

# Filling a bottle of water

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This is a problem I have run into:

I am trying to fill a bottle at the water fountain. My goal is to fill as much water as possible given that I cannot get the bottle to come completely under the fountain. Here is a simplified statement of the problem. Assume that the water fountain is a perfect horizontal disk of radius  $R = 15$  cm with negligible thickness. Also, assume that the water comes out of a tap at the edge of the disk at a uniform horizontal velocity such that the water reaches a maximum height  $H = 5$  cm. Also, the distance that the water falls at along the disk is 20 cm from the tap. Now, assume that the bottle is a perfect cylinder of height  $H_{\text{Bottle}} = 30$  cm and mouth radius  $R_{\text{Bottle}} = 5$  cm.

The question is, where should I position the bottle along the rim, and at what angle to the vertical, horizontal  $x$  and  $y$  axes, so that I can get maximum water in one filling? Given that the bottle is taller than the maximum height, I cannot place it to fill it completely.

Thanks  
Anand

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