**Introduction to programming – Activity 10**

**Getting started**

* Make sure you complete the **Unit Conversion activity** before you start Activity 10
* There will be no programming in Activity 10, unless you want to do the calculations in R Studio.

**Main exercise**

In this exercise, will compare our wave measurements with theory. During the wave tank demonstration, we learned that there are shallow-water waves that interact with the bottom, and deep-water waves that don’t interact with the bottom. Both of these waves have different equations to predict their speed ().

For shallow-water waves ()

For deep-water waves ()

where **L** is the wavelength (m), **g** is gravity (9.8 m/s2), and **D** the water depth (m).

* Based on your values of **D** and **L**, in meters, do you think your wave should be a shallow-water wave or a deep-water wave? Use the values of **D** and **L** (in meters) that you calculated in the Unit Conversion activity and show your calculations.  
    
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* Use the values of **D** and **L** (in meters) you calculated and the equations above to predict for your wave in shallow and deep water  
    
    
   (shallow water): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
    
    
   (deep water): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Write down the speed that you calculated for your wave in the Unit Conversion activity. Is it closer to the shallow-water or the deep-water prediction?  
    
  Speed of your wave: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
    
  Closer to which predicted ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Look at the video for your wave again. Do you see evidence that it moves the dirt at the bottom? What does that tell us about our predictions?  
    
    
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* Look at the video for the extra wave, do you see a difference? What does that tell you about the wavelength of the extra wave? Note: we could not analyze that extra wave because its wavelength is too long and we cannot see two crests in one frame.  
    
    
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**Advanced activities – if your group is done early**

* **Transition waves.** Based on the wavelength (**L**) of your wave, calculate at which water depths (**D**) it would start interacting with the bottom. It does not need to behave exactly like a shallow-water wave; the depth only needs to be below the limit for deep-water waves.  
    
  Calculated value of **D**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Based on the wavelength (**L**) of your wave, calculate at which water depths it would behave like a shallow-water wave.  
    
  Calculated value of **D**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_