

Worst Case:
Summer in the morning

$$(28.5'' + 35.6'') \sin(25^\circ) = X_2$$

$$X_2 = 27''$$

$$X_3 = 27 + 12'' = 35''$$

$$(28.5'' + 35.6'') \cos(25^\circ) = X_4$$

$$X_4 = 58''$$

$$X_6 \cos(60^\circ) = 58''$$

$$X_6 = \frac{58}{\cos(60^\circ)} = 116''$$

$$116'' \sin(60^\circ) = X_5$$

$$X_5 = 100.5''$$



at 40° Latitude

Winter $90^\circ - 26^\circ = 64^\circ$

Summer $90^\circ - 72^\circ = 18^\circ$

Jan 1 $90^\circ - 30^\circ = 60^\circ$

Feb 15 $90^\circ - 35^\circ = 55^\circ$

Mar 15 $90^\circ - 45^\circ = 45^\circ$

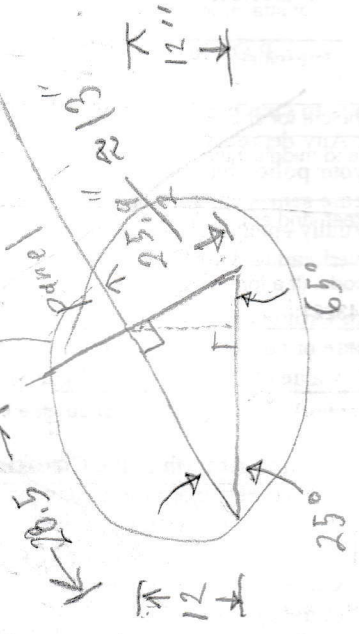
Apr 15 $90^\circ - 55^\circ = 35^\circ$

May 15 $90^\circ - 65^\circ = 25^\circ$

Sep 15 35°

Oct 15 45°

Nov 15 55°



$$X_3 \sin 65^\circ \approx 12''$$

$$X_3 \sin 25^\circ = 12''$$

$$X = \frac{12}{\sin 25^\circ} \approx 28.5''$$