REVIEW—LAW OF SINES/LAW OF COSINES
2013

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I. Which method would be the best choice to use when solving the following triangles? Choose from SOHCAHTOA, Law of Sines, or Law of Cosines.

1. $C = 35^o$, a = 11, b = 10.5 SAS → LOC

2. a = 10, $A = 40^o$, c = 8 SSA → LOS

3. a = 5, b = 8, c = 6 SSS → LOC

4. $A = 40^o$, $C = 70^o$, c = 14 AAS → LOS

II. Determine the number of triangles possible given the following information.

5. a = 3, b = 2, $A = 50^o$ one

smaller angle

6. b = 4, c = 6, $B = 20^o$ two

larger angle

III. Given triangle ABC, use the given information to find the requested part.

7. Given: $A = 29^o10'$, $B = 62^o20'$, c = 11.5, find side a

$C = 88^o30'$ $\quad \frac{11.5}{\sin 88^o30'} = \frac{a}{\sin 29^o10'}$ $\quad \boxed{a = 5.6}$

8. Given: a = 13, b = 15, $A = 55^o$, find angle C

$\frac{\sin 55^o}{13} = \frac{\sin B}{15}$ $\quad B_1 = 70.9^o \quad B_2 = 109.1^o$ $\quad \boxed{C_1 = 54.1^o \quad C_2 = 15.9^o}$

9. Given: a = 15, b = 18, c = 20, find angle B

$18^2 = 15^2 + 20^2 - 2(15)(20)\cos B$

$B = \cos^{-1}\left(\frac{301}{600}\right) \rightarrow \boxed{B = 59.9^o}$

10. Given: b = 40, c = 45, $A = 51^o$, find side a

$a^2 = 40^2 + 45^2 - 2(40)(45)\cos 51^o$

$\boxed{a = 36.9}$

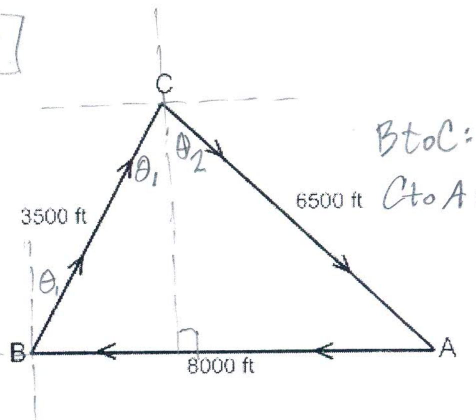
IV. Application problems - SHOW PICTURES & WORK

1. Determine the measure of the largest angle of a triangle with sides 12 feet, 14 feet, and 18 feet.

$18^2 = 12^2 + 14^2 - 2(12)(14)\cos\theta$

$\theta = \cos^{-1}\left(\frac{16}{336}\right) \rightarrow \boxed{\theta = 87.3^o}$

12. A boat race is run along a triangular course marked by buoys A, B, and C. The race starts with the boats headed due west from A. Find the bearings for the last two legs of the race; that is, from B to C and from C to A.



B to C: N37.4°E

C to A: S64.7°E

$6500^2 = 3500^2 + 8000^2 - 2(3500)(8000)\cos B$

$B = 52.6^o \qquad \theta_1 = 90^o - 52.6^o = 37.4^o$

$8000^2 = 3500^2 + 6500^2 - 2(3500)(6500)\cos C$

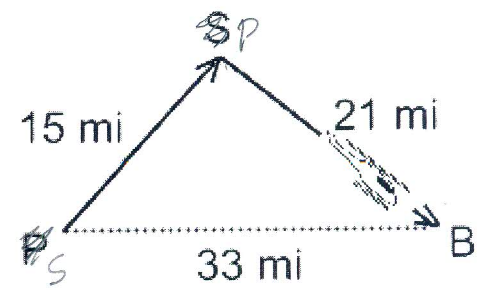
$C = 102.1^o \qquad \theta_2 = C - \theta_1 = 64.7^o$

13. Samantha files a helicopter to drop supplies to stranded flood victims. She will fly from the supply depot, S, to the drop point, P. Then she will return to the helicopter's base at B, as shown in the figure.
The drop point is 15 miles from the supply depot. The base is 21 miles from the drop point. It is 33 miles between the supply depot and the base. Because the return flight to the base will be made after dark, Samantha wants to know in what direction to fly. What is the angle between the two paths at the drop point?

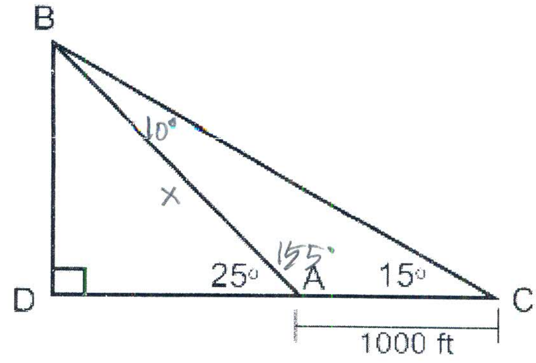
$33^2 = 15^2 + 21^2 - 2(15)(21)\cos P$

$P = \cos^{-1}\left(-\frac{423}{630}\right)$

$\boxed{P = 132.2^o}$



14. To find the length of the span of a proposed ski lift from A to B, a surveyor measures the angle DAB to be 25^o and then walks off a distance 1000 feet to C and measures angle ACB to be 15^o. What is the distance from A to B?



$$\frac{1000}{\sin 10^\circ} = \frac{x}{\sin 15^\circ}$$

$\boxed{x = 1490.5 \text{ feet}}$

15. A surveyor measures the three sides of a triangular field and gets lengths 114 m, 165 m, and 257 m.

(a) What is the measure of the largest angle of the triangular field?

$257^2 = 114^2 + 165^2 - 2(114)(165)\cos\theta$

$\theta = \cos^{-1}\left(\frac{25828}{-37620}\right) \rightarrow \boxed{\theta = 133.4^\circ}$

(b) What is the area of the field?

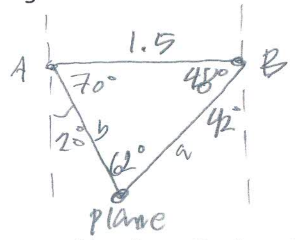
$s = 268$ $\quad$ Area $= \sqrt{268(154)(103)(11)} = \boxed{6838.2 \text{ m}^2}$

(c) If land in the area currently sells for \$94 per square meter, and property taxes are assesses at $4\frac{1}{2}\%$ of the current value, how much will the owner pay in property taxes?

$6838.2\,(94)(0.045)$

$= \boxed{\$28925.59}$

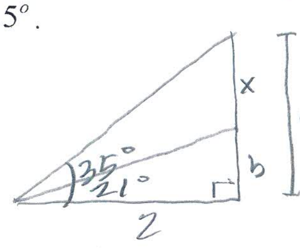
16. An airplane crashes in a lake and is spotted by observers at lighthouses A and B along the coast. Lighthouse B is 1.5 miles due east of lighthouse A. The bearing of the airplane from lighthouse A is $S20^o E$; the bearing of the plane from lighthouse B is $S42^o W$. Find the distance from each lighthouse to the crash site.



$$\frac{1.5}{\sin 62^\circ} = \frac{a}{\sin 70^\circ} = \frac{b}{\sin 48^\circ}$$

$\boxed{a = 1.6 \text{ mi}}$ distance to B! $\quad$ $\boxed{b = 1.3 \text{ mi}}$ distance to A!

17. An observer 2km from the launch pad observes a rocket ascending vertically. At one instant, the angle of elevation is 21^o. Five seconds later, the angle of elevation has increased to 35^o.



$\tan 35^\circ = \frac{a}{2}$

$a = 2\tan 35^\circ$

$\tan 21^\circ = \frac{b}{2}$

$b = 2\tan 21^\circ$

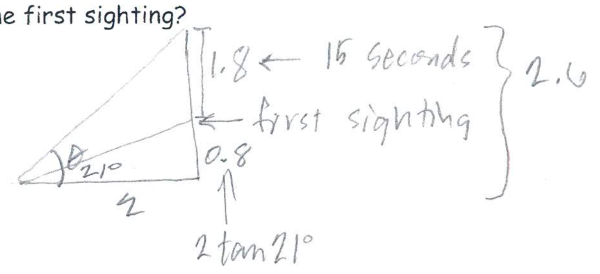
(a) How far did the rocket travel during the 5 second interval?

$x = a - b = 0.6$ km

(b) What was its average speed during the interval?

$\frac{0.6 \text{ km}}{5 \text{ sec}} = 0.12$ km/sec

(c) If the rocket keeps going vertically at the same average speed, what will be the angle of elevation 15 seconds after the first sighting?



$\tan\theta = \frac{2.6}{2}$

$\theta = \tan^{-1}\left(\frac{2.6}{2}\right)$

$\theta = 52.4^\circ$