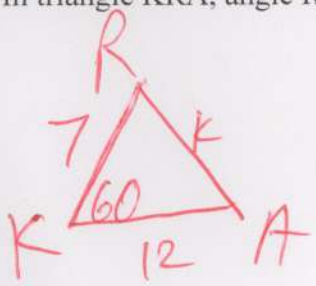
Law of Sines, Law of Cosines, and Area Practice **Name:**

Introduction to Calculus

1) In triangle KRA, angle K = 60°, side r = 12, and side a = 7. Find side k.



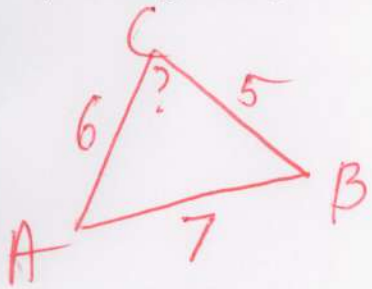
$k^2 = 7^2 + 12^2 - 2(7)(12)\cos 60$

$k^2 = 193 - 84$

$k^2 = 109$

$k = \sqrt{109}$ $\quad k \approx 10.4$

2) In triangle ABC, a = 5 cm, b = 6 cm, and c = 7 cm. Use your trig table to find angle C to the nearest degree.



$7^2 = 6^2 + 5^2 - 2(6)(5)\cos C$

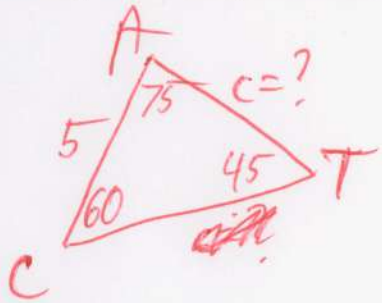
$-12 = -60\cos C$

$\cos C = \frac{12}{60}$

$\cos C = .2$

$C \approx 78°$

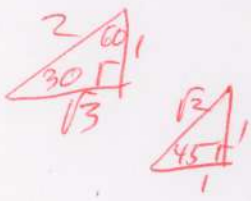
3) In triangle CAT, angle C = 60°, angle A = 75°, and side t = 5 mm. Find side c.



$\angle C + \angle A + \angle T = 180°$

$60 + 75 + \angle T = 180$

$\angle T = 45$



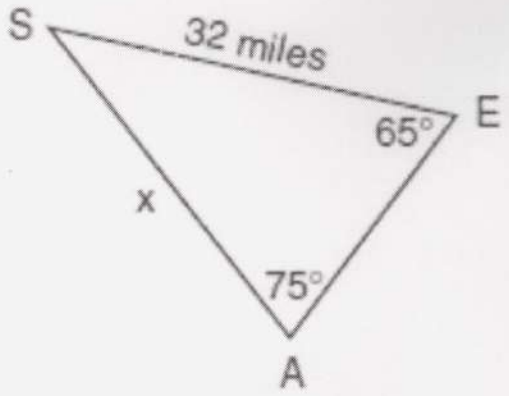
$\frac{5}{\sin 45°} = \frac{c}{\sin 60°}$

$c = \frac{5\sin 60°}{\sin 45}$

$c = \frac{5 \cdot \frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}} = \frac{5\sqrt{3}}{2} \cdot \sqrt{2}$

$c = \frac{5\sqrt{6}}{2}$ OR $c \approx 6.12$

4) The accompanying diagram shows the approximate linear distances traveled by a sailboat during a race. The sailboat started at point S, traveled to points E and A, respectively, and ended at point S. Find x, the distance from point A to point S. (Leave the answer in exact form…no need to find trig ratios.)



$\frac{x}{\sin 65^\circ} = \frac{32}{\sin 75^\circ}$

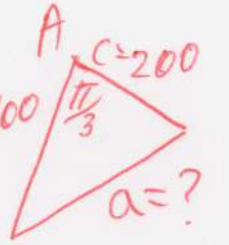
$x \sin 75^\circ = 32 \sin 65^\circ$

$x = \frac{32 \sin 65^\circ}{\sin 75^\circ}$

OR $x \approx 30.02$

5) A surveyor is mapping a triangular plot of land. He measures two of the sides and the angle formed by these two sides and finds that the lengths are 400 yards and 200 yards and the included angle is $\frac{\pi}{3}$

a) What is the measure of the third side of the plot of land?



$\cos \frac{\pi}{3} = .5$

$a^2 = 400^2 + 200^2 - 2(400)(200)\cos\frac{\pi}{3}$ ($\cos\frac{\pi}{3} = .5$)

$a^2 = 200{,}000 - 80{,}000$

$a^2 = 120{,}000$

$a \approx 346.41$ OR leave as $a = \sqrt{120{,}000}$

b) What is the area of this plot of land?

$K = \frac{1}{2} ab \sin C$

$K = \frac{1}{2} 400 \cdot 200 \cdot \sin\frac{\pi}{3}$ $\quad K = 40000 \cdot \frac{\sqrt{3}}{2}$

$K \approx 34{,}641.02$ OR $K = 20{,}000\sqrt{3}$