

Filling the Vase

Student Activity

7 8 9 10 **11** 12



TI-Nspire



Investigation



Student



20 min

Introduction

Pipettes are commonly used in the science lab to dispense a *precise* volume of liquid. The large region in the middle of the pipette holds most of the liquid, the line near the top occurs in a very narrow section so a small change in volume will represent a significant variation in the height of the liquid in that region. It takes some time to become proficient at filling a pipette as the liquid progresses slowly through the larger middle region but rapidly through the narrow upper section.

The purpose of this activity is to connect the shape of a variety of vessels with their height versus volume curve and corresponding rate of change during the filling process.



Getting Started

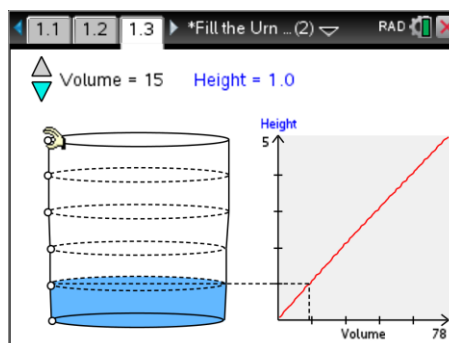
Open the TI-nspire document “Fill the Vase” and navigate to page 1.3.

The image on page 1.3 shows a vase being filled with water.

The amount of volume can be changed using the slider on the top left corner.

The corresponding height and volume are shown numerically (top of page), visually (left: vase) and graphically.

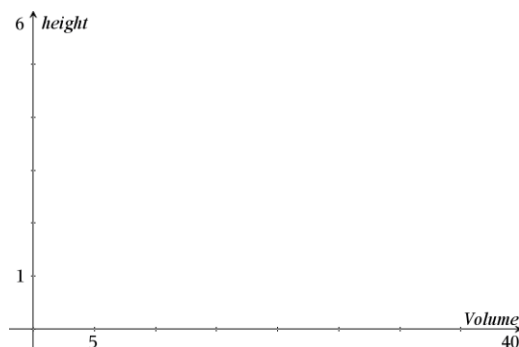
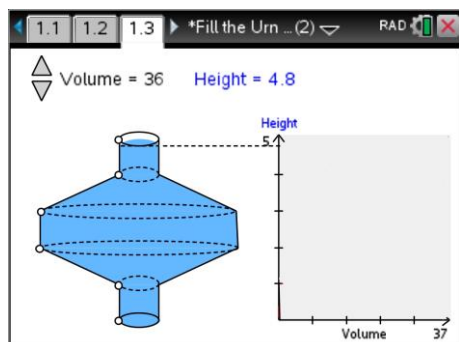
The shape of the vessel can be changed by dragging the points on the left side of the vase.



To grab a point on the side of the vase, move the mouse over the point until it changes to an open hand. Click once on the centre of the navigation pad to grab it, move the point to its new location then click once again to release.

Question: 1.

Sketch a graph of the height vs volume graph for the vase shown below. To check your answer, adjust the sides of the vase in the TI-Nspire document to match the image shown.

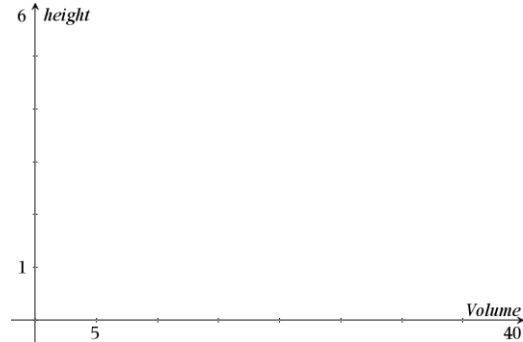
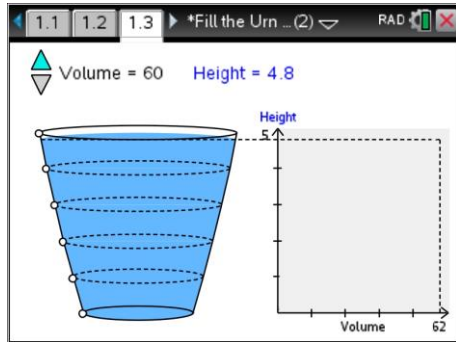


Question: 2.

Imagine water is being poured into the vessel at a constant rate, in what sections of the vessel will the water rise most rapidly.

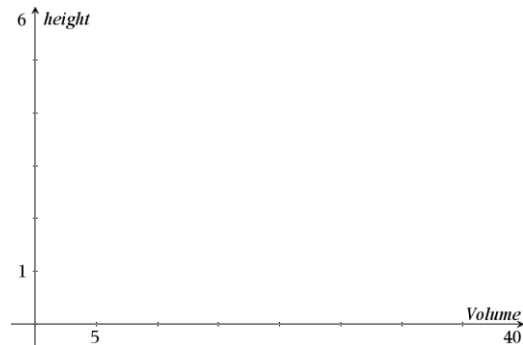
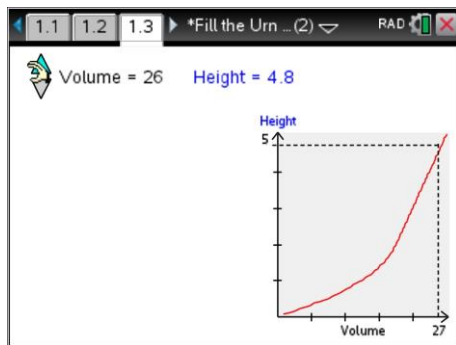
Question: 3.

Sketch a graph of the height vs volume graph for the vase shown below. To check your answer, adjust the sides of the vase in the TI-Nspire document to match the image shown.



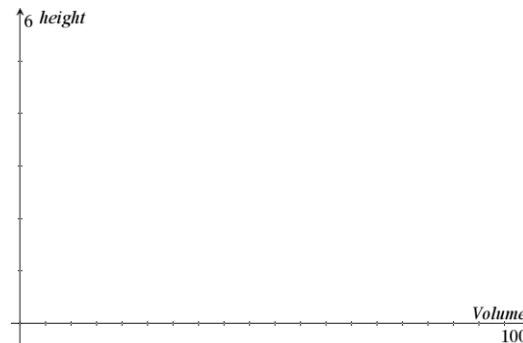
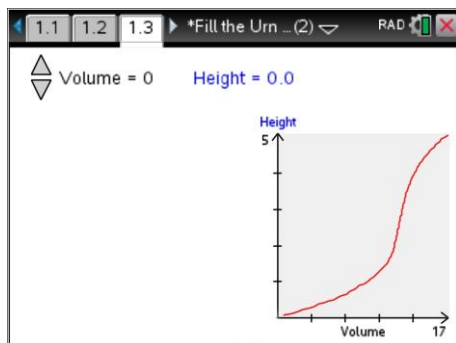
Question: 4.

A graph of the height vs volume has been produced for a vase. Draw the shape of the vase that could produce such a graph. Create the vase on the TI-Nspire document to check your answer.



Question: 5.

A graph of the height vs volume has been produced for a vase. Draw the shape of the vase that could produce such a graph. Create the vase on the TI-Nspire document to check your answer.



Question: 6.

Imagine the water is now released from the vessel at a constant rate, the same rate at which it entered. Extend the graph to show the change in height with respect to volume.