

## FS.L1.4 | Pressure at a Depth, Pascal's Principle | Challenge Homework

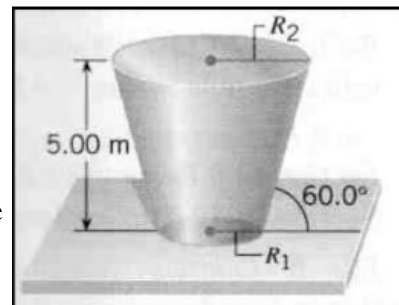
Submit a digital copy (PDF, jpg, etc.) to gradescope.com. Every page should be labeled on the top left with the question code (e.g. GR.L1.4-01) and there should be only be one solution per page. The questions should be in order. If a solution takes more than one page, be sure to label that it is a continuation of the previous page's solution (e.g. GR.L1.4-01 continued). One question will be randomly selected and graded. Challenge homework for a given week are due the following week by Tuesday at midnight. If data is needed to complete a problem, be sure to cite the source you've acquired your data from. See the course website for further details.

You will be asked to apply sense-making in most problems. Use the list below as a reference to the different sense-making techniques. More information about sense-making can be found on the BoxSand menu under Math Tools => [Sense-making](#).

- *Sign*: Check the **sign** of each quantity makes sense.
- *Dimensionality*: Check the **dimensionality** and units of each quantity makes sense.
- *Order of Magnitude*: Check the **order of magnitude** of the final answer and other important quantities is within a a factor of 10 of what you think it should be.
- *Graphical Analysis*: Use a **graph** to see if the behavior of a solution makes sense.
- *Proportionality*: Using a symbolic solution, check the behavior of the answer when you change a given quantity on which it is dependent. Does the answer vary **proportionally** to what you expect?
- *Special Cases*: Check the behavior of a derived equation in limiting (**special**) cases makes sense, e.g. as  $x$  goes to 90 degrees in  $\sin(x)$ .
- *Self-consistency*: Check derived equations, functions, or values, are **self-consistent**, e.g. check that the slope of a derived position plot matches the values of the given velocity plot
- *Known Values*: Compare given or derived quantities with common well **known values**.
- *Related Quantities*: Compare the relative magnitude of two **related quantities**.

**FS.L1.4-01**

A huge bucket of water is illustrated in the figure as having the shape of an inverted cone with its top (bottom in the figure) cut off. The water's height is 5.00 m and there is atmospheric pressure acting on the top of it. Both the circular top of radius  $R_2$  and the circular bottom of radius  $R_1$  are parallel to the ground. The force acting on the top surface of the water is equal in magnitude to that on the bottom surface.



- (a) Determine  $R_2$  and  $R_1$ .
- (b) Use *Dimensionality* sense-making to check the units of your answer in part (a).