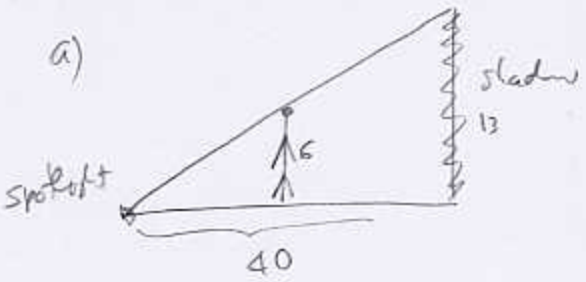
Spring '06/MAT 145/Worksheet 7 **Name:** *Show all your work.*

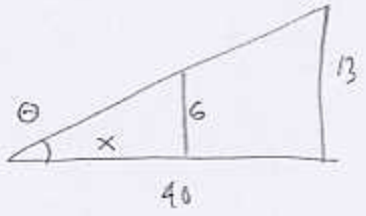
1. (6pts) A spotlight sits on the ground and shines at a wall 40ft away. If a 6ft man stands between the spotlight and the wall, his shadow on the wall is 13ft tall.
a) How far from the spotlight is the man standing?
b) What is the angle of elevation of the line connecting the spotlight with the top of the man's shadow?



a) $\tan\theta = \frac{6}{x}$ so $\frac{6}{x} = \frac{13}{40}$

$\tan\theta = \frac{13}{40}$ $\quad 240 = 13x$

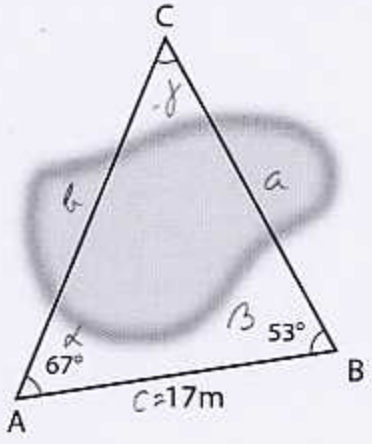
$x = \frac{240}{13} = 18.46$



b) $\tan\theta = \frac{13}{40}$

$\theta = \arctan\frac{13}{40} = 18.0°$

2. (8pts) To find straight-line distance across a pond, surveyors took some measurements that are indicated in the picture.
a) Find the angle at C.
b) Find the distance from A to C.
c) Find the distance from B to C.



a) $\gamma = 180° - (67° + 53°) = 60°$

b) $\frac{\sin 53°}{b} = \frac{\sin 60°}{17}$

$17\sin 53° = b\sin 60°$

$b = \frac{17\sin 53°}{\sin 60°} = 15.68\text{m} = d(A,C)$

$\frac{\sin 67°}{a} = \frac{\sin 60°}{17}$

$a = \frac{17\sin 67°}{\sin 60} = 18.07\text{m}$

3. (7pts) Solve the triangle: $a = 6$, $\alpha = 47°$, $\gamma = 56°$.

$B = 180° - (47° + 56°) = 77°$

$\frac{\sin 77°}{b} = \frac{\sin 47°}{6}$ $\qquad$ $\frac{\sin 56°}{c} = \frac{\sin 47°}{6}$

$6 \sin 77° = b \sin 47°$ $\qquad$ $6 \sin 56° = c \sin 47°$

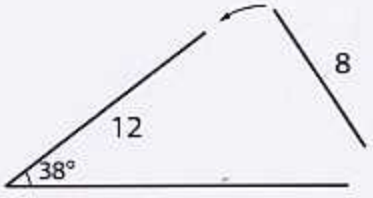
$b = \frac{6 \sin 77°}{\sin 47°} = 7.99$ $\qquad$ $c = \frac{6 \sin 56°}{\sin 47°} = 6.80$

4. (9pts) A solar panel rests on a 12ft beam. To maximize efficiency of the solar panel, the beam must have an angle of 38° with the ground. Another 8ft beam will be used to support the structure by attaching one end of it to the free end of the 12ft beam, and the other end will be anchored in the ground.

a) Investigate all the ways this can be done without cutting the 8ft beam.

b) How far will the possible anchor points of the 8ft beam be away from the anchor point of the 12ft one?

(1)



$\frac{\sin \gamma}{12} = \frac{\sin 38°}{8}$

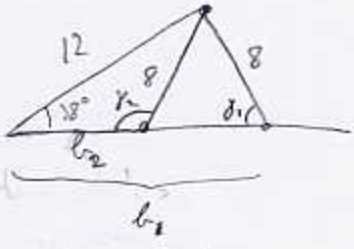
$\sin \gamma = \frac{12 \sin 38°}{8} = 0.92\ldots$

$\gamma_1 = \arcsin 0.92\ldots$

$\gamma_1 = 67.44°$

$\gamma_2 = 180 - \arcsin 0.92$

$= 112.56°$



two solutions appear possible

$B_1 = 180° - (38° + 67.44°)$

$= 74.56°$

$B_2 = 180° - (37° + 112.56°)$

$= 29.44°$

$\frac{\sin 74.56°}{b_1} = \frac{\sin 38°}{8}$ $\qquad$ $\frac{\sin 29.44°}{b_2} = \frac{\sin 38°}{8}$

$b_1 = \frac{8 \sin 74.56°}{\sin 38} = 12.52$ ft $\qquad$ $b_2 = \frac{8 \sin 29.44°}{\sin 38°} = 6.39$ ft