C12 - 3.9 - Cost Area/Length Max/Min Notes

Min SA Cost.

$V = 8m^3$

$Cost_{Base} = \frac{\$4.5}{m^2}$

$Cost_{Sides} = \frac{\$6}{m^2}$

$V = Lwh$

$8 = 2w^2h$

$4 = w^2h$

$h = \frac{4}{w^2}$

$h = \frac{4}{2^2}$

$\boxed{h = 1m}$

$SA^* = 2w^2 + 6wh$

$SA = 2w^2 + 6w\left(\frac{4}{w^2}\right)$

$SA = 2w^2 + 24w^{-1}$

$C = 2w^2 \times 4.5 + 24w^{-1} \times 6$

$C = 9w^2 + 144w^{-1}$

$C' = 18w - 144w^{-2}$

$0 = 18w(1 - 8w^{-3})$

~~$w = 0$~~ $1 - 8w^{-3} = 0$

$1 = \frac{8}{w^3}$

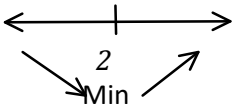
$\boxed{w = 2m}$

$C = 9w^2 + 144w^{-1}$

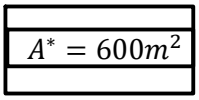
$C = 9(2)^2 + 144(2)^{-1}$

$\boxed{C = \$108}$

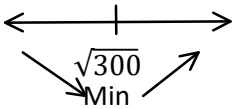
$$\boxed{Cost = Area \times \frac{Cost}{Area}}$$



Min Perimeter Cost.



$C = \frac{\$60}{m}$



$A = lw$

$A = xy$

$600 = xy$

$y = \frac{600}{x}$

$y = \frac{600}{\sqrt{300}}$

$\boxed{y = 20\sqrt{3}\,m}$

$P = 2y + 4x$

$C = 2y \times 60 + 4x \times 60$

$C = 2\left(\frac{600}{x}\right) \times 60 + 4x \times 60$

$C = \frac{72000}{x} + 240x$

$C = 72000x^{-1} + 240x$

$$\boxed{Cost = Length \times \frac{Cost}{length}}$$

$C' = -72000x^{-2} + 240$

$C' = -\frac{72000}{x^2} + 240$

$0 = -\frac{72000}{x^2} + 240$

$\frac{72000}{x^2} = 240$

$x = \sqrt{300}$

$\boxed{x = 10\sqrt{3}m}$

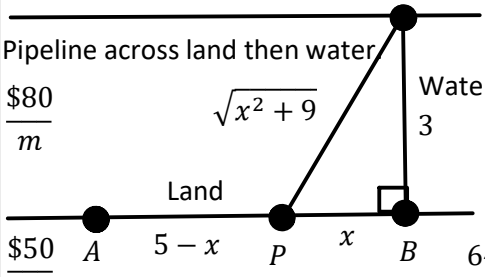
Check Answer

$A = xy$

$A = 20\sqrt{3}(10\sqrt{3})$

$A = 600$

$Min\ Cost\ A \to C$



$C = 50(5 - x) + 80\sqrt{x^2 + 9}$

$C = 50(5 - 0.416) + 80\sqrt{0.416^2 + 9}$

$\boxed{C = \$229.20}$

$C = 50(5 - x) + 80\sqrt{x^2 + 9}$

$C' = -50 + \frac{80(2x)}{2\sqrt{x^2 + 9}}$

$0 = \cdots$

$50 = \frac{80x}{\sqrt{x^2 + 9}}$

$8x = 5\sqrt{x^2 + 9}$

$64x^2 = 25x^2 + 225$

$\cdots$

$\boxed{x = 0.416}$

Min t, v=a, v=b

$$\boxed{Cost = length \times \frac{cost}{length}}$$

Check End Points

$C = 50(5 - x) + 80\sqrt{x^2 + 9}$

$C = 50(5 - 0) + 80\sqrt{0^2 + 9}$

$C = \$290$

$C = 50(5 - x) + 80\sqrt{x^2 + 9}$

$C = 50(5 - 5) + 80\sqrt{5^2 + 9}$

$C = \$466.48$