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| **Multiplication and Division** |
| **Enrichment Investigations #1**  |
| Common Core State Standard(s):3.OA.6 3.OA.83.OA.9 | Standard(s) for Mathematical Practice:1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the mathematical thinking of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in

 repeated reasoning  |
| Materials Needed:* Blackline Masters:
	+ *Congratulations*
* Computer with Internet Access
* Math notebook, paper, and/or graph paper
* Pencil/eraser
 |
| Instructions: ***For this unit of enrichment investigations, they need to be done in order. The first one is an introduction to the remaining investigations. There is no product at the end of this investigation. Students are just collecting information as background knowledge for the remaining activities.*** 1. Each set of partners or teams will gather all needed materials.
2. Each set of partners or teams will read and discuss the *“Congratulations”* scenario.
3. Each set of partners or teams will explore the given websites
 |
| Sources: * <http://www.nps.gov/caha/photosmultimedia/webcams.htm>
* [www.youtube.com/watch?v=FdHvtr8vKEQ](http://www.youtube.com/watch?v=FdHvtr8vKEQ)
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![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\KD3OA3MY\MC900212217[1].wmf]()![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\KD3OA3MY\MC900212217[1].wmf]()“Congratulations!”

You are part of a famous treasure hunting team. You and your team just received word from the President of the United States that you will be flying to Cape Hatteras as part of a top secret mission to see if there really is treasure hidden under the Cape Hatteras Lighthouse. Documents were recently discovered in a hidden underwater cove about 30 miles off the coast of Beaufort, North Carolina, indicating that Blackbeard stashed a stolen bounty of jewels and coins inside the lighthouse. **Your mission: Find the treasure!** If you are successful and the treasure can be returned to its rightful owners, the president has authorized the United States Treasury Department to pay you and your team one million dollars!!!

The only problem is…. You are not the only team searching for the treasure! The great, great, great, great, great, great nephew of Blackbeard himself is also looking for this loot. He believes he is the rightful owner of this bounty and intends on finding it and returning it to HIS family. Rumor has it that he and his gang arrived on Hatteras Island last week, and they have been seen on the grounds of the lighthouse after the sun goes down. To make matters worse, the President thinks they may have intercepted a message stating your team was coming, but he’s not 100% sure…

In order to be successful, you must not only find the treasure, but you must be able to outsmart this gang of outlaws just to survive.... Because of national security, the President cannot share all of the information from the documents that were found in the underwater cove, but he felt it was important to point out the following: **First**, the documents reported several different locations in and around the lighthouse may have been home at some point in time to the treasure. **Second**, some families have lived in this area for generations and may have more knowledge about the treasure than they would like to share with your team. **Lastly**, it is still hurricane season! Please keep one eye on the sky at all times. You will only be able to find the treasure if you are still alive!

![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\0CVEZFZ1\MC900237202[1].wmf]()To start your mission, the President has requested that you and your team explore the following website to familiarize yourself with the area. This website offers a live webcam of the lighthouse grounds, as well as a live webcam from atop the Cape Hatteras Lighthouse itself. He has also included a YouTube video from a family that has recently toured the lighthouse. This will allow your team to better understand how the lighthouse looks on the inside. Remember, Blackbeard’s family has been in the area for at least a week and has been seen on the grounds of the lighthouse. They already know much more information than you and your team. You must plan properly if you are to survive… I mean succeed… GOOD LUCK!

1. <http://www.nps.gov/caha/photosmultimedia/webcams.htm>
2. [www.youtube.com/watch?v=FdHvtr8vKEQ](http://www.youtube.com/watch?v=FdHvtr8vKEQ)

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| **Multiplication and Division** |
| **Enrichment Investigations #2** |
| Common Core State Standard(s):3.OA.63.OA.83.OA.9 | Standard(s) for Mathematical Practice:1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the mathematical thinking of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
 |
| Materials Needed:* Blackline Masters:
	+ *Getting Started*
* Math notebook, paper, and/or graph paper
* Pencil/eraser
* OPTIONAL: calculator
 |
| Instructions: 1. Each set of partners or teams will gather all needed materials.
2. Each set of partners or teams will read and discuss the *“Getting Started”* scenario.
3. Each set of partners or teams will answer each question related to the *“Getting Started”* scenario.
4. Teams will meet, share, and discuss how they solved each problem.
 |
| Sources: * <http://www.nps.gov/caha/historyculture/constructionandmaintenancefaqs.htm>

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***“Getting Started!”***

Your team has finally arrived safely on Hatteras Island, North Carolina. Since it is raining outside, you first decide to visit the public library to research the history of the lighthouse. You’re hoping that you and your team can learn more about how the lighthouse was built and if any secret hiding spots were built within the lighthouse. You are greeted by a friendly older woman at the front desk. When you ask her where you can find the history section of the library, she smiles and states the history section has been the **most popular** part of the library lately. She tells you that other visitors have spent the last two days researching the Cape Hatteras Lighthouse, too. You race to the history section hoping to get a glimpse of these “visitors,” but arrive only to find empty seats and several books about the lighthouse sitting on the table. Frustrated that your team just missed Blackbeard’s family, you settle in for several hours of research. As the rain slows to a drizzle, you grab your notes in one hand and your umbrella in the other and head for the lighthouse. *Will today be the day you solve the mystery*?



**Note #1:** The lighthouse was built using stones that were shipped in from Virginia. Estimates say that it took as many as 1.2 million stones to create the entire lighthouse. The base of the lighthouse is made of brick and is almost 22 feet tall. Each brick measures 2 ft. high.

1. How many rows of big bricks did the base contain? Write an equation(s) to explain how you know mathematically.
2. Suddenly, you count the number of rows on your lighthouse drawing in your notes, and you notice there are 12 rows. Could the treasure be hidden in the twelfth row? You race to the base, but notice there are 8 rows of big bricks and some rows of smaller bricks that are only 1 foot tall. How many rows of smaller bricks are there? How many rows of bricks are actually on the base of the Cape Hatteras Lighthouse? Explain how you know mathematically.

 

**Note #2:** It takes 150 gallons of paint to

paint the entire lighthouse. Although several painters were thought to have worked on the lighthouse, your notes show otherwise. Your research shows that one man, Robert S., was responsible for painting the Cape Hatteras Lighthouse.

1. If Robert S. used 10 gallons of paint a day, how many days did it take him to paint the lighthouse? Write an equation(s) to explain how you know mathematically.
2. However, you notice that Robert. S. was paid for 8 hours a day for **17** days. Could he have secretly worked for Blackbeard and hidden the treasure in a secret pocket of the outside wall? What was he doing on those extra days if he wasn’t painting? You double check your notes with a teammate’s and realize he was paid for painting the window frames, too. If he could paint 7 window frames in one hour, how many window frames did Robert S. paint altogether? Explain how you know mathematically.

 

**Note #3:** In 1879, the lighthouse was struck by lightning. The brick work on the outside of the lighthouse was cracked. (Yet another perfect opportunity for someone to disguise himself as a worker and hide the treasure!) A team of workers helped to fix the cracks in the brick work and to make the lighthouse stronger buy placing steel rods inside the structure.

1. If the structure was almost 200 feet tall and each piece of steel rod was 8 feet, how many pieces of steel rod did the workers use? Write an equation(s) to explain how you know mathematically.
2. When you checked your notes, it stated that only 20 steel rods were used. What happened to the other rods? Could they have been used to create a secret hiding place or vault? Just then a park ranger from the lighthouse notices the puzzled look on your face.

She mentions that some of the extra rods were used to strengthen the doorway frames. If each door way frame measured 8 feet, how many doorways were strengthened using the extra steel? Explain how you know mathematically.

 

**Note #4:** There are 268 steps in the spiral staircase inside the lighthouse. There are exactly 8 inches between each step.

1. How many inches are there between all of the steps in the lighthouse? Write an equation(s) to explain how you know mathematically.
2. When you are about halfway up the spiral staircase you trip and fall. As you look down you realize why you fell. Instead of there being 8 inches between steps 134 and 135, there are only 6 inches. Did someone change the location of the stair on purpose? Is there a secret drawer in the stair making its height smaller? You peek under the stair and find that the stair has been repaired. When you look up, you notice that starting with stair 134, every other 4th stair has been repaired. Write down the number of each stair that has been repaired. Explain how you know mathematically.

**Keep Reading!!**

As you and your team reach the top of the lighthouse and step out on to the observation deck, you are greeted by a ray of sunshine. The first glimpses of sun all day! You look out over the ocean when it suddenly hits you. The President said Blackbeard’s nephew and his gang have been on the grounds of the lighthouse **AFTER** the sun goes down. You are beginning to understand what his family has already discovered…. If there is a secret treasure hidden here, it isn’t hidden **INSIDE** the lighthouse… You’ll have to come up with plan B for tomorrow! GOOD LUCK!

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| **Unit III: Multiplication and Division** |
| **Enrichment Investigation #3** |
| Common Core State Standard(s):3.OA.53.OA.63.OA.8 | Standard(s) for Mathematical Practice:1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the mathematical thinking of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in

 repeated reasoning  |
| Materials Needed:* Blackline Masters:
	+ *Plan B…*
* Math notebook or paper
* Pencil/eraser
* OPTIONAL: calculator
 |
| Instructions:1. Each set of partners or teams will gather all needed materials.
2. Each set of partners or teams will read and discuss the *“Plan B…”* scenario.
3. Each set of partners or teams will answer each question related to the *“Plan B…”* scenario.
4. Teams will meet, share, and discuss how they solved each problem.

  |
| Sources:* <http://www.nps.gov/caha/naturescience/seaturtles.htm>
 |

***“Plan B…”***

As the sun comes up over the Atlantic Ocean, your teammate comes running out of the beach house waving her notebook around. “I’ve got it! I’ve got it!” She screams. Without any warning, a symbol from her notebook is shoved in your face. You don’t really understand what she is showing you, but it looks like a symbol of a turtle surrounded by rocks with an arrow pointing to the east?? You’ve never seen it before, but she explains how she copied it from a strange looking brick on the base of the Cape Hatteras Lighthouse yesterday. Still not understanding how this connects to the possible treasure, she explains there are seven species of sea turtles in the world and five of them spend part of the year living at the Cape Hatteras National Seashore. She thinks the **treasure may be hidden in** one of their nesting areas since these areas are not allowed to be disturbed by people. “It is against the law to interfere with the sea turtles’ nests! This is the perfect place to hide the treasure!” You have to hand it to her – it does make perfect sense! If she is right, the treasure is hiding within 100 yards of where you are sitting right now!

You jump out of your chair and flag down the passing beach patrol. You ask them about the best time to see the nesting turtles, and you and your team are met with a stern look and a lecture about not disturbing the sea turtles at this time of the year. This is going to be harder than I thought, you think to yourself. We really do need a plan B!

Suddenly, the beach patrol officer commands you to freeze… “Don’t step back, there is a sea turtle walking right behind you.” The officer checks the identification tag on the turtle and realizes it is the same turtle he spotted yesterday afternoon near the original site of the Cape Hatteras Lighthouse. He tells you he is glad she has traveled back to the protected nesting grounds because he saw her on the road about two miles away when he was on patrol last night.

As the officer continues to talk, you notice a **shiny piece of metal** on her foot. It appears to be a gold ring or a piece of metal. Could this be a piece of the treasure? Did he say he saw her near the original site of the lighthouse? Two good clues you think to yourself. Just then the officer says, “I tell you what, you look like nice kids. If you can answer the following five questions about sea turtles correctly, I’ll let you visit with them for a few minutes. But you must promise me you will not touch the turtles or their eggs.” You and your team can’t believe your luck. Although you really want to get to the original site of the lighthouse and explore the area for clues, your team agrees to the officer’s idea.

Using your math notebooks, work on the following questions together. Remember, you can’t visit with the sea turtles and get a closer look at that gold ring unless you answer the questions correctly. GOOD LUCK!

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![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\3O5M3NPN\MC900358143[1].wmf]()1. Sea turtles swim out of the ocean to make a nest on the beach. This process can take almost three hours for her to find the perfect spot in the sand, make a nest, and lay her eggs before returning to the ocean. If a park ranger checks on the turtle every 12 minutes, how many times will the turtle be checked on before she heads back to the ocean? Write an equation(s) to help explain your mathematical thinking.

2.Sea turtles will nest with their eggs during the night. Each sea turtle can lay about 80 eggs in her nest. If there are 20 turtles on the beach this nesting season, how many eggs will be laid? One of your teammates says 1,600 eggs will be laid because 20 X 20 = 400 and there are four sets of 20 in one set of 80, so 400 X 4 = 1,600. Another teammate says there will be 1,600 eggs laid because the basic fact of 8 X 2 = 16 and then you add two zeros, so 16 plus two zeros is 1,600. Who is correct? Explain how you know mathematically.

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3.Imagine that you solved the problem in a completely different way than either of your teammates. Explain how you solved the problem mathematically.

4.After baby turtles hatch from their eggs, they are called hatchlings. The hatchlings that find their way to the ocean water will swim 36 hours to find the seaweed beds and safety to help them survive. If a hatchling stops to rest after swimming every 20 minutes, how many times will the hatchling stop on its trip to the seaweed bed? Explain how you know mathematically.

![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\3O5M3NPN\MC900358143[1].wmf]()

5. Unfortunately, only one in every one thousand hatchlings will survive the trip to the sea weed beds. If there are 3,812 hatchlings born on the coast of North Carolina, 4,219 hatchlings born on the coast of South Carolina, and 5,745 hatchlings born on the coast of Florida this summer, about how many will actually survive and become adult turtles? Explain how you know mathematically.

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| **Multiplication and Division** |
| **Enrichment Investigation #4** |
| Common Core State Standard(s):3.OA.63.OA.83.OA.9 | Standard(s) for Mathematical Practice:1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the mathematical thinking of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in

 repeated reasoning  |
| Materials Needed:* Blackline Masters:
	+ *The Race is On…*
* Math notebook or paper
* Pencil/eraser
* OPTIONAL: calculator
 |
| Instructions:* 1. Each set of partners or teams will gather all needed materials.
	2. Each set of partners or teams will read and discuss the *“The Race is* *On…”* scenario (handout attached). Each set of partners or teams will answer each question related to *“The Race is On…”*
	3. Teams will meet, share, and discuss how they solved each problem.
 |
| Sources:* <http://www.lighthousefriends.com/light.asp?ID=356>
 |

***“The Race is On…”***

As the beach patrol officer congratulates your team for answering your questions correctly, your team anxiously awaits the opportunity to get a closer look at the golden ring you spotted earlier on the sea turtle’s foot. The patrol officer leads you through a thick clump of sea grass and down a path about 20 feet from the water’s edge. Before he can point out the different nesting sites, a man dressed in brown pants, a brown shirt, and wearing a brown hat jets out of the nesting area and makes a run for his bike. The officer takes off after him, but reminds your team of the deal you made. “Remember, you promised me that you wouldn’t touch the turtles or their eggs. I’m counting on you to honor your word.” And with that, he was off in a flash.

We were stunned. Who was this man dressed in brown? Why was he in the nesting area without permission? Fear flashed across my teammate’s face. “Do you think he is Blackbeard’s nephew?” Nobody knew the answer to his question, but we knew it was more important than ever to locate the sea turtle we had seen before. After several minutes of careful searching, you happen to catch a glimmer of **gold** out of the corner of your eye. Could it be the turtle your team has been looking for?

You spot the glimmer again and notice a turtle moving behind you slowly towards the sea grass. You know you must not touch the turtle, but wonder how you are going to get a good look at that gold ring? You run ahead of the turtle and crouch down in the middle of the clump of swaying grass making sure to stay completely still. As the turtle approaches, **you see it**! It is clearly a *gold ring with a diamond gemstone* on it. This has got to be your best clue yet that there really is treasure on this island!

You jump out of your hiding spot and pull out a map. Your team knows there is only one thing standing between you and returning the treasure to its rightful owner… or at least you think there is… the man in brown. Whatever you saw, he saw too, and he is one step ahead of you. You must make it to the original site of the lighthouse first! Luckily, it is only ½ mile away. Just then, a large gust of wind takes the map from your hand and blows it towards the road. In all the excitement, you hadn’t kept one eye on the weather like you must always do during hurricane season in North Carolina. You are shocked when you look up and see the **dark clouds swirling overhead**…

 

Panic sets in! There is no time to think about treasure or the man in brown or getting to the original site of the lighthouse. There is barely enough time for you and your team to get back to your beach house and hide from the storm’s wrath. Taking one last look before you close the storm shutters, you can’t believe your eyes. There, amidst all the chaos, was a cloud shaped like a turtle surrounded by rocks with an arrow pointing towards the site of the original Cape Hatteras lighthouse! The power flickered on and off several times before finally going out for good. Luckily, you pulled out your iPhone and was able to pull up the website for the National Weather Agency. As a team, use the information from the NWA to follow the track of the storm. GOOD LUCK!



* + 1. The center of a severe thunderstorm is located 48 miles west of your beach house. If it is traveling east at 12 miles per hour, how long will it take for the center of the storm to be over your beach house? Write an equation(s) to explain your mathematical thinking.
		2. Winds from this severe thunderstorm are currently gusting at 59 miles per hour. Every 3 miles that the storm travels, data shows that the wind gusts are increasing by 2 miles per hour. How strong will the wind be gusting when the storm reaches your beach house if this pattern continues? ? Explain how you know mathematically.
1. ![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\3O5M3NPN\MC900440407[1].png]()The rain is coming down fast and furious at a rate of 4.2 inches per hour. About how much rain will fall when the center of the storm is 12 miles from your beach house? ? Explain how you know mathematically.
2. A gust of air sneaks in under your front door, and you notice how much the temperature has cooled. You remember hearing the temperature was 98 degrees on the beach patrol officer’s radio when you were standing down on the beach. Now the thermometer hanging in your kitchen window is only reading 70 degrees. If the center of the storm is directly over your beach house, how many degrees has the temperature cooled each hour since the beginning of the storm? \*Remember, it took the storm 4 hours to travel from where it became a storm to your beach house! Explain how you know mathematically.
3. As the storm finally passes, your team sneaks outside to continue your journey. The only problem is that the wind has blown sand everywhere. You can no longer tell where the path is or where the turtles’ nests are. You remember each nest being about 3 feet away from each other. You also remember that there were 20 nests all lined up in a straight row about 20 feet from the water’s edge. You and your team decide to jump every three feet on the beach hoping not to land on a turtle’s nest. After your team gets past the nesting grounds, how many feet must your team still travel in order to reach the original site of the Cape Hatteras Lighthouse? (Hint: There are 5,280 feet in one mile, and your team is only ½ mile from the site.) Explain how you know mathematically.

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| **Multiplication and Division** |
| **Enrichment Investigation #5** |
| Common Core State Standard(s):3.OA.53.OA.63.OA.83.OA.9 | Standard(s) for Mathematical Practice:1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the mathematical thinking of others.
4. Model with mathematics
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in

 repeated reasoning  |
| Materials Needed:* Blackline Masters:
	+ *Captain Unaka Jennette*
* Paper or writing notebook
* Math notebook
* Pencil/eraser
* OPTIONAL: calculator
 |
| Instructions:1. Each set of partners or teams will gather all needed materials.
2. Each set of partners or teams will read and discuss the “Captain Unaka Jennette…” scenario.
3. Each set of partners or teams will write the ending to this story.
4. Each set of partners of teams will create and answer 10 math problems that relate to the end of their story. \*Problems must include: multiplication problems, division problems, equations, and multi-step word problems.
5. Each team will share the ending of their story with the other teams. The teacher may choose to have teams present their problems for the other teams to solve or just share the problems and solutions.
 |
| Sources:* <http://www.lighthousefriends.com/light.asp?ID=356>
 |

***“Captain Unaka Jennette”***

Under the cover of darkness, your team arrives at the original site of the Cape Hatteras Lighthouse. You notice you are just about standing in the ocean and feel the cold water lapping against your ankles. You’re not sure if you are feeling the chills because of the cold ocean waters, or because you are sure your team is not alone at this monument. You can feel the presence of others around you, though you can see no one in the darkness.

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As you walk around the bricks that are in the shape of a circle, you realize these bricks were the foundation of the original Cape Hatteras Lighthouse. A nearby historic marker explains these bricks were kept as a memorial to the eighty-three keepers who have worked at the lighthouse, and their names were engraved on the granite bricks as a way of recognizing their hard work. When the lighthouse was moved to its current location in 2001, a ceremony was held to present this memorial to the keeper’s descendants.

Because the history found in this location and the story of these brave lighthouse keepers, you almost forget why you are here. That is until….a large **bolt of lightning** streaks across the sky revealing a symbol of a turtle surrounded by rocks with an arrow facing east jumps up at you off of the stone belonging to Captain Unaka Jennette. Captain Jennette’s family donated this land for the lighthouse to stand on, and he himself, spent many years as a light keeper raising his family on these grounds. Without thinking, you immediately reach down and lift up his stone. While all of the other stones remain securely fastened, his stone lifts up as if to say it is about time someone has figured out this mystery. Your team flips the stone over, and there before your very eyes, is an **X**. You look down at the ground where the stone has laid untouched for more than ten years, and there written in the sand is another **X**.

You begin to dig feverishly, but you hear an evil laugh coming from the sand dunes. You shine your flashlight up the beach to see the man in brown holding what appears to be a treasure map. You can’t believe you’ve come all this way and been this close only to lose out on finding the missing treasure. As the man in brown turns to leave, you again feel the presence of many others begin to surround you. It’s not the gang from Blackbeard’s family, it is the spirits of the 83 lighthouse keepers who have so proudly served on this land. “Justice will be done and the rightful owner of this treasure shall inherit it.” boomed out in a voice louder than the ocean waves crashing on the shore. The man in brown quickly dropped the treasure map, ran for the mainland, and was never seen or heard from again.

![C:\Documents and Settings\michelle_tucker\Local Settings\Temp\Temporary Internet Files\Content.IE5\KD3OA3MY\MC900441717[1].png]()So, how does the story end? **Do you ever really find the treasure of Hatteras Island**? Do you get it back to its rightful owner? Do you keep the $1,000,000 reward, or does your team donate it to help keep the animals and history of this magical place alive for future generations? Only you can tell the ending! With your team, create the ending to this story. When you have finished writing your story, you and your team must write at least 10 math problems that relate to the end of your story. You must use multiplication problems, division problems, equations, and multi-step word problems. Only then will your job (and your story) truly be finished. GOOD LUCK! I can’t wait to see what happens to you and your team… ☺

***Answer Key!***

**Investigation #2:**

1. How many rows of big bricks did the base contain? Write an equation(s) to explain how you know mathematically.

 22 feet divided by 2 feet bricks = **11 rows** of bricks

1. Suddenly, you count the number of rows on your lighthouse drawing in your notes, and you notice there are 12 rows of bricks. Could the treasure be hidden in the twelfth row? You race to the base, but notice there are actually 8 rows of big bricks and some rows of smaller bricks that are only 1 foot tall. How many rows of smaller bricks are there? How many rows of bricks are actually on the base of the Cape Hatteras Lighthouse? Explain how you know mathematically. (Explanations will vary.)

12 rows – 8 rows = 4 rows of 1 ft small bricks and 4 rows X 2 smaller bricks per row = 8, so there are **8 rows of smaller bricks**.

8 rows of bigger bricks + 8 rows of smaller bricks =16 total rows of bricks, so there are actually **16 rows of bricks** on the base of the Cape Hatteras Lighthouse.

1. If Robert S. used 10 gallons of paint a day, how many days did it take him to paint the lighthouse? Write an equation(s) to explain how you know mathematically.

 150 gallons of paint divided by 10 gallons per day = 15 days, so it took Robert S. **15**  **days** to paint the lighthouse.

1. However, you notice that Robert. S. was paid for 8 hours a day for **17** days. Could he have secretly worked for Blackbeard and hidden the treasure in a secret pocket of the outside wall? What was he doing on those extra days if he wasn’t painting? You double check your notes with a teammate’s and realize he was paid for painting the window frames, too. If he could paint 7 window frames in one hour, how many window frames did Robert S. paint altogether? Explain how you know mathematically. (Explanations will vary.)

 17 days- 15 days = 2 days, 2 days X 8 hrs. per day = 16 hours, and

 16 hours X 7 frames per hour = 112 frames total,

so Robert S. painted **112 window frames.**

1. If the structure was almost 200 feet tall and each piece of steel rod was 8 feet, how many pieces of steel rod did the workers use? Write an equation(s) to explain how you know mathematically.

200 feet divided by 8 feet sections of steel rod = 25, so the workers used **25 pieces** of steel rod.

1. When you checked your notes, it stated that only 20 steel rods were used. What happened to the other rods? Could they have been used to create a secret hiding place or vault? Just then a park ranger from the lighthouse notices the puzzled look on your face.

She mentions that some of the extra rods were used to strengthen the doorway frames. If each door way frame measured 8 feet, how many doorways were strengthened using the extra steel? Explain how you know mathematically. (Explanations will vary.)

 25 total steel rods – 20 steel rods used to fix the lighthouse = 5 steel rods left over,

 5 steel rods X 8 feet per steel rod = 40 feet, and 40 feet divided by 8 feet sections needed

 for each door frame = 5 strengthened doorways, so **5 doorways** were strengthened in all.

1. How many total inches are there between all of the steps in the lighthouse? Write an equation(s) to explain how you know mathematically.

268 steps X 8 inches between each step = 3,216, so there are 3,216 inches between all of the steps in the lighthouse.

1. When you are about halfway up the spiral staircase you trip and fall. As you look down you realize why you fell. Instead of there being 8 inches between steps 134 and 135, there are only 6 inches. Did someone change the location of the stair on purpose? Is there a secret drawer in the stair making its height smaller? You peek under the stair and find that the stair has been repaired. When you look up, you notice that starting with stair 134, every other 4th stair has been repaired. Write down the number of each stair that has been repaired. Explain how you know mathematically. (Explanations will vary.)

134 + 4 = 138, 138 + 4 = 142, 142 + 4 = 146, 146 + 4 = 150, 150 + 4 = 154… (Students should note a pattern!)

Answer: 134, 138, 142, 146, 150, 154, 158, 162, 166… ☺

**Investigation #3:**

1. Sea turtles swim out of the ocean to make a nest on the beach. This process can take almost three hours for her to find the perfect spot in the sand, make a nest, and lay her eggs before returning to the ocean. If a park ranger checks on the turtle every 12 minutes, how many times will the turtle be checked on before she heads back to the ocean? Write an equation(s) to help explain your mathematical thinking.

3 hours X 60 minutes per hour = 180 minutes and 180 minutes divided by 12 minutes = 15 checks, so the park ranger will check on the sea turtle **15 times** before she returns to the ocean.

1. Sea turtles will nest with their eggs during the night. Each sea turtle can lay about 80 eggs in her nest. If there are 20 turtles on the beach this nesting season, how many eggs will be laid? One of your teammates says 1,600 eggs will be laid because 20 X 20 = 400 and there are four sets of 20 in one set of 80, so 400 X 4 = 1,600. Another teammate says there will be 1,600 eggs laid because the basic fact of 8 X 2 = 16 and then you add two zeros, so 16 plus two zeros is 1,600. Who is correct? Explain how you know mathematically. (Explanations will vary.)

**Both students are correct!**

1. Imagine that you solved the problem in a completely different way than either of your teammates. Explain how you solved the problem mathematically. (Explanations will vary.)

(20 X 40) + (20 X 40) = **1,600 eggs**  or 20 X 80 = **1,600 eggs**, …

1. After baby turtles hatch from their eggs, they are called hatchlings. The hatchlings that find their way to the ocean water will swim 36 hours to find the seaweed beds and safety to help them survive. If a hatchling stops to rest after swimming every 20 minutes, how many times will the hatchling stop on its trip to the seaweed bed? Explain how you know mathematically. (Explanations will vary.)

36 hours X 60 minutes = 2,160 minutes, 2,160 minutes divided by 20 minutes = 108, so the hatchling will stop **108 times** on its journey to the seeweed bed.

5. Unfortunately, only one in every one thousand hatchlings will survive the trip to the sea weed beds. If there are 3,812 hatchlings born on the coast of North Carolina, 4,219 hatchlings born on the coast of South Carolina, and 5,745 hatchlings born on the coast of Florida this summer, about how many will actually survive and become adult turtles? Explain how you know mathematically. (Explanations will vary.)

NC: 3,812 rounds to about 4,000, SC: 4,219 rounds to about 4,000, and FL: 5,745 rounds to about 6,000, AND 4,000 + 4,000 + 6,000 = 1,600 total hatchlings, 1,600 hatchlings divided by 1,000 equals 16 hatchlings, so about **16 hatchlings** will survive the trip to the seeweed beds.

**Investigation #4:**

1. The center of a severe thunderstorm is located 48 miles west of your beach house. If it is traveling east at 12 miles per hour, how long will it take for the center of the storm to be over your beach house? Write an equation(s) to explain your mathematical thinking.

48 miles divided by 12 mph = 4 hours, so it will take **4 hours** for the center of the storm

to be over your beach house.

1. Winds from this severe thunderstorm are currently gusting at 59 miles per hour. Every 3 miles that the storm travels, data shows that the wind gusts are increasing by 2 miles per hour. How strong will the wind be gusting when the storm reaches your beach house if this pattern continues? ? Explain how you know mathematically. Explanations will vary

 Distance Wind Speed OR 48 divided by 3 equals 16, 16 X 2 =

48 – 3 = 45 59 + 2 = 61 mph 32, 59 mph + 32 mph = 91 mph,

45 – 3 = 42 61 + 2 = 63 mph so the wind will be blowing at **91 mph**

42 – 3 = 39 63 + 2 = 65 mph when it reaches your beach house!

39 – 3 = 36 65 + 2 = 67 mph

36 – 3 = 33 67 + 2 = 69 mph OR…

33 – 3 = 30 69 + 2 = 71 mph

30 – 3 = 27 71 + 2 = 73 mph

27 – 3 = 24 73 + 2 = 75 mph

24 – 3 = 21 75 + 2 = 77 mph

21 – 3 = 18 77 + 2 = 79 mph

18 – 3 = 15 79 + 2 = 81 mph

15 – 3 = 12 81 + 2 = 83 mph

12 – 3 = 9 83 + 2 = 85 mph

9 – 3 = 6 85 + 2 = 87 mph

6 – 3 = 3 87 + 2 = 89 mph

3 – 3 = 0 89 + 2 = **91 mph**

3. The rain is coming down fast and furious at a rate of 4.2 inches per hour. About how much rain will fall when the center of the storm is 12 miles from your beach house? ? Explain how you know mathematically.

4.2 rounds to about 4 inches per hour and 12 miles per hour X 4 inches per hour = 48 inches of rain, so about **48 inches** of rain will fall. \*Some kids will round both numbers to more convenient numbers, so they will end up with 4 X 10 or about **40 inches** of rain. You can promote a discussion about the best estimate to use for this situation!

4.A gust of air sneaks in under your front door, and you notice how much the temperature has cooled. You remember hearing the temperature was 98 degrees on the beach patrol officer’s radio when you were standing down on the beach. Now the thermometer hanging in your kitchen window is only reading 70 degrees. If the center of the storm is directly over your beach house, how many degrees has the temperature cooled each hour since the beginning of the storm? \*Remember, it took the storm 4 hours to travel from where it became a storm to your beach house! Explain how you know mathematically.

98 degrees – 70 degrees = 28 degrees and 28 divided by 4 equals 7, so the temperature has dropped **7 degrees each hour** since the beginning of the storm.

1. As the storm finally passes, your team sneaks outside to continue your journey. The only problem is that the wind has blown sand everywhere. You can no longer tell where the path is or where the turtles’ nests are. You remember each nest being about 3 feet away from each other. You also remember that there were 20 nests all lined up in a straight row about 20 feet from the water’s edge. You and your team decide to jump every three feet on the beach hoping not to land on a turtle’s nest. After your team gets past the nesting grounds, how many feet must your team still travel in order to reach the original site of the Cape Hatteras Lighthouse? (Hint: There are 5,280 feet in one mile, and your team is only ½ mile from the site.) ? Explain how you know mathematically.

20 nests X 3 feet apart = 60 feet, 5,280 feet in one mile divided by 2 (2 halves in one mile) = 2,640 feet, 2,640 feet – 60 feet your team has already jumped = 2,580 feet, so your team still has to travel **2,580 feet** to reach the original site of the Cape Hatteras Lighthouse.