EOSC114 Homework: Waves *(See footnote for an important copyright notice[1])*
This exercise is a mixture of short readings and questions aimed at learning goals in the Waves Module associated with rogue waves. After completing the exercise, you should be better able to …

1. Characterize rogue waves in terms of their size, location and frequency
2. Differentiate between different types of data used in scientific writing
3. Compare and contrast different types of scientific writing

Instructions:
1. You will need to access web resources – links provided below.
2. As for all other homework, work with this worksheet FIRST.
3. Working with colleagues on homework is OK, but copying the work of others is cheating and will not help you succeed. See the Code of Conduct on our course's Canvas website and UBC's strict rules regarding academic integrity at http://www.calendar.ubc.ca/vancouver/?tree=3,54,111,959.[1]

Part 1: Rogue Waves – the basics
Watch the following YouTube video about Rogue Waves to set up the framework for the rest of the homework:
https://www.youtube.com/watch?v=2ylOpbW1H-I

 The MS Munchen disappeared in which Ocean?

 Based on mathematical models used to predict wave height, rogue waves were not considered possible up until the end of the 20th century. This changed with the building of a new oil platform called the _____ in _____(year) in the North Sea.

  The Queen Elizabeth II was hit by a wave of _____m in 1995 on route to New York. This was the size of a _____ story building.

  For a wave to be regarded a rogue wave it must be ____ times higher than the average height of the largest third of the surrounding waves at the time.

Rogue waves are individual ocean surface waves whose crest height η or trough-to-crest height H are large compared to the significant wave height Hs of the underlying sea state. In other words:
$H/Hs>2.2$ or $\eta/Hs>1.25$.
Thus we should be able to determine whether an individual wave is a rogue wave or not if we know the crest height H and trough depth.

  Consider a wave with the following characteristics:
- Trough 1 height (preceding the crest): -2 m
- Crest height: 3 m
- Trough 2 height (following the crest): -1.5 m
- Sea state wave heights: 1.5 m

 Is this a rogue wave? Circle one: YES / NO / Not enough information to tell
 What would be the most conservative estimate of the height of this wave? Give your answer in meters to one decimal place.

 Using the less conservative estimate of the wave height, what is the minimum stable wavelength of the wave?
H / L <= 1 / 7

 Consider a wave with the following characteristics:
  - Trough 1 height (preceding the crest): -5 m
  - Crest height: 8 m
  - Trough 2 height (following the crest): -5.5 m
  - Sea state wave heights: 7 m

 Is this a rogue wave? Circle one: YES / NO / Not enough information to tell
 If a wave with wavelength of 100 m is considered a deep water wave, at what minimum depth of water in meters is it moving over?
- D >= L/2

 What is the speed of the wave?
- Speed = 1.25 * sqrt(L)

Part 2: Maclean's Newsletter: (https://www.macleans.ca/sinking-of-leviathan-ii/) Sinking of the Leviathan II a tragedy caused by rogue wave. In October 2015, a whale watching boat was capsized by a rogue wave off the coast of Tofino. 6 people died. This article is a personal account from the survivors and rescuers of how the tragedy unfolded. Read the article and answer the following questions:

 Which of the following is not suggested by the article as a possible cause of the sinking of the Leviathan II?
- A rogue wave
- An unstable boat load
- A collision with submerged rocks
- Rough seas due to Hurricane Patricia

 Which of the following is not associated with sudden submersion in cold water?
- hyperventilation
- the gasp reaction
- cardiac arrest
- paralysis

 How many times faster do humans lose heat in water than on land?

 The main purpose of this reading is to _____.
- offer social commentary to any reader
- provide news for the general public
- explain some scientific matters to the general public
- provide information for a person or organization that requested it
- present and discuss recommendations about scientific priorities in the peer-reviewed literature
- communicate new scientific methods, procedures, or discoveries to experts in the subject

 What kinds of data was used to make the following statements:

"The boat, which had been lying parallel to the water, started to shift, and sink, stern first, its bow rising above the water line."

- a quantity or quantities that were measured with instruments of some sort
- information that was observed – i.e. seen or noticed, not measured with instruments
- data that was simulated, modelled or calculated
- information collected from people, archives, records etc.
- not really data at all

"The wind was blowing at 5.8 knots, with waves hitting 1.7m"

- a quantity or quantities that were measured with instruments of some sort
- information that was observed – i.e. seen or noticed, not measured with instruments
- data that was simulated, modelled or calculated
- information collected from people, archives, records etc.
- not really data at all

"The unpredictable weather, combined with the North Pacific's craggy shores, have created a dangerous patch of sea known by generations of mariners as the Graveyard of the Pacific."

- a quantity or quantities that were measured with instruments of some sort
- information that was observed – i.e. seen or noticed, not measured with instruments
- data that was simulated, modelled or calculated
- information collected from people, archives, records etc.
- not really data at all
-

 How did the article describe the formation of rogue waves?

- large waves caused by freak storms
- the addition of many waves from different directions to form one large wave
- large waves caused by tsunamis
- large waves caused by a rapid water depth decrease

 How many people reported seeing the wave that capsized the Leviathan II?

 True or false? It only took a few seconds for the Leviathan II to capsize.

 True or false? The passengers of the Leviathan II were wearing life jackets.

 True or False? When the Leviathan II capsized, most of the passengers were below deck.

 True or false? The survivors of the Leviathan II were rescued by the coastguard.

 True or false? Rogue waves have previously occurred along Vancouver Island's west coast.

Part 3: Smithsonian Article (https://www.smithsonianmag.com/smart-news/record-breaking-4-story-rogue-wave-detected-off-vancouver-island-180979598/) Access and read the article on a record breaking rogue wave detected off the coast of Vancouver Island in 2020, then answer the following questions.

 What kinds of data were used to make the following statements:
"The probability of such an event occurring is once in 1,300 years."

- a quantity or quantities that were measured with instruments of some sort
- information that was observed – i.e. seen or noticed, not measured with instruments
- data that was simulated, modelled or calculated
- information collected from people, archives, records etc.
- not really data at all

"As tools for monitoring rogue waves improve, scientists are optimistic they'll learn more about the mysterious phenomenon."

- a quantity or quantities that were measured with instruments of some sort
- information that was observed – i.e. seen or noticed, not measured with instruments
- data that was simulated, modelled or calculated
- information collected from people, archives, records etc.
- not really data at all

 The main purpose of this reading is to _____.

- offer social commentary to any reader
- provide news for the general public
- explain some scientific matters to the general public
- provide information for a person or organization that requested it
- present and discuss recommendations about scientific priorities in the peer-reviewed literature
- communicate new scientific methods, procedures, or discoveries to experts in the subject

 In what ways are rogue waves and tsunamis similar?

- Both can be detected from pressure sensors on the ocean floor.
- Both are hazardous to vessels in the open ocean.
- Both are caused by the sudden displacement of water linked to another event
- Both are characterized by a single wave
- None of the above

 If a wave height was 13.3 m and the surrounding waves were 5.8 m, this wave would be:

- A rogue wave more extreme than the ones near Norway and Ucluelet
- A rogue wave more extreme than the one near Norway but less extreme than the one near Ucluelet
- A rogue wave less extreme than both the ones near Norway and Ucluelet
- Not a rogue wave

 How do scientists think that climate change has influenced the intensity and frequency of rogue waves?

- No change in intensity or frequency
- A 5-15% increase in extreme wave conditions
- A 20-30% increase in extreme wave conditions
- A 5-15% decrease in extreme wave conditions
- A 20-30% decrease in extreme wave conditions

 True/False: The wave described in this article off the coast of Ucluelet was record breaking because it was highest rogue wave ever recorded.

 True/False: A rogue wave of this magnitude will not happen again for 1,300 years.