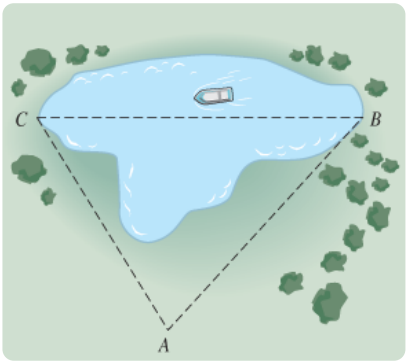
Quiz 9 (20 pts.) Name: KEY

Short Answer

1.) (3 pts) To estimate the length CB of the lake in the figure, a surveyor measures AB and AC to be 89 m and 74 m respectively and $\angle CAB$ to be 95°. Find the approximate length of the lake to the nearest meter.



$(CB)^2 = (AC)^2 + (AB)^2 - 2(AC)(AB)\cos(\angle CAB)$

$= (89)^2 + (74)^2 - 2(89)(74)\cos(95°)$

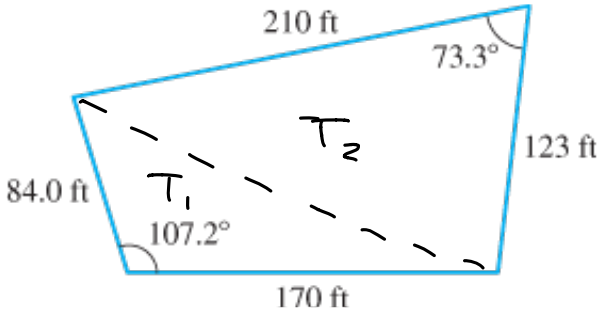
$= 7921 + 5476 - 13172\cos(95°)$

$= 13397 - 13172\cos 95°$

$= 14545.01544$

$\Rightarrow CB = \sqrt{14545.01544} = 120.6027 \approx \boxed{121 \text{ m}}$

2.) (4 pts.) The figure below represents a four-sided plot of land in a new delevopment that sells for \$5.20 per square foot. Find the price of this plot to the nearest thousand dollars. (*Hint: Draw a diagonal that divides the plot into two triangles.*)



area of T_1

$A_1 = \frac{1}{2}(84)(170)\sin(107.2°)$

$= \frac{1}{2}(14280)\sin(107.2°)$

$= (7140)\sin(107.2°)$

$= 6820.6875$

area of T_2

$A_2 = \frac{1}{2}(210)(123)\sin(73.3°)$

$= (12915)\sin(73.3°)$

$= 12370.2775$

$\Rightarrow A = A_1 + A_2$

$= 6820.6875 + 12370.2775$

$= 19190.965 \text{ ft}^2$

↑ find area of figure by adding area of T_1 to area of T_2

$\Rightarrow P = (\$5.20)(19190.965)$

$= 99793.01811$

$\approx \boxed{\$100{,}000}$

3.) (3 pts.) Find the area of triangle with sides $a = 4.0$ in, $b = 6.0$ in, and $c = 8.0$ in to the nearest decimal place.

Heron's Formula : $A = \sqrt{s(s-a)(s-b)(s-c)}$ with $s = \frac{a+b+c}{2}$

$s = \frac{4+6+8}{2} = \frac{18}{2} = 9$

$A = \sqrt{9(9-4)(9-6)(9-8)}$

$= \sqrt{9(5)(3)(1)}$

$= \sqrt{135}$

$= 11.61895$

$\approx \boxed{11.6 \text{ in}^2}$

4.) (3 pts.) Let $A = (-9, -1)$ and $B = (5, -17)$.

(a) Represent the geometric vector $\overrightarrow{AB}$ as a standard vector.

$\overrightarrow{AB} = \langle 5-(-9), -17-(-1) \rangle$

$= \langle 5+9, -17+1 \rangle$

$= \langle 14, -16 \rangle$

(b) Find the magnitude of $\mathbf{v} = < a, b >$

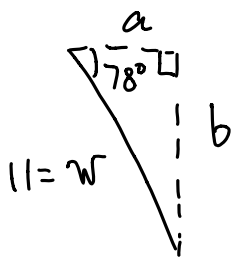
$|v| = \sqrt{(14)^2 + (-16)^2}$

$= \sqrt{196 + 256}$

$= \boxed{\sqrt{452}}$

≈ 21.26029

5.) (3 pts.) Given the diagram below, find the scalar components a and b of vector $\mathbf{w} = < a, b >$.



$\cos(78°) = \frac{a}{11}$

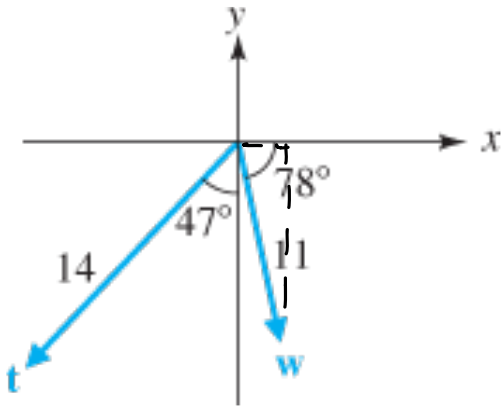
$\Rightarrow 11\cos(78°) = a$

$2.287 = a$

$\sin(78°) = \frac{b}{11}$

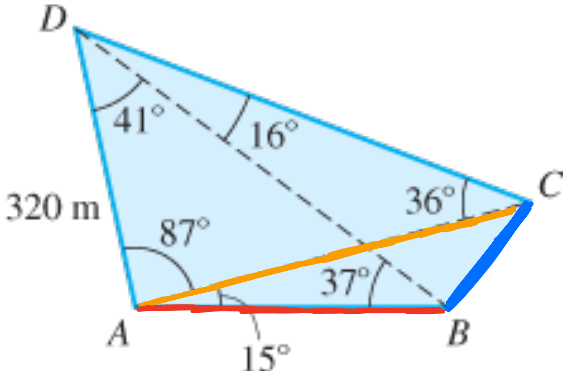
$\Rightarrow 11\sin(78°) = b$

$10.7596 = b$



$\Rightarrow \boxed{w = < 2.3, 10.8 >}$

6.) (4 pts.) A plot of land was surveyed, with the resulting information shown in the figure. Find the length of BC.



Strategy: (1) Find AB using Law of Sines
(2) Find AC using Law of Sines
(2) Find BC using Law of Cosines

(1) $\frac{\sin(41°)}{AB} = \frac{\sin(37°)}{320}$

$\Rightarrow \frac{320\sin(41°)}{\sin(37°)} = AB$

$\Rightarrow 348.843 = AB$

(2) $\frac{\sin(36°)}{320} = \frac{\sin(41°+16°)}{AC}$

$\Rightarrow \frac{320\sin(57°)}{\sin(36°)} = AC$

$\Rightarrow 456.586 = AC$

(3) $(BC)^2$

$= (AC)^2 + (AB)^2 - 2(AC)(AB)\cos(\angle CAB)$

$= (456.586)^2 + (348.843)^2 - 2(456.586)(348.843)\cos(15°)$

$= 22463.0068$

$\Rightarrow BC = \sqrt{22463.0068}$

$= 149.8766$

$\approx \boxed{149.9\ m}$