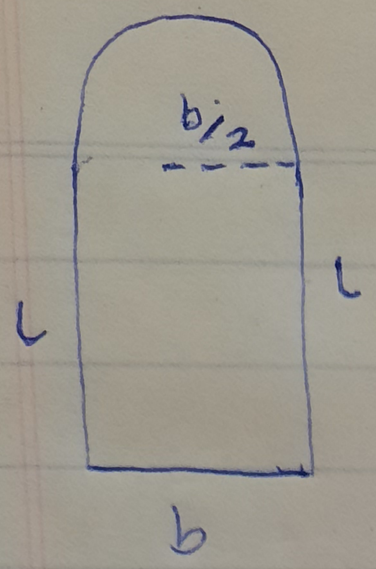


Wood available = $(8+\pi)$ feet

Perimeter of window = Perimeter of rectangle + Perimeter of semicircle

$\Rightarrow$ Perimeter of rectangle = $2l+b$

Perimeter of semicircle = $\frac{\pi b}{2}$

Total Perimeter = $2l+b+\frac{\pi b}{2}$

$8+\pi = 2l+b+\frac{\pi b}{2}$

$16+2\pi = 4l+2b+\pi b$

$l = \frac{16+2\pi-2b-\pi b}{4}$ ... eq ①

Area = area of rectangle + area of semicircle

$= lb + \frac{\pi b^2}{8}$

from eq ①

$= \left(\frac{16+2\pi-2b-\pi b}{4}\right)b + \frac{\pi b^2}{8}$

$= \frac{16b+2\pi b-2b-\pi b}{4} + \frac{\pi b^2}{8}$ Using quotient rule to differentiate

$= \frac{4(16+2\pi-4b-2\pi b)}{16} + \frac{8(2\pi b)}{64}$

$$A = \frac{16+2\pi-4b-2\pi b}{4} + \frac{\pi b}{4}$$

$$A = \frac{16+2\pi-4b-2\pi b+\pi b}{4}$$

at maximum point $A=0$

$$0 = 16+2\pi-4b-2\pi b+\pi b$$

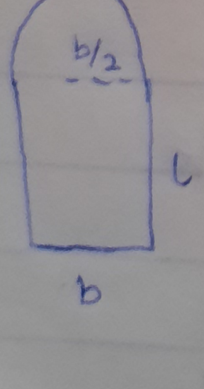
$$0 = 16+2\pi-4b-\pi b$$

$$-16-2\pi = -4b-\pi b$$

$$16+2\pi = 4b+\pi b$$

$$\frac{b(4+\pi)}{4+\pi} = \frac{16+2\pi}{4+\pi}$$

$$\therefore b = \frac{16+2\pi}{4+\pi} \;/\; 3.12\text{ft}$$



$$l = \frac{16+2\pi-2b-\pi b}{4}$$

$$l = 1.56\text{ft}$$

Dimensions of rectangle

$l = 1.56\text{ft}$

$b = 3.12\text{ft}$

Dimension of semicircle

$$\text{radius} = \frac{b}{2} = \frac{3.12}{2} = 1.56$$