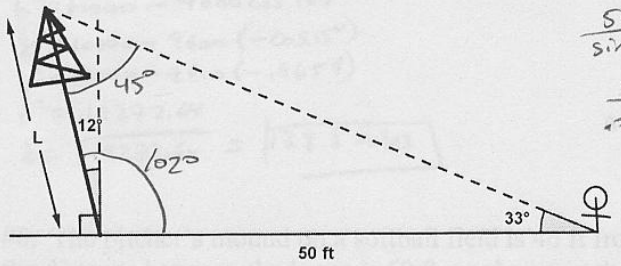
Geometry – Law of Sines/Cosines homework Name: Key

Period: _____

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

#1. You are standing 50 feet from the base of a tree which is leaning 12 degrees away you. If the line from your feet to the top of the tree is 33 degrees above the ground, what is the length, L, of the tree?



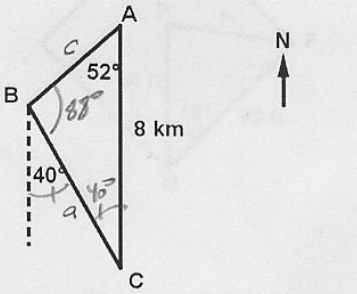
$\frac{50}{\sin 45^\circ} = \frac{L}{\sin 33^\circ}$

$\frac{50}{.7071} = \frac{L}{.5446}$

$.7071L = 50(.5446)$

$L = \frac{50(.5446)}{.7071} = \boxed{38.5 \text{ ft}}$

#2. The course for a boat race starts at point A and proceeds 52 degrees west of south to point B, then turns 40 degrees east of south to point C which is directly south of point A. Boats then turn directly north a race back to point A (see picture). If the distance from point A to C is 8 km, what is the length of the entire race course?



$\frac{8}{\sin 88^\circ} = \frac{a}{\sin 52^\circ}$

$\frac{8}{.9994} = \frac{a}{.788}$

$a = \frac{8(.788)}{.9994} = \boxed{6.31 \text{ km}}$

$\frac{8}{\sin 88^\circ} = \frac{c}{\sin 40^\circ}$

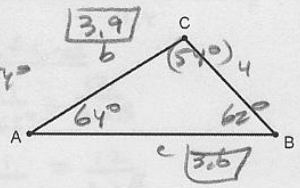
$\frac{8}{.9994} = \frac{c}{.6428}$

$c = \frac{8(.6428)}{.9994} = \boxed{5.15 \text{ km}}$

$\boxed{\text{total race} = 19.46 \text{ km}}$

#3. Find all sides and angles:

$m\angle A = 64^\circ,\ a = 4,\ m\angle B = 62^\circ$



$\frac{b}{\sin 62^\circ} = \frac{4}{\sin 64^\circ}$

$\frac{b}{.8829} = \frac{4}{.8978}$

$(.8978)b = 4(.8829) = 3.5316$

$b = \frac{3.5316}{.8978} = \boxed{3.9}$

$C = 180^\circ - (64^\circ + 62^\circ) = 54^\circ$

$\frac{c}{\sin 54^\circ} = \frac{4}{\sin 64^\circ}$

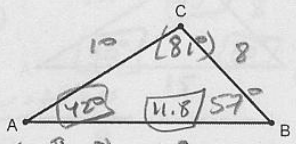
$\frac{c}{.8090} = \frac{4}{.8978}$

$(.8978)c = 4(.8090) = 3.236$

$c = \frac{3.236}{.8978} = \boxed{3.6}$

#4. Find all sides and angles:

$m\angle B = 57^\circ,\ a = 8,\ b = 10$



$\frac{8}{\sin A} = \frac{10}{\sin 57^\circ}$

$\frac{8}{\sin A} = \frac{10}{.8387}$

$10\sin A = 8(.8387) = 6.7096$

$\sin A = \frac{6.7096}{10} = 0.67096$

$\boxed{A = 42^\circ}$

$C = 180^\circ - (42^\circ + 57^\circ) = 81^\circ$

$\frac{c}{\sin 81^\circ} = \frac{10}{\sin 57^\circ}$

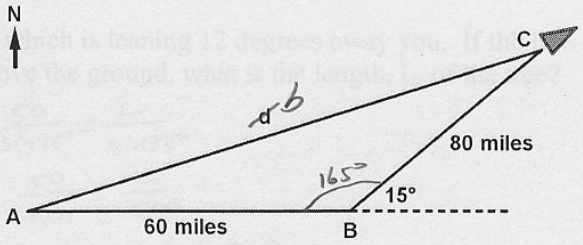
$\frac{c}{.9877} = \frac{10}{.8387}$

$(.8387)c = 10(.9877) = 9.877$

$\rightarrow\ c = \frac{9.877}{.8387} = \boxed{11.8}$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$ $\quad b^2 = a^2 + c^2 - 2ac\cos B$ $\quad c^2 = a^2 + b^2 - 2ab\cos C$

#5. A boat travels 60 miles due east, then adjusts its course 15 degrees northward, as shown in the picture. After traveling 80 miles in the new direction, how far is the boat from where it started? (Find distance d).



$b^2 = a^2 + c^2 - 2ac\cos B$

$b^2 = 80^2 + 60^2 - 2(80)(60)\cos 165°$

$b^2 = 10000 - 9600\cos 165°$

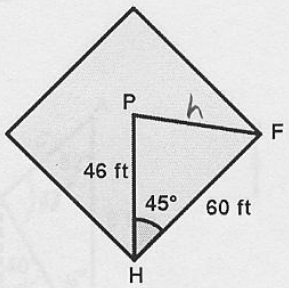
$b^2 = 10000 - 9600(-\cos 15°)$

$b^2 = 10000 - 9600(-.9659)$

$b^2 = 19272.64$

$b = \sqrt{19272.64} = 138.8$ miles

#6. The pitcher's mound on a softball field is 46 ft from home plate and the distance between the bases is 60 ft, as shown in the picture. (The pitcher's mound is *not* halfway between home plate and second base.) How far is the pitcher's mound from first base (distance from P to F)?



$h^2 = 46^2 + 60^2 - 2(46)(60)\cos 45°$

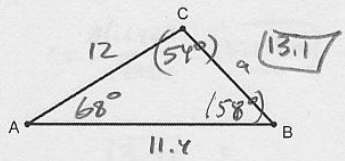
$h^2 = 5716 - 5520(.7071)$

$h^2 = 1812.8$

$h = \sqrt{1812.8} = 42.6$ ft

#7. Find all sides and angles:

$m\angle A = 68°,\ b = 12,\ c = 11.4$



Law of cosines

$a^2 = b^2 + c^2 - 2bc\cos A$

$a^2 = (12)^2 + (11.4)^2 - 2(12)(11.4)\cos 68°$

$a^2 = 273.96 - 273.6(.3746)$

$a^2 = 171.4694$

$a = 13.09$

13.1

Law of sines

$\frac{13.1}{\sin 68°} = \frac{12}{\sin B}$

$\frac{13.1}{.9272} = \frac{12}{\sin B}$

$(13.1)\sin B = 12(.9272) = 11.1264$

$\sin B = \frac{11.1264}{13.1}$

$\sin B = .8493$

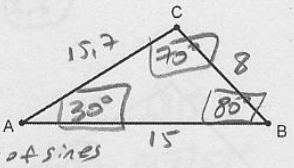
$B = 58°$

$C = 180° - (68° + 58°)$

$C = 54°$

#8. Find all sides and angles:

$a = 8,\ b = 15.7,\ c = 15$



Law of cosines – find largest angle (B)

$b^2 = a^2 + c^2 - 2ac\cos B$

$(15.7)^2 = 8^2 + 15^2 - 2(8)(15)\cos B$

$246.49 = 289 - 240\cos B$

$-289 \quad -289$

$-42.51 = -240\cos B$

$\frac{-42.51}{-240} = \frac{-240\cos B}{-240}$

$\cos B = 0.17712$

$B = 80°$

Law of sines

$\frac{15.7}{\sin 80°} = \frac{8}{\sin A}$

$\frac{15.7}{.9848} = \frac{8}{\sin A}$

$15.7\sin A = 8(.9848) = 7.8784$

$\sin A = \frac{7.8784}{15.7}$ $\quad \sin A = .5018$

$A = 30°$

$C = 180° - (30° + 80°)$

$C = 70°$

Geometry – Right/Non-right triangle practice sheet Name: Key

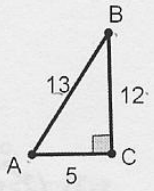
Period: _____

Trigonometric ratios: $\sin A = \frac{opposite}{hypotenuse}$ $\cos A = \frac{adjacent}{hypotenuse}$ $\tan A = \frac{opposite}{adjacent}$

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$ $b^2 = a^2 + c^2 - 2ac\cos B$ $c^2 = a^2 + b^2 - 2ab\cos C$

#1. For the triangle to the right, find the following trig ratios:

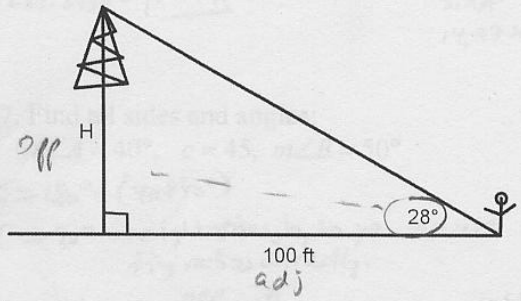


$\sin A = \frac{12}{13}$ $\sin B = \frac{5}{13}$

$\cos A = \frac{5}{13}$ $\cos B = \frac{12}{13}$

$\tan A = \frac{12}{5}$ $\tan B = \frac{5}{12}$

#2. You are standing 100 feet from the base of a tree which grows at a right angle to the ground. If the line from your feet to the top of the tree is 28 degrees above the ground, what is the height, H, of the tree?



opp

adj

$\tan A = \frac{opp}{adj}$

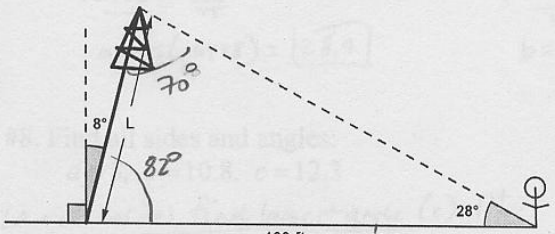
$\tan 28° = \frac{H}{100}$

$0.5317 = \frac{H}{100}$

$H = 100(0.5317)$

$H = 53.17 ft$

#3. You are standing 100 feet from the base of a tree which is leaning 8 degrees toward you. If the line from your feet to the top of the tree is 28 degrees above the ground, what is the length, L, of the tree?



82 + 28 = 110

Law of sines

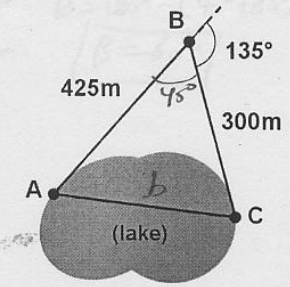
$\frac{L}{\sin 28°} = \frac{100}{\sin 70°}$

$\frac{L}{.4695} = \frac{100}{.9397}$

$.9397L = 100(.4695)$

$L = \frac{100(.4695)}{.9397} = 49.96 \approx 50 ft$

#4. To measure the length of a lake a surveyor walks 425 m from point A to point B. Then the surveyor turns 135 degrees and walk 300 m to point C. What is the length, AC, across the lake?



Law of cosines

$b^2 = a^2 + c^2 - 2ac\cos B$

$b^2 = 300^2 + 425^2 - 2(300)(425)\cos 45°$

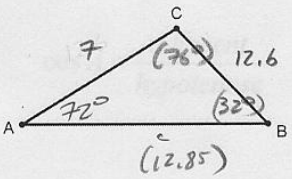
$b^2 = 270625 - 255000(.7071)$

$b^2 = 90314.5$

$b = \sqrt{90314.5} = 300.5 m$

#5. Find all sides and angles:

$m\angle A = 72°,\ a = 12.6,\ b = 7$



Law of sines

$\frac{12.6}{\sin 72°} = \frac{7}{\sin B}$

$\frac{12.6}{.9511} = \frac{7}{\sin B}$

$12.6 \sin B = 7(.9511)$

$\sin B = \frac{7(.9511)}{12.6}$

$\sin B = .5284$ $\boxed{B = 32°}$

$C = 180° - (32° + 72°)$

$\boxed{C = 76°}$

$\frac{c}{\sin 76°} = \frac{12.6}{\sin 72°}$

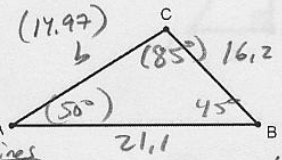
$\frac{c}{.9703} = \frac{12.6}{.9511}$

$(.9511)c = 12.6(.9703)$

$c = \frac{12.6(.9703)}{.9511} = \boxed{12.85}$

#6. Find all sides and angles:

$m\angle B = 45°,\ a = 16.2,\ c = 21.1$



Law of cosines

$b^2 = a^2 + c^2 - 2ac\cos B$

$b^2 = 16.2^2 + 21.1^2 - 2(16.2)(21.1)\cos 45°$

$b^2 = 707.65 - 683.64(.7071)$

$b^2 = 224.2482$

$b = \sqrt{224.2482} = \boxed{14.97}$

now, Law of Sines

$\frac{16.2}{\sin A} = \frac{14.97}{\sin 45°}$

$\frac{16.2}{\sin A} = \frac{14.97}{.7071}$

$14.97 \sin A = 16.2(.7071)$

$\sin A = \frac{16.2(.7071)}{14.97}$

$\sin A = .7652$

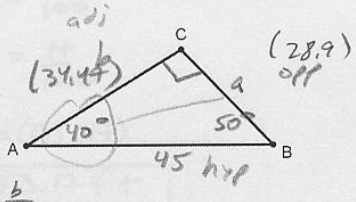
$\boxed{A = 50°}$

$C = 180° - (50° + 45°)$

$\boxed{C = 85°}$

#7. Find all sides and angles:

$m\angle A = 40°,\ c = 45,\ m\angle B = 50°$



$C = 180° - (40° + 50°)$

$C = 90°$ right triangle, so you can use trig ratios directly.

$\sin 40° = \frac{opp}{hyp} = \frac{a}{45}$

$.6428 = \frac{a}{45}$

$a = 45(.6428) = \boxed{28.9}$

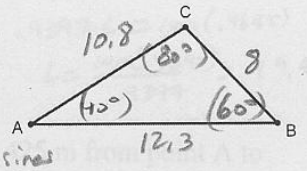
$\cos 40° = \frac{adj}{hyp} = \frac{b}{45}$

$.7660 = \frac{b}{45}$

$b = 45(.7660) = \boxed{34.47}$

#8. Find all sides and angles:

$a = 8,\ b = 10.8,\ c = 12.3$



Law of cosines, find largest angle (c) 1st:

$c^2 = a^2 + b^2 - 2ab\cos C$

$12.3^2 = 8^2 + 10.8^2 - 2(8)(10.8)\cos C$

$151.29 = 180.64 - 172.8\cos C$

$-180.64 \quad -180.64$

$-29.35 = -172.8\cos C$

$\frac{-29.35}{-172.8} = \frac{-172.8\cos C}{-172.8}$

$.1698 = \cos C$

$\boxed{C = 80°}$

now, law of sines

$\frac{12.3}{\sin 80°} = \frac{8}{\sin A}$

$\frac{12.3}{.9848} = \frac{8}{\sin A}$

$12.3 \sin A = 8(.9848)$

$\sin A = \frac{8(.9848)}{12.3}$

$\sin A = .6405$

$A = 40°$

$B = 180° - (40° + 80°)$

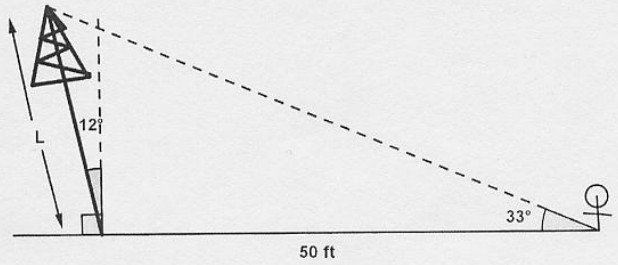
$\boxed{B = 60°}$

Geometry – Law of Sines/Cosines homework Name:_____

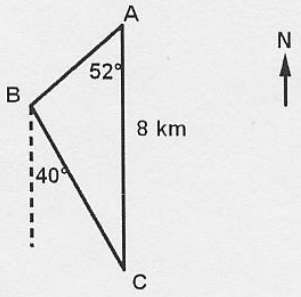
Period: _____

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

#1. You are standing 50 feet from the base of a tree which is leaning 12 degrees away you. If the line from your feet to the top of the tree is 33 degrees above the ground, what is the length, L, of the tree?

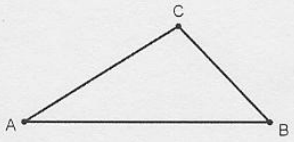


#2. The course for a boat race starts at point A and proceeds 52 degrees west of south to point B, then turns 40 degrees east of south to point C which is directly south of point A. Boats then turn directly north a race back to point A (see picture). If the distance from point A to C is 8 km, what is the length of the entire race course?



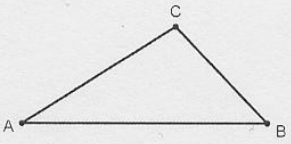
#3. Find all sides and angles:

$m\angle A = 64°,\ \ a = 4,\ \ m\angle B = 62°$



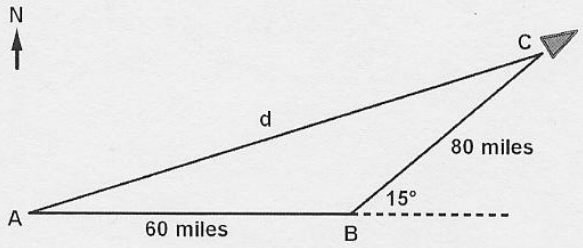
#4. Find all sides and angles:

$m\angle B = 57°,\ \ a = 8,\ \ b = 10$

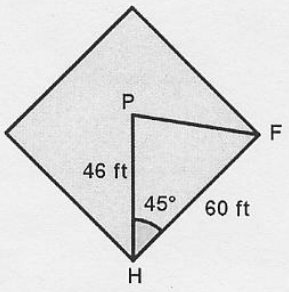


Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$ $\quad b^2 = a^2 + c^2 - 2ac\cos B$ $\quad c^2 = a^2 + b^2 - 2ab\cos C$

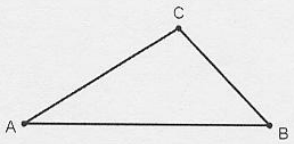
#5. A boat travels 60 miles due east, then adjusts its course 15 degrees northward, as shown in the picture. After traveling 80 miles in the new direction, how far is the boat from where it started? (Find distance d).



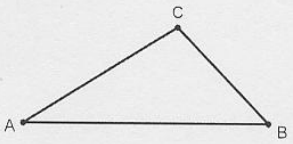
#6. The pitcher's mound on a softball field is 46 ft from home plate and the distance between the bases is 60 ft, as shown in the picture. (The pitcher's mound is *not* halfway between home plate and second base.) How far is the pitcher's mound from first base (distance from P to F)?



#7. Find all sides and angles:
$m\angle A = 68°,\ b = 12,\ c = 11.4$



#8. Find all sides and angles:
$a = 8,\ b = 15.7,\ c = 15$



Geometry – Right/Non-right triangle practice worksheet Name:_____

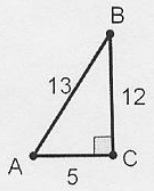
Period: _____

Trigonometric ratios: $\sin A = \frac{opposite}{hypotenuse}$ $\cos A = \frac{adjacent}{hypotenuse}$ $\tan A = \frac{opposite}{adjacent}$

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$ $b^2 = a^2 + c^2 - 2ac\cos B$ $c^2 = a^2 + b^2 - 2ab\cos C$

#1. For the triangle to the right, find the following trig ratios:

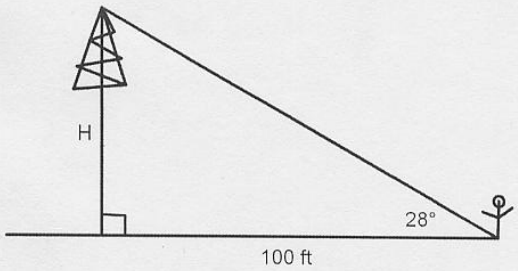


$\sin A =$ $\sin B =$

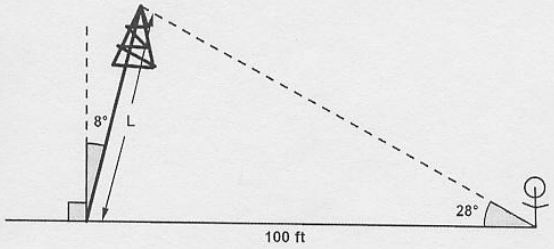
$\cos A =$ $\cos B =$

$\tan A =$ $\tan B =$

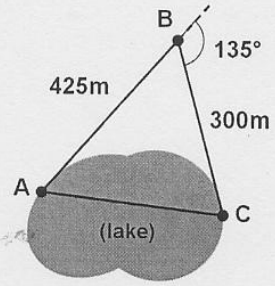
#2. You are standing 100 feet from the base of a tree which grows at a right angle to the ground. If the line from your feet to the top of the tree is 28 degrees above the ground, what is the height, H, of the tree?



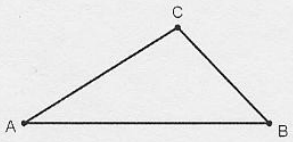
#3. You are standing 100 feet from the base of a tree which is leaning 8 degrees toward you. If the line from your feet to the top of the tree is 28 degrees above the ground, what is the length, L, of the tree?



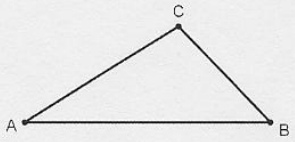
#4. To measure the length of a lake a surveyor walks 425 m from point A to point B. Then the surveyor turns 135 degrees and walk 300 m to point C. What is the length, AC, across the lake?



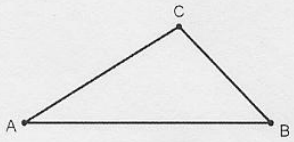
#5. Find all sides and angles:
$m\angle A = 72°,\ a = 12.6,\ b = 7$



#6. Find all sides and angles:
$m\angle B = 45°,\ a = 16.2,\ c = 21.1$



#7. Find all sides and angles:
$m\angle A = 40°,\ c = 45,\ m\angle B = 50°$



#8. Find all sides and angles:
$a = 8,\ b = 10.8,\ c = 12.3$