, flippers and tail protrude. The shell has two parts: the top, carapace, and the bottom, plastron. They are connected to each other on the sides by the bridge. The carapaces' bone plates that comprise the under layer are fused with the vertebrae and ribs of the turtle so that the turtle cannot leave its shell. The bone plates that make up the top of the carapace are covered with a protective keratin outer layer, much like our fingernails. This keratinous outer covering is called a scute. Through all of this armor, the sea turtle's shell may seem indestructible, but it is actually quite sensitive. Beneath the thin, keratin scutes is living tissue with sensitive nerve endings.

The sea turtle's appendages are paddlelike flippers (two large front flippers and two smaller rear flippers) and a tail. Sea turtles use their back flippers as rudders to maneuver while swimming. In adult sea turtles, the tail length is used to determine sex. Male characteristics include a longer tail and larger claws on the front flippers, which are used to grasp the female during mating.



The Head

The sea turtle's skull is solid and does not contain teeth. Turtles have horny beaks. The beak is adapted to the diet of the turtle: sharp for cutting and slicing and flat for crushing. Sea turtle beaks are species specific and so is their diet. A Loggerhead sea turtle's beak is very strong with powerful jaw muscles that enable it to crush crabs and other shellfish, while Leatherbacks have a beak with a special notch to grab and pierce soft jellyfish. Green sea turtles have a very finely serrated beak that enables them to cut sea grasses and seaweed for food.

The turtle's tongue is a large broad muscle anchored securely in the turtle's mouth and cannot be extended. The turtle swallows food whole or in large chunks without chewing. They will also use their beaks to test and explore new objects.

Food is located by means of an acute sense of smell. Sea turtles detect scents in the water by opening their mouths slightly and drawing in water through the nares. The water is not swallowed but is immediately expelled through the mouth. A sea turtle's sense of smell is so acute that some scientists believe it might help an adult turtle locate the beach where it hatched.

Sea turtles do not have externally visible ears, but they can hear low frequency sounds and vibrations underwater. Sea turtle eyes are well developed to see underwater, but they only provide nearsighted vision in the air. Large eyelids protect a sea turtle's eyes from predators.

Build a Geometric Turtle – Math Activity

Objectives

Students will:

- Recognize and identify geometric shapes
- Identify geometric patterns as specific shapes and as combined shapes
- Understand the relationship between adaptations and survival

Materials

Copies of Geometric Turtle activity sheet, one per student

White, green or brown construction paper

Paper plates (optional)

Glue or tape

Crayons or markers

Pencil

Ruler

Scissors

Eyes (optional)

Procedure

1. Give each student a geometric turtle activity sheet.
2. Have students decorate / color the geometric shapes.
3. Have students cut out shapes from the activity sheet.
4. Have students identify the geometric shapes and write that shape name on the back of the shape.
5. Have students arrange shapes for a turtle shell and attach them to one of the colored pieces of construction paper (or paper plate).
6. Have students cut off any construction paper that is not covered by the decorated shapes. (Omit this step if using a paper plate.)
7. Have students arrange shapes for the head, tail, front and rear flippers and attach these to the under side of the paper.
8. Glue on eyes or pieces of white paper.
9. Go over each body part describing its function as an adaptive characteristic; describe each part's positive and negative impacts to the animal. (Example: Flippers are used by the turtle to help him swim / fly through the water, however, they hinder the turtles movements on land).

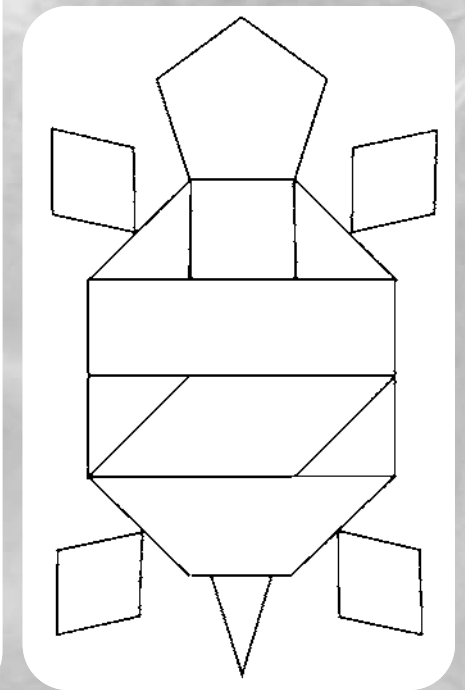
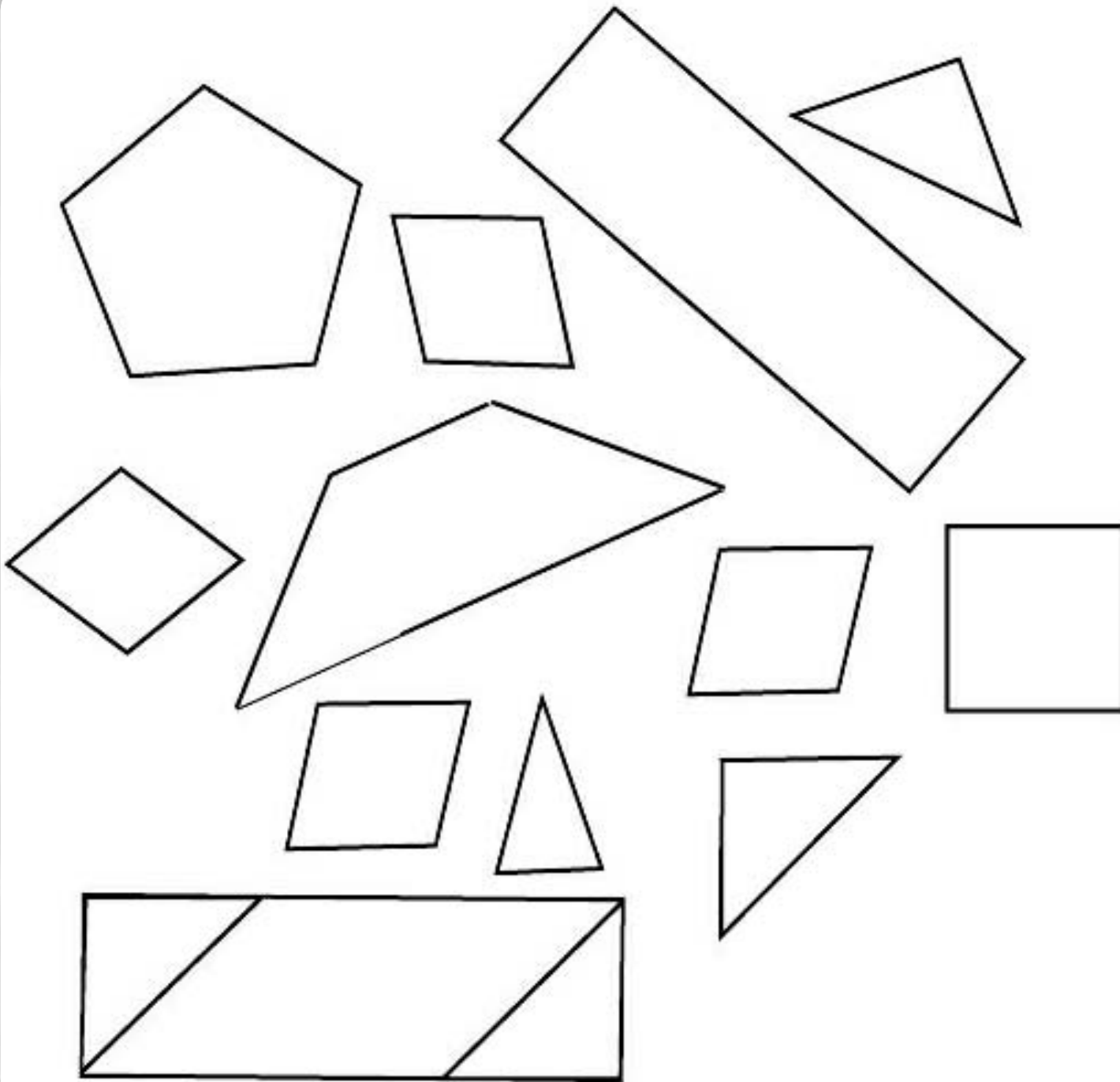
Extension

- Use the shapes from the turtle sheet to teach about perimeter, volume and area. (Have the students measure the shapes sides and then determine the different values.)
- Use these shapes to teach about numerical prefixes: mono-, bi-, tri-, quad-...

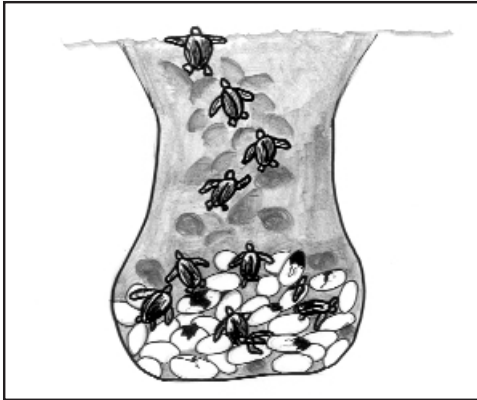
Reinforcement and Evaluation suggestions

- Quiz on geometric shapes identifying each.
- Matching - adaptation to body part.
- Have students describe other shapes they see in everyday life.
- Have students describe other shapes they see in nature. Have some examples to demonstrate to the students.

Geometric Turtle Activity



"Temperature Will Tell" - Activity Sheet



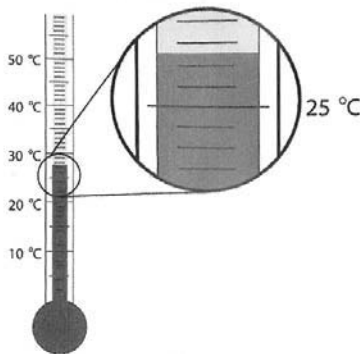
Sea turtles lay their eggs in nests that they have built in the sand. The eggs will take about 60 days to hatch, during which time they need to be kept warm, about 29 degrees Celsius (C). At this temperature 50% will be males and 50% will be females. The eggs in the bottom of the nest are more insulated but may be a little cooler. The eggs in the top of the nest have less insulation and may be exposed to changes in temperature, either cooler or warmer, depending on the weather. Generally speaking, eggs that develop at a cooler temperature, less than 29 degrees C, will be male turtles, and eggs that develop at a warmer temperature, more than 29 degrees C, will be females.

Use the following information to answer the questions.

- Each nest contains 100 eggs.
- At a temperature of 29 degrees C, eggs will develop 50% male, 50% female.
- Average temperatures above 29 degrees C will yield all females; average temperatures below 29 degrees C will yield all males.
- Eggs exposed to temperatures less than 25 degrees C and greater than 35 degrees C may not develop.
- Formula to convert from Celsius to Fahrenheit: Degrees Fahrenheit = (1.8 x degrees Celsius) + 32

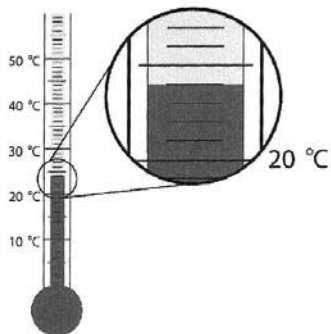
1. A turtle lays her eggs in a nest with a bottom temperature of 28 degrees C. The top half of the nest gets warmer because the sun is out every day. The top half of the nest develops at a temperature of 30 degrees C.

- A. How many male sea turtles do you expect? _____
- B. How many female sea turtles do you expect? _____



2. Sand has been brought to the beach in large trucks to help a beach erosion problem; it is very coarse and not as packed as the natural sand. This sand is a poor insulator and not able to maintain consistent temperatures. A turtle lays her eggs in the new sand. The temperature of the whole nest is pictured on the thermometer to the left.

- A. Read the thermometer. What is the temperature in the nest?
In degrees Celsius _____
In degrees Fahrenheit _____
- B. What do you think will happen to the eggs in the nest? _____
- C. How many male sea turtles do you expect? _____
- D. How many female sea turtles do you expect? _____



3. The number of storms has been uncommonly high this summer and the coastal area where turtles lay their eggs has had lots of rain and very high tides. This has cooled the sand and the nests where sea turtle eggs have been laid.

- A. Read the thermometer to the left and determine the temperature of the nest. What is the temperature in
In degrees Celsius _____
In degrees Fahrenheit _____
- B. What do you think will happen to the eggs in the nest? _____
- C. How many male sea turtles do you expect? _____
- D. How many female sea turtles do you expect? _____

4. A dog discovers the nest and uncovers it, exposing the eggs to the bright sunlight. The average temperature of the nest climbs to 37 degrees C.

- A. Convert this temperature to Fahrenheit. _____
- B. What do you think will happen to the eggs in the nest? _____

Glossary

Adaptation

a) Adjustment to environmental conditions; (b) modification of an organism or its parts that makes it more fit for existence under the conditions of its environment; often hereditary

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Amniotic

Containing a thin membrane forming a closed sac around the embryo containing a fluid in which the embryo is immersed

Arribada

Great nesting aggregations

http://www.nmfs.noaa.gov/prof_res/species/turtles/olive.html 07/20/04

Beak

a) The bill or nib of a bird, consisting of a horny sheath, covering the jaws. The form varied much according to the food and habits of the bird, and is largely used in the classification of birds. (b) A similar bill in other animals, as the turtles

Webster's Revised Unabridged Dictionary, © 1996, 1998 MICRA, Inc.

Calcareous

Made of or containing calcium carbonate or calcium; associated with bones and egg shells

Carapace

A hard bony or chitinous outer covering, such as the fused dorsal plates of a turtle or the portion of the exoskeleton covering the head and thorax of a crustacean

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Characteristic

A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait

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Circumglobal

Around or about the entire world

Clutch

The complete set of eggs produced or incubated at one time

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Cold-Stunned

Disoriented due to hypothermia; applies mainly to cold-blooded animals that are trapped in cold waters

Dehydrate

To lose water or bodily fluids

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Direct Action

Action that seeks to achieve an end directly and by the most immediately effective means

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Ectothermic

Of or relating to an organism that regulates its body temperature largely by exchanging heat with its surroundings; cold-blooded

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Endangered

To threaten with extinction

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Extinct

No longer in existence; lost or especially having died out leaving no living representatives

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Flotilla

A group moving together comprised of a large number of individuals; commonly used to describe a group of sea turtles

Habitat

The area or environment where an organism or ecological community normally lives or occurs

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Herbivore

An animal that feeds chiefly on plants

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Hydrodynamic

Deals with the motion of fluids and the forces acting on solid bodies immersed in fluids and in motion; moves through liquid with minimal resistance

Imprint

To fix permanently in the memory

Ingestion

To take into the body by the mouth for digestion or absorption

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Indirect

Not directly aimed or achieved

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Jurassic

From 135 million to 190 million years ago

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Latitude

The angular distance between an imaginary line around a heavenly body parallel to its equator and the equator itself

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Longitude

An imaginary great circle on the surface of the earth passing through the north and south poles at right angles to the equator

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Metabolism

The chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized

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Myoglobin

A red iron-containing protein pigment in muscles that is similar to hemoglobin but differs in the globin portion of its molecule, only one fourth the molecular weight of the hemoglobin and has a greater tendency to combine with oxygen

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Orbit

The path of a celestial body or an artificial satellite as it revolves around another body

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Plastron

The ventral part of the shell of a turtle or tortoise

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Poaching

To take fish or game in a forbidden area

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Prehensile

Adapted for seizing, grasping, or holding, especially by wrapping around an object

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Southern Hemisphere

The half of the earth south of the equator

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Threatened

At risk of becoming endangered.

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Triassic

From 190 million to 230 million years ago

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Trawl

A large bag net attached to a beam with iron frames at its ends, and dragged at the bottom of the sea; used in fishing, and in gathering forms of marine life from the sea bottom

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Sea Turtle Identification Cards

Average size and weight:
27.5 inches and under 100 pounds

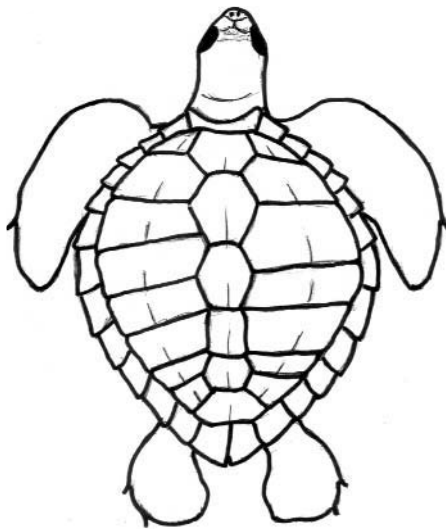
Diet: Crustaceans, mollusks and tunicates as well as seaweed and sea grasses

Range: Circumglobal- Found in tropical and subtropical coastal waters ; usually seen in large flotillas travelling between breeding and feeding grounds in the Eastern Pacific and Indian Ocean

Status: Endangered

Fact(s): Known to participate in arribadas and reproduce annually

Olive Ridley
Lepidochelys olivacea



Average size and weight:
27 inches and 85 pounds

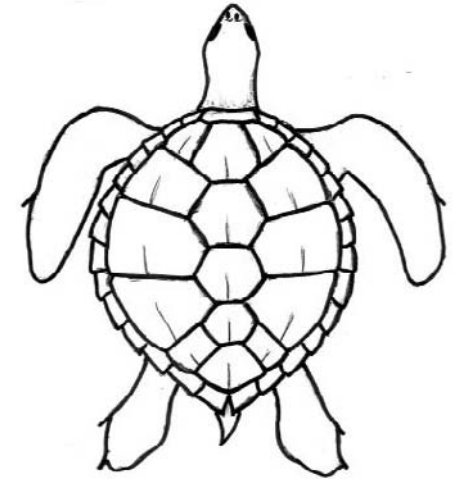
Diet: Crabs, clams, mussels, shrimp as well as fish, sea urchins, squid and jellyfish

Range: Gulf of Mexico, Bahamas and western Atlantic Ocean, along the east coast from Florida to New York

Status: Critically Endangered

Fact(s): The smallest of the sea turtles; nests annually, laying about two clutches of 100 eggs each year

Kemp's Ridley
Lepidochelys kempii



Average size and weight:
36-40 inches and 300 pounds (largest was five feet and 871 pounds)

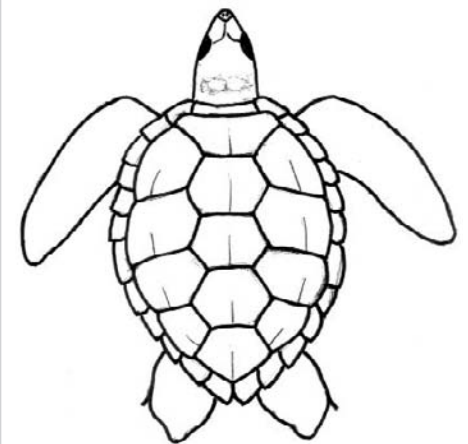
Diet: Strict herbivores, eating sea grasses and algae; juveniles eat worms and young sea creatures as well as grasses and algae

Range: Circumglobal in tropical and subtropical waters, near continental coasts and around islands

Status: Endangered (C.E. in Mediterranean)

Fact(s): Named for the color of its fat

Green
Chelonia mydas



Average size and weight:
Up to eight feet and 1,300 pounds
(Largest was 10 feet and 2,019 pounds)

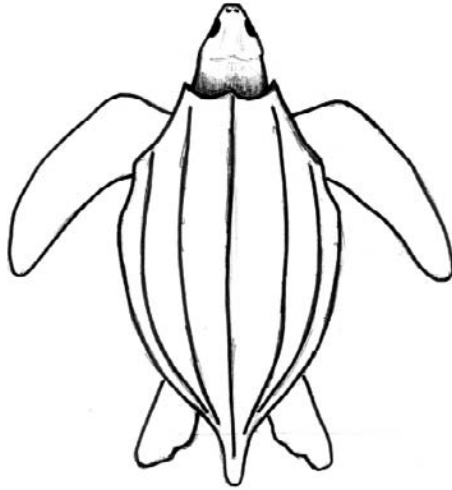
Diet: Jellyfish

Range: Circumglobal - ranging in most of the world's oceans, nests on beaches of the Atlantic, Indian and Pacific

Status: Critically Endangered

Fact(s): The largest, deepest diving and furthest traveled of all sea turtles; lack a hard shell but have a layer of tough, rubbery skin with tiny bone plates

Leatherback *Dermochelys coriacea*



Average size and weight:
36 inches and 150 pounds

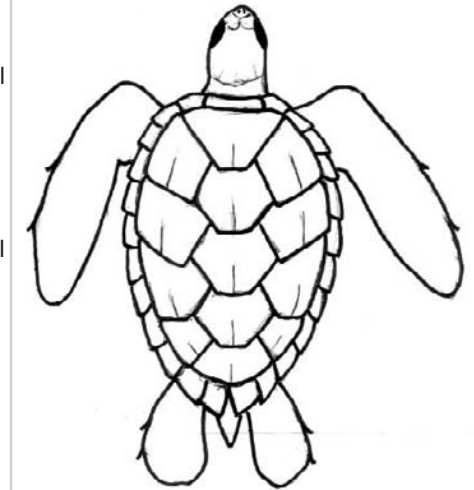
Diet: Sponges, anemones, squid and shrimp

Range: Circumglobal - the most tropical of all sea turtles; most common near coral reefs in the Atlantic and Indo-Pacific

Status: Critically Endangered

Fact(s): Were hunted to endangerment due to the desire for their shell; traditional tortoise shell products are made from the shell of these turtles

Hawksbill *Eretmochelys imbricata*



Average size and weight:
39 inches and 150 pounds

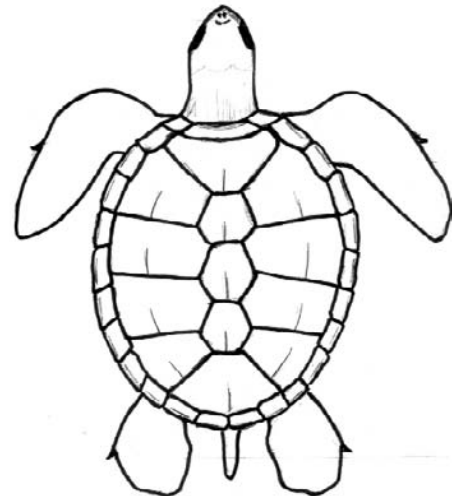
Diet: Sea cucumbers, mollusks, prawns, seaweed

Range: North coast of Australia and gulf of Papua New Guinea

Status: Data Deficient

Fact(s): The most poorly understood of all sea turtles because of its limited range; Will only lay approximately 50 large eggs up to four times a season

Flatback *Natator depressus*



Average size and weight:
41 inches and 350 pounds

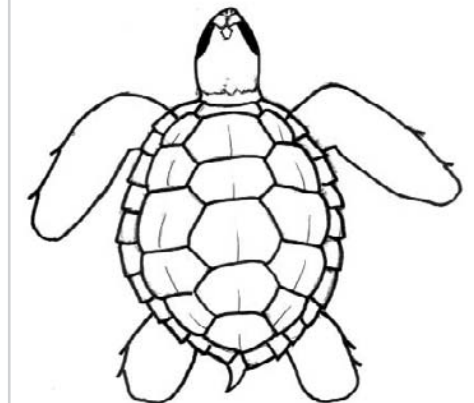
Diet: Primarily carnivorous feeding on crustaceans, horseshoe crabs, clams, mussels and shrimp

Range: Circumglobal - ranging in most of the world's oceans; usually visible on continental shelves, in bays and estuaries and lagoons in temperate, subtropical and tropical waters

Status: Endangered

Fact(s): Named for their very large head; also the most numerous of the US Atlantic Coast sea turtles

Loggerhead *Caretta caretta*



Paper Plate Turtles – Craft Activity

Box Turtle / Sea Turtle

Objectives:

Students will:

- Identify basic appendages of a turtle and explain their functions
- Be introduced to basic turtle morphology

Materials:

Paper plates, one per student

Crayons or markers

Glue or stapler

Scissors

Copies of turtle parts sheet, one per student

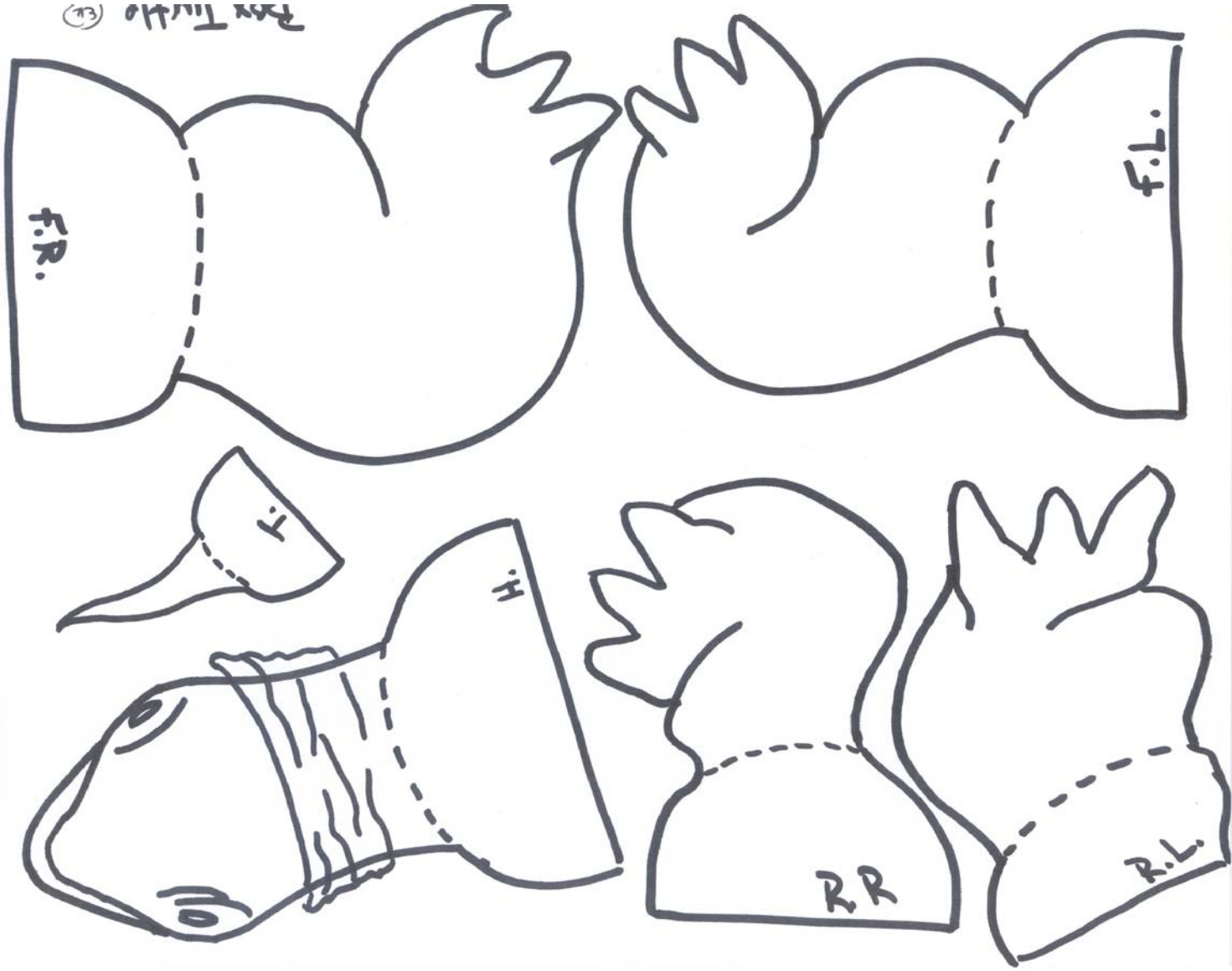
(Optional Items: Brads, googly eyes)

Procedure:

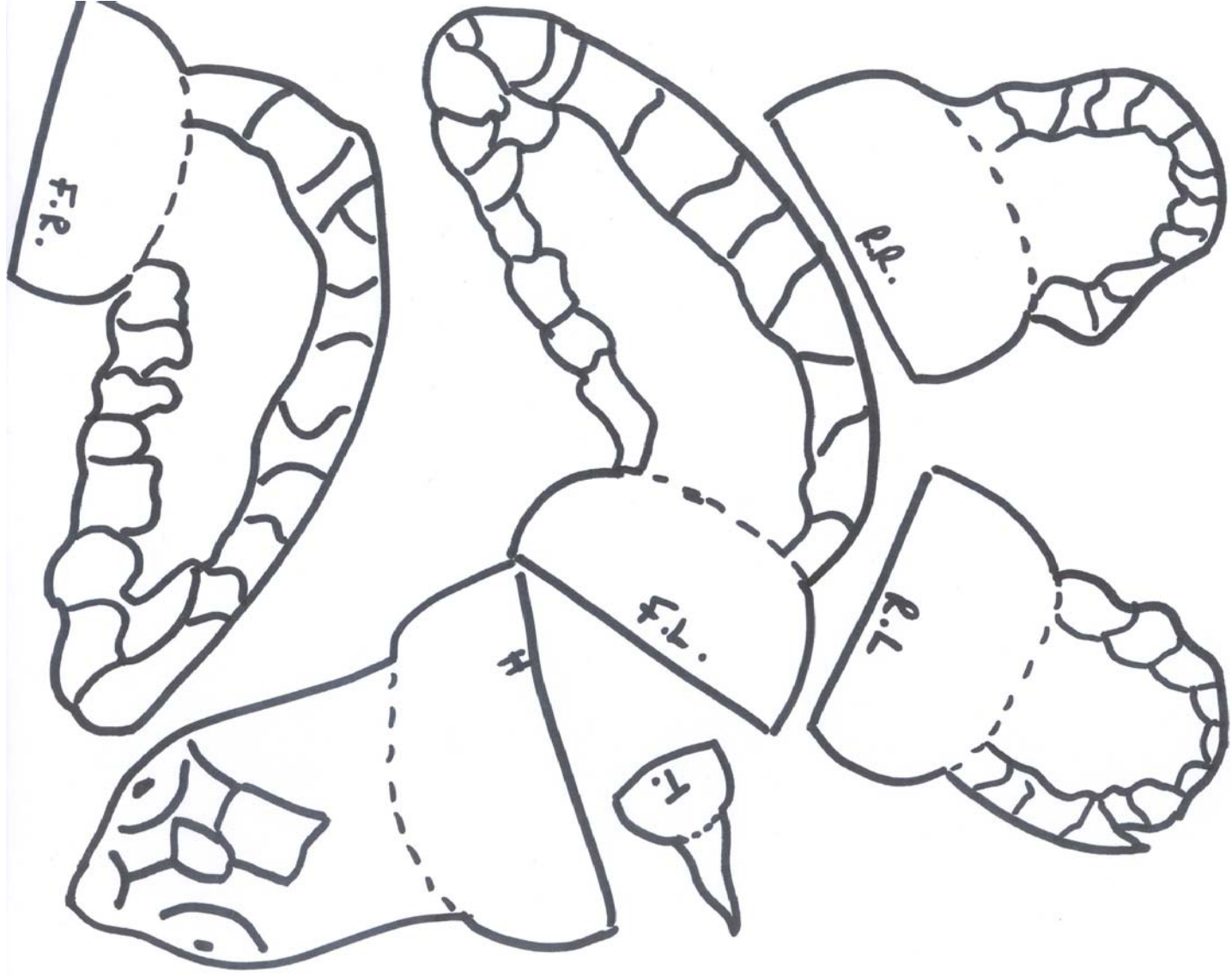
1. Choose a turtle type to color, either a sea turtle or a box turtle.
2. Take a paper plate and the turtle sheet.
3. Color the turtle sheet and plate bottom to resemble a real turtle and its shell.
4. Carefully cut out the turtle parts. One head (H), a left front leg (LF), a right front leg (RF), a left rear leg (LR), a right rear leg (RR) and a tail (T).
5. Place the area of the turtle cut out pieces behind the dotted line under the paper plate. Using glue or a stapler, attach the turtle cut out pieces in their appropriate places.

Extension:

- Use brads to attach head, legs and tail so they can move.
- Use an additional plate for the plastron and stuff the turtle.
- Use cloth and transfer the turtle designs to the cloth and make a turtle pillow.

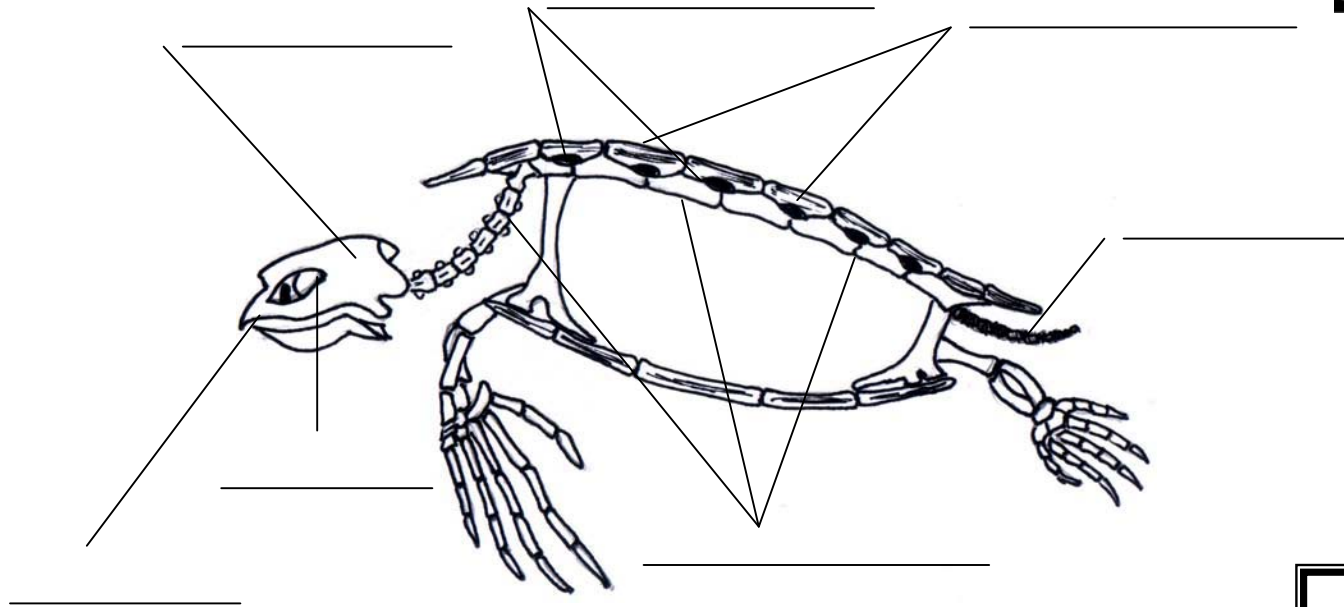


Base Tulle (2)



Sea Turtle. ©

“No Bones About It” – Skeleton Activity



Word Bank

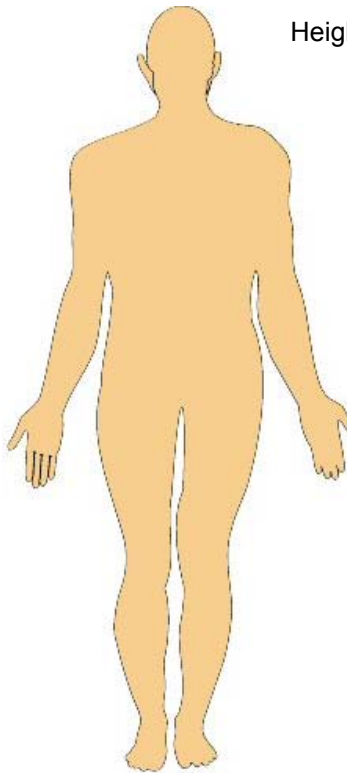
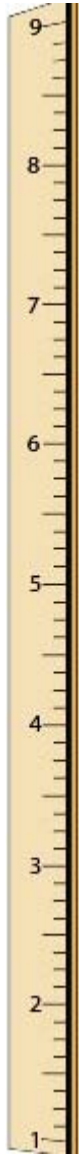
Skull
Tail
Ribs
Bone plate
Beak
Vertebra (Backbones)
Eye socket

1. Fill in the labels on the skeletal diagram using terms from the list.
2. What features look similar to a human skeleton?
3. What evidence do you see in the skeletal diagram that sea turtles evolved from land reptiles?

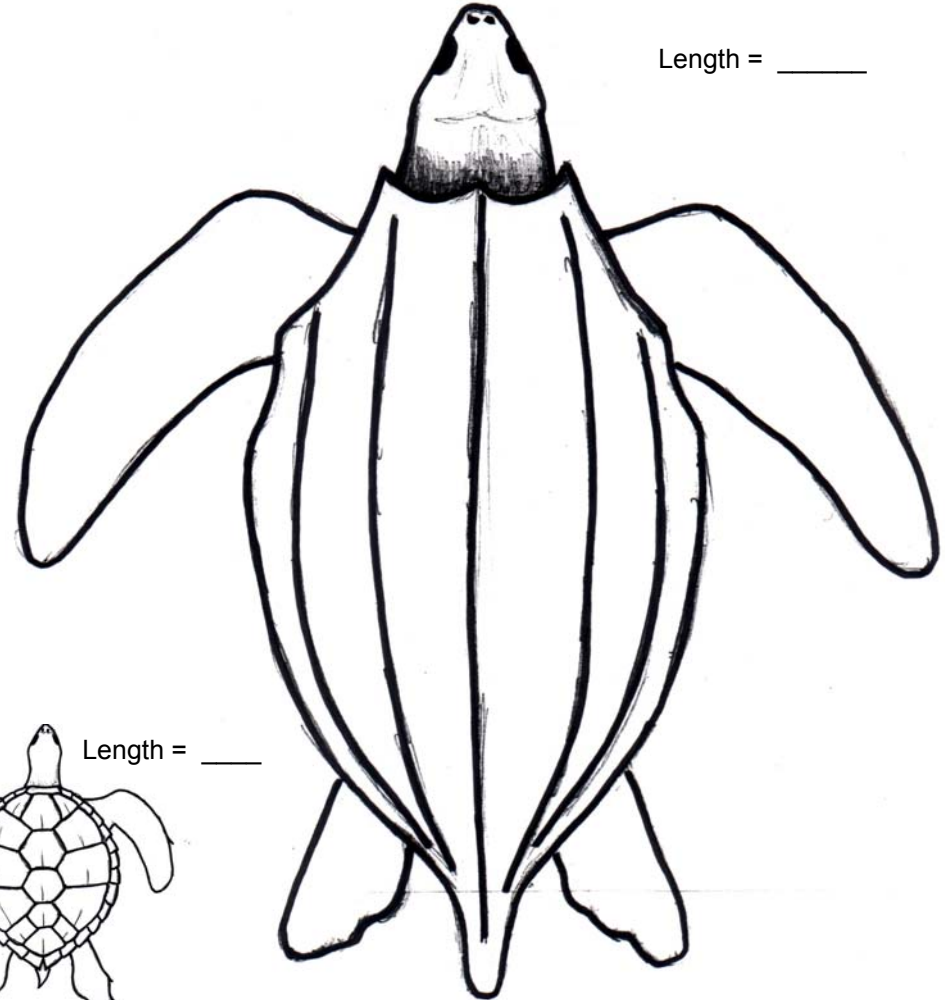
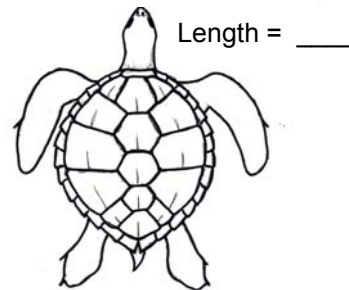
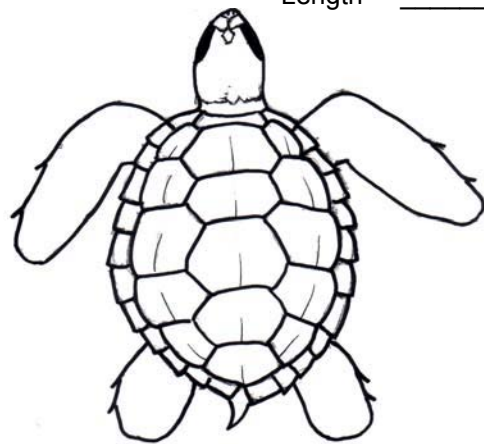
How do sea turtles measure up?



You are a junior sea turtle biologist in the field. Can you identify the species of sea turtles you see just by their size? Use the scale, **1 inch = 18 inches**, to estimate the turtles' sizes. Use the size statistics on your turtle ID cards to determine the identity of each species. Measure turtles from tip of nose to tail then convert from the scale length to actual length. This will give you the actual total length (TL) measurement.



Height = 72 inches



Name: _____

Human

Scale: 1 inch = 1.5 feet

Conservation, How to Help

Become Aware – Get Informed – Use Influence - and Be Responsible.

We must be responsible for our actions and understand that we share the oceans and the Earth with many different living things. Once we are aware, then we can become informed. Learn what is endangering and harming the environment and the organisms living around us. Use what you have learned to influence others by making your voice heard. Lastly, be responsible. Pick up after yourself - dispose of waste correctly. Make environmental choices that are wise and beneficial, not cheap and convenient. Small changes can make a big difference in the sea turtles' journey for survival.

What You Can Do to Help Sea Turtles

There are a few simple things you can do with your classroom to help sea turtles:

1. Write an essay for the Newport Aquarium on why sea turtles are important to us and why we should protect them. Selected essays will be placed on display for Aquarium visitors to read.
2. Officially adopt a tagged turtle on www.seaturtle.org to have your classroom's name on the web page. Money from this program is used to support sea turtle conservation.
3. Stay informed about issues that affect turtles such as development of natural lands, particularly wetlands. Take action on the issues by writing letters to the appropriate authorities and elected officials.
4. Many families travel to the beaches for summer vacation. Before summer break, have students compile a list of what they can do while at the beach to help sea turtles and other ocean wildlife.
5. Reduce your use of plastic by reusing bags and containers. Recycle and pick up trash. Turtles may mistake plastic bags, styrofoam and trash floating in the water as food, which can cause serious health problems and in some cases death.
6. Celebrate events without the use of helium balloon releases. Like plastic trash, balloons end up in the ocean, especially when released near the coast. Sea turtles mistakenly eat the balloons and die.
7. Discuss biodegradable cleaners or distribute recipes for creating environmentally safe cleaners for the home. Household chemicals that are not biodegradable contribute to the pollution of our waterways and can kill plants and animals.
8. Support organizations that are working to save turtles or their habitats. We have listed a few good organizations on this page but there are many others.

Organizations Helping Sea Turtles

Newport Aquarium

<http://www.newportaquarium.com>

Seaturtle.org

<http://www.seaturtle.org>

Karen Beasley Sea Turtle Rescue and Rehabilitation Center
<http://www.seaturtlehospital.org>

Bald Head Island Conservancy

<http://www.bhic.org>

Marine Turtle Research Group

<http://www.seaturtle.org/mtrg/>

North Carolina Wildlife Resources Commission

<http://www.ncwildlife.org>

Answer Guide

1. A. 50
B. 50
2. A. 27.5 ; 81.5
B. Eggs will experience more temperature fluctuation than eggs laid in regular beach sand.
C. 100
D. 0
3. A. 24 ; 75.2
B. Eggs may rot or drown because of the excess rains and high tides. The cold temperatures will kill the developing embryos.
C. 0
D. 0
4. A. 98.6
B. Eggs will dehydrate from exposure to the sun and will not develop at the higher temperatures.