

Wilbur's Trough

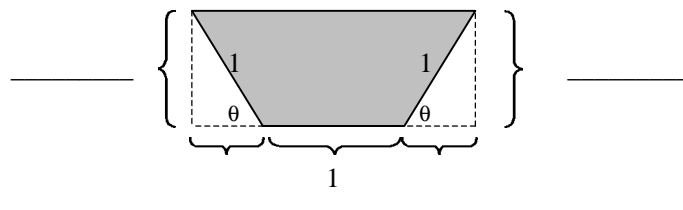
Dorothy has three identical planks and must build a feeding trough whose cross-section is a trapezoid. Wilbur wants Dorothy to construct the trough which will hold the most food. We must determine the angle θ shown which will maximize the cross-sectional area A of the trough. For simplicity, assume each plank is 1 ft. wide.



1. (2 pts) Use your intuition (NO FORMULAS!) to determine the value of A if $\theta = 0$. Draw a picture of this situation. $A = \underline{\hspace{2cm}}$ Explain.

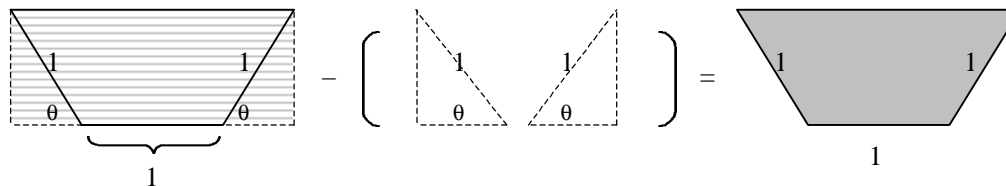
2. (2 pts) Use your intuition (NO FORMULAS!) to determine the value of A if $\theta = 90$ degrees. Draw a picture of this situation. $A = \underline{\hspace{2cm}}$ Explain.

3. (4 pts) Fill in the blanks. (These should be expressions involving θ .)



4. (2 pts) Determine the shaded area A in Question 3 as a function of θ . $A = \underline{\hspace{2cm}}$

Hint:



5. (6 pts) Use a grapher to find the degree measure of θ for which A is a maximum. Also report the **exact** maximum value of A and the viewing window you used.

$$\theta = \underline{\hspace{2cm}}$$

$$A_{\max} = \underline{\hspace{2cm}} \text{ (exact)}$$

viewing window: [,] by [,]

6. (4 pts) While perusing through some old math texts in the library, you discover this identical problem; however, the author gives the area function as $A = \sin \theta + 0.5 \sin 2\theta$. Explain.