The JETS Challenge

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Challenge 103 — The Prime Number Challenge

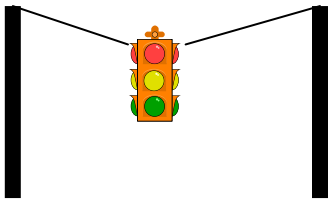
Problem:

Wire expands as it warms up by the formula

$$x = L \bullet a \bullet \Delta T$$

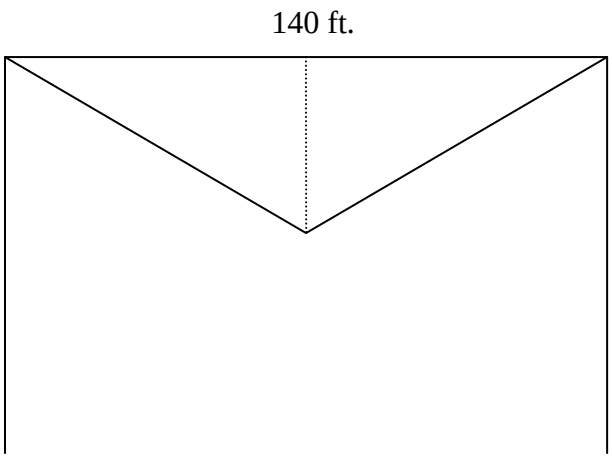
where x is the increase in length in feet, L is the length of the wire, a is the thermal coefficient of expansion and ΔT is the temperature change in °F. The thermal coefficient of expansion for steel wire is 9.9×10^{-6} feet per foot of length per °F.

If a 0.8 in diameter wire between two poles spaced 140 feet apart supports a traffic light in the center and is very tight when the winter temperature is –15°F, how many inches lower will the light be mounted on a hot 95 °F day?



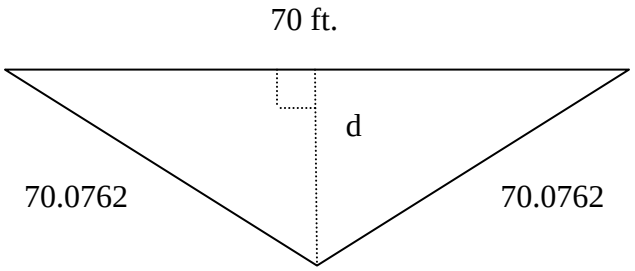
Solution:

L = 140 ft.
A = 9.9×10^{-6} ft per foot per °F
$\Delta T = 95 - {}^{-}15 = 110°$



$x = \ 140 \quad 9.9 \times 10^{-6} \quad 110$

$x = .15246$ ft. $\rightarrow$ new length 140.1526 ft.



$70^2 + d^2 = (70.07623)^2$

$d = 3.27\ ft. = 39.24\ inches$