



## *Prepare to Hatch*

*Created by the NC Aquarium at Fort Fisher Education Section*

### Essential Question:

How can we help sea turtle hatchlings reach the ocean safely?

### Lesson Overview:

Students will design methods to protect sea turtle hatchlings and help them reach the ocean, using the “Ask-Imagine-Plan-Create-Improve” design process . Students will then use math skills to determine how much edging and sand is needed to protect nests as they hatch.

### Learning Objectives:

Students will learn how sea turtle groups prepare a nest to hatch. Students will be able to:

- Explain how researchers help sea turtle hatchlings to the ocean.
- Calculate the perimeter of a nest and runway.
- Calculate the area of sand removed for turtle hatchlings.

### North Carolina Standards:

#### Second Grade:

##### *Science:*

- **2.L.1** Understand animal life cycles.
  - **2.L.1.1** Summarize the life cycle of animals:
    - Birth
    - Developing into an adult
    - Reproducing
    - Aging and death

##### *Social Studies:*

- **2.G.2** Understand the effects of humans interacting with their environment.
  - **2.G.2.2** Explain how people positively and negatively affect the environment.

#### Third Grade:

##### *Math:*

- **3.MD.C.7** Relate area to the operations of multiplication and addition.
  - **3.MD.C.7.b** Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
- **3.MD.D.8** Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.



## North Carolina Aquariums Education Section

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### Fourth Grade:

#### *Math:*

- **4.MD.A.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
- **4.MD.A.3** Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

#### *Science:*

- **4.L.1** Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats.
  - **4.L.1.2** Explain how animals meet their needs by using behaviors in response to information received from the environment.

### Fifth Grade:

#### *Science:*

- **5.L.2** Understand the interdependence of plants and animals with their ecosystem.
  - **5.L.2.3** Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.

### Engineering Connection:

- **EG K-2 D 1** Use the engineering design process of Ask-Imagine-Plan-Create-Improve.
  - **EG K-2 D 1.1** Design product to solve a stated problem.
- **EG K-2 P 1** Use a systematic approach to solve several different types of problems.
  - **EG K-2 P 1.1** Identify problems that need to be solved.
- **EG K-2 P 2** Use critical thinking to suggest solutions to problems.
  - **EG K-2 P 2.3** Solve a problem that requires a picture to be drawn.
- **EG 3-5 D 1** Use the engineering design process of Ask-Imagine-Plan-Create-Improve.
  - **EG 3-5 D 1.2** Design product to solve a stated problem.
  - **EG 3-5 D 1.3** Contrast multiple designs for a specific challenge.
- **EG 3-5 P 1** Use a systematic approach to solve several different types of problems.
  - **EG 3-5 P 1.2** Identify several problems that need to be solved in daily life.

### **Time Frame:**

Preparation: 5 minutes

Activity: 40 minutes

### **Materials:**

- Sea turtle nest worksheets
- Markers
- Nest preparation worksheets
- Pencils



### Supplemental Background Information for Teachers:

A sea turtle's life begins on the beach. Sea turtles nest, or lay eggs, throughout the summer. Nesting season usually lasts from May to September, reaching peak activity in late June and July. The female loggerhead comes ashore at night and drags her body far up the beach above the high tide line. Here she digs a hole about 18" deep with her rear flippers and begins laying her eggs. The nesting process is a complex and vulnerable time for a mother sea turtle. She carefully selects a nest site and may sometimes be frightened away by bright lights and beach activity. Predators such as foxes, raccoons, and ghost crabs abound on the beach and may devour her eggs even as they are deposited into the nest.

On average, 120 golf ball-sized, tough, leathery eggs are laid in the nest. The turtle covers her eggs completely with sand and returns to the sea. The average female may nest three to five times during the summer months at roughly two-week intervals. Since most nesting occurs at night, scientists rely on using trails and tracks to identify where a nest has been laid and by what species. A track is an impression of a single flipper. Long lines of tracks showing an animal's movement and behavior are called trails. Scientists measure the width of a sea turtle's track, called the straddle, as well as note the crawl pattern of each species to tell what kind of turtle laid a nest.

Unfortunately, sea turtles are threatened by people and their activities in coastal areas. What were once long stretches of open beach where turtles could nest are now developed areas. Bright lights discourage females from coming ashore at night, and confuse young turtles after they leave the nest. Debris and other ocean pollution also create life-threatening problems for these ancient reptiles. Although sea turtles have always fascinated people, we still know little about their migrations, nesting habits, and life spans.

If you see a sea turtle nesting or hatching:

- Enjoy this event from a distance. Many turtles scare easily and may stop the nesting process and return to the sea, which will stop the development of the eggs.
- Take note of the location and report it to the local police department. They will contact the area's sea turtle coordinator.
- Please do not take flash photos of her! Scientists use infrared cameras to get photos so they do not disrupt her night vision.
- Do not put your hands on or near the turtle. Any distractions may frighten and disorient her, causing her to return to the ocean before completely covering and camouflaging her nest.
- Also please refrain from giving out the location of a nesting turtle to anyone other than the authorities.
- If you see a nest hatching, leave them alone. You can report it to the local police department. They will contact the area's sea turtle coordinator to assist in the hatching.

About 60 days after the nest is laid, it will be time to hatch. When a sea turtle nest is ready to hatch, the sand above the nest will drop a few inches. This is due to the eggs hatching within the nest. This drop in the sand alerts the nest watchers to watch for the nest to hatch



within the next few nights. The nest parents will begin preparing the area for the turtle hatchlings. This process varies from group to group. Many groups have begun using yard edging to help the hatchlings to find their way to the oceans. The edging will be laid from the water's edge, up and around the back of the nest, and back to the water's edge. Many groups will then dig a trench within the edging from the nest to the water. This helps to funnel the turtles down to the water.

When sea turtles hatch from a nest, it is called a boil. This is because the turtles come out of the sand so quickly, and in such a large number, it looks like the sand is boiling. Then the hatchlings race for the water. Some groups use a flashlight to guide the hatchlings to the ocean. Sea turtles are attracted to the light of the moon and the flashlight is used to mimic the moon light on the water.

Seventy two hours after the nest hatches, it will be excavated. Sometimes there are stragglers. The scientists will collect the following data:

- How many eggs hatched.
- How many eggs did not hatch.
- How many turtles were stuck in the nest.
- How many turtles pipped (began to hatch but died in the egg).
- How many turtles were dead.

This data will be used in other lessons.

### Preparation:

Print one of each worksheet per student.

### Procedure:

1. Review the nesting process with your students. We recommend the lessons "*You Make the Crawl*" or "*Nest Observation and Relocation*".
2. Inform the students that they are a group of researchers that have been monitoring a set of sea turtle nests. Their nests have all dropped and it is time to prepare the nests for hatching.
3. Each student, or group of students, will be given a sea turtle nest worksheet.
4. As sea turtle researchers, each student is responsible for preparing the nest for hatching. They must come up with a way to help protect the turtles on their way to the ocean. They cannot interfere with the turtles (such as picking them up to put them in the ocean) but they can design a way to help guide the hatchlings to the water.
5. Each student should use their sea turtle nest worksheet to create a way to help the turtles make their way to the ocean. The students should use the "Ask-Imagine-Plan-Create-Improve" design process.
  - a. Ask: What is the problem? (We need to help the turtles get to the ocean without touching them).
  - b. Imagine: What are some ways we can do that?



## North Carolina Aquariums Education Section

- c. Plan: Draw the diagram of your process on the worksheet. Once the students are finished, have them share their ideas with the class.
  - d. Create: If the class has time, you can build some of their ideas using household objects and a tray of sand. Use the sand recipe from the “Nest Observation and Relocation” lesson. Otherwise just show them images of how nests are often prepared (with the yard edging and a trench).
  - e. Improve: As a class, brainstorm some ways to improve on their designs or the designs currently being used in the field.
6. Once you have completed the design process, pass out the nest preparation worksheet and review perimeter and area.
  7. Have the students complete the nest preparation worksheet.

### Extensions:

1. Watch our video on sea turtle nest preparation and hatching.
2. Have the students draw their own nests and yard edging. Once their drawings are complete, have them create perimeter and area problems for one another.


### Resources:

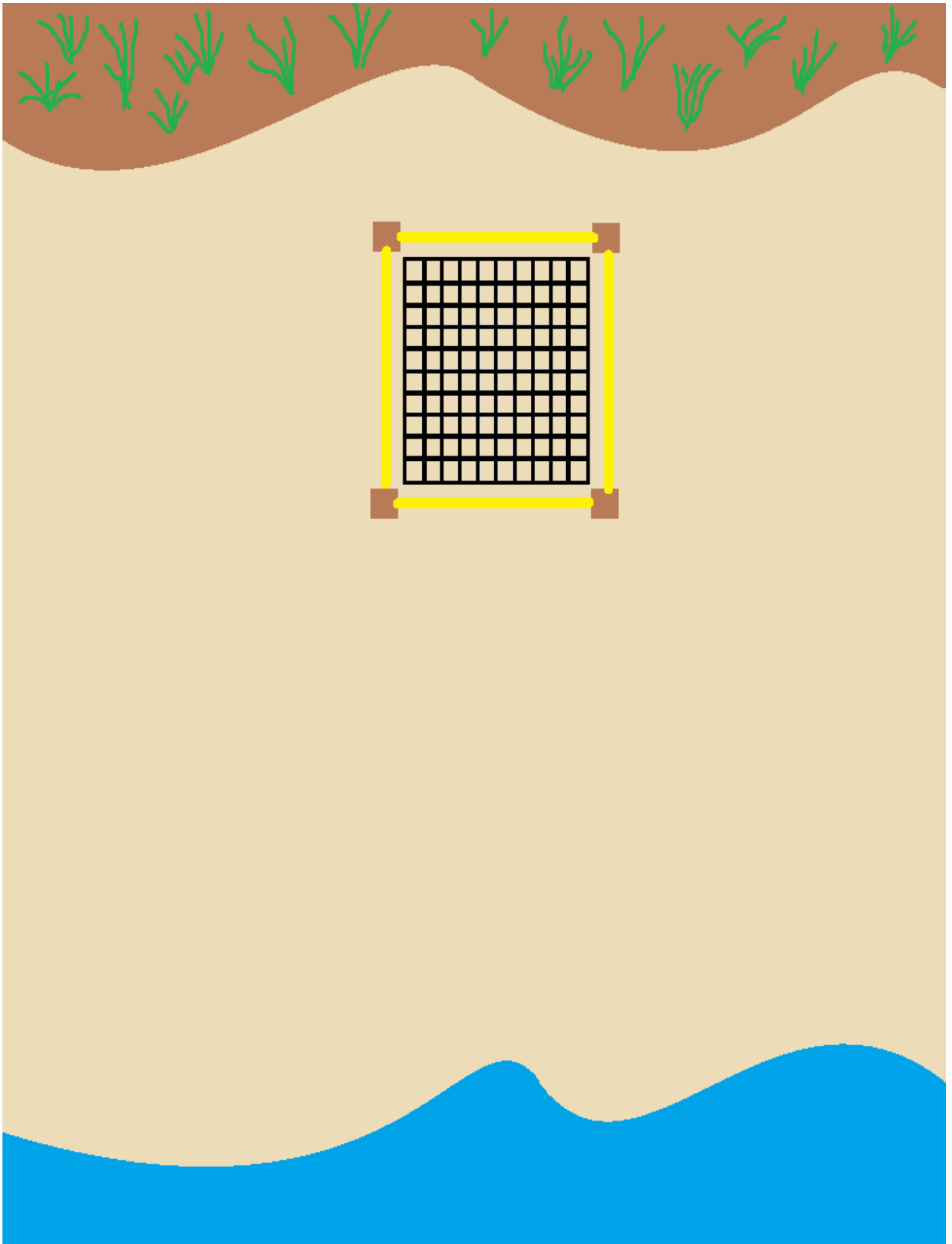
For more information on the design process check out this resource from North Carolina State University:

<https://khsstem.pbworks.com/w/file/fetch/51523487/Engineering%20Design%20Process.pdf>

This resource is from the North Carolina State Standards website:

<http://www.ncpublicschools.org/docs/academicservices/conference/2013/presentations/76.pdf>

Engineering Design Process Elementary School	Graphic
Ask	
Imagine	
Plan	
Create	
Improve as needed at any step	

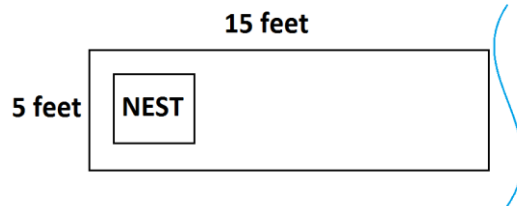




**Nest Preparation Worksheet**

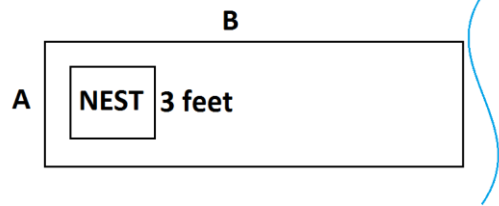
Sea turtle nests are getting ready to hatch. We need to find out how much yard edging is needed to surround the nests.

Use this nest to answer the following questions:



1. Calculate the perimeter of the yard edging surrounding this nest. \_\_\_\_\_
2. What is the area of sand surrounded by the yard edging? \_\_\_\_\_
3. The cover over the nest is four feet on each side. What is the perimeter? \_\_\_\_\_
4. What is the area underneath the cover? \_\_\_\_\_

Use this nest to answer the following questions.



5. What is the perimeter of the nest cover? \_\_\_\_\_ What is the area? \_\_\_\_\_
6. If the yard edging has to be one foot away from the nest, what is the width of side A?  
\_\_\_\_\_
7. If the nest is 10 feet from the water, what must the length of the yard edging be to extend one foot past the nest (Side B)? \_\_\_\_\_
8. What is the perimeter of the yard edging based on your calculations of the length and width? \_\_\_\_\_
9. What is the area of the sand within the yard edging? \_\_\_\_\_
10. What is the area of sand within the yard edging but not covered by the nest cover?  
\_\_\_\_\_