3.10 Test Review: Laws and Area

Date: key

For each, a) state how many triangles and b) solve the triangle(s) if possible.

1. A = 79°, B = 33°, a = 7 AAS $\boxed{1\triangle}$

$C = 180 - 79 - 33 = 68°$

$\boxed{C = 68°}$

$\frac{b}{\sin 33°} = \frac{7}{\sin 79°}$ $\frac{c}{\sin 68°} = \frac{7}{\sin 79°}$

$b = \frac{7\sin 33°}{\sin 79°}$ $c = \frac{7\sin 68°}{\sin 79°}$

$\boxed{b = 3.884}$ $\boxed{c = 6.612}$

2. b = 5, a = 8, A = 110° ASS $\boxed{1\triangle}$

$\frac{\sin B}{5} = \frac{\sin 110°}{8}$

$B = \sin^{-1}\left(\frac{5\sin 110°}{8}\right)$

$\boxed{B_1 = 35.966°}$

$B_2 = 180 - B_1$ $B_2 = 144.034°$ X

$C = 180 - 110 - 35.966 = \boxed{34.034° = C}$

$\frac{c}{\sin 34.034°} = \frac{8}{\sin 110°}$

$c = \frac{8\sin 34.034°}{\sin 110°}$

$\boxed{c = 4.785}$

3. b = 8, a = 3, A = 30° ASS $\boxed{0\triangle}$

$\frac{\sin B}{8} = \frac{\sin 30°}{3}$

$B = \sin^{-1}\left(\frac{8\sin 30°}{3}\right)$

error

4. a = 24.1, b = 27, C = 18° SAS $\boxed{1\triangle}$

$c^2 = 24.1^2 + 27^2 - 2(24.1)(27)\cos 18°$

$\boxed{c = 8.491}$

$\frac{\sin A}{24.1} = \frac{\sin 18°}{8.491}$

$A = \sin^{-1}\left(\frac{24.1\sin 18°}{8.491}\right) = \boxed{61.287° = A}$

$B = 180 - 18 - 61.287$

$\boxed{B = 100.713°}$

5. A = 34°, B = 74°, c = 5 ASA $\boxed{1\triangle}$

$C = 180 - 34 - 74 = \boxed{72° = C}$

$\frac{a}{\sin 34°} = \frac{5}{\sin 72°}$ $\frac{b}{\sin 74°} = \frac{5}{\sin 72°}$

$a = \frac{5\sin 34°}{\sin 72°}$ $b = \frac{5\sin 74°}{\sin 72°}$

$\boxed{a = 2.940}$ $\boxed{b = 5.054}$

6. c = 41, A = 22.9°, C = 55.1° AAS $\boxed{1\triangle}$

$B = 180 - 22.9 - 55.1$

$\boxed{B = 102°}$

$\frac{b}{\sin 102°} = \frac{41}{\sin 55.1°}$

$b = \frac{41\sin 102°}{\sin 55.1°}$

$\boxed{b = 48.938}$

$\frac{a}{\sin 22.9°} = \frac{41}{\sin 55.1°}$

$a = \frac{41\sin 22.9°}{\sin 55.1°}$

$\boxed{a = 19.483}$

7. a = 4.1, b = 12, c = 8.7 SSS $\boxed{1\triangle}$

$12^2 = 4.1^2 + 8.7^2 - 2(4.1)(8.7)\cos B$

$144 = 92.5 - 71.34\cos B$

$51.5 = -71.34\cos B$

$\cos B = \left(\frac{51.5}{-71.34}\right)$

$B = \cos^{-1}\left(\frac{51.5}{-71.34}\right)$

$\boxed{B = 136.211°}$

$\frac{\sin A}{4.1} = \frac{\sin 136.211°}{12}$

$A = \sin^{-1}\left(\frac{4.1\sin 136.211°}{12}\right)$

$\boxed{A = 13.676°}$

$C = 180 - 136.211 - 13.676$

$\boxed{C = 30.113°}$

8. A = 47°, a = 25, b = 34 ASS 2 △s

△1

$\frac{\sin B}{34} = \frac{\sin 47°}{25}$

$B = \sin^{-1}\left(\frac{34\sin 47°}{25}\right)$

$\boxed{B_1 = 84.066}$

$C_1 = 180 - 47 - 84.066$

$\boxed{C_1 = 48.934°}$

$\frac{c}{\sin 48.934°} = \frac{25}{\sin 47°}$

$c = \frac{25\sin 48.934°}{\sin 47°}$

$\boxed{c = 25.773}$

△2

$B_2 = 180 - B_1 = \boxed{95.934° \; B_2}$

$C_2 = 180 - 47 - 95.934$

$\boxed{C_2 = 37.066°}$

$\frac{c}{\sin 37.066°} = \frac{25}{\sin 47°}$

$c_2 = \frac{25\sin 37.066°}{\sin 47°}$

$\boxed{c_2 = 20.603}$

Find the area of each.

9. a = 3, b = 5, c = 6

$S = \frac{3+5+6}{2} = 7$

$A = \sqrt{7(7-3)(7-5)(7-6)}$

$\boxed{A = 7.483 \text{ u}^2}$

10. a = 10, b = 6, C = 50°

$A = \frac{1}{2}(10)(6)\sin 50°$

$\boxed{A = 22.981 \text{ u}^2}$

11. A = 34°, B = 74°, c = 5

$C = 180 - 34 - 74$

$C = 72°$

$\frac{a}{\sin 34°} = \frac{5}{\sin 72°}$

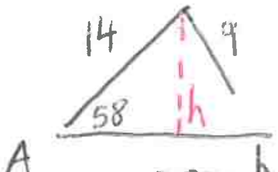
$a = \frac{5\sin 34°}{\sin 72°}$

$a = 2.940$

$A = \frac{1}{2}(2.94)(5)\sin 74°$

$\boxed{A = 7.065 \text{ u}^2}$

12. If b = 14, A = 58°, and a = 9, which law would you use first to solve and how many triangle solutions are there? *Law of sines, SSA



$\sin 58 = \frac{h}{14}$

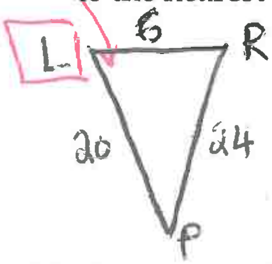
$h = 14\sin 58$

$h = 11.873$

no triangle, since side a is less than height.

13. When a hockey player attempts a shot, he is 20 feet from the left post of the goal and 24 feet from the right post. If a regulation hockey goal is 6 feet wide, what is the player's shot angle to the nearest degree?

125.685°



law of cosine

$l^2 = r^2 + p^2 - 2rp\cos(L)$

$24^2 = 20^2 + 6^2 - (2)(20)(6)\cos L$

$140 = -240\cos(L)$

$\frac{140}{-240} = \cos L \rightarrow L = \cos^{-1}(-0.5833)$

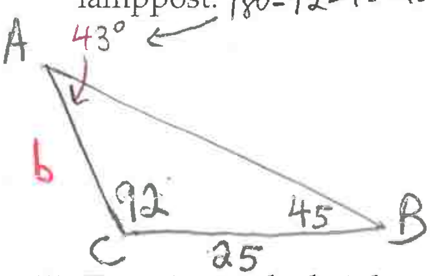
$L = 125.685°$

$\frac{\sin P}{6} = \frac{\sin 125.685}{24}$

$P = \sin^{-1}(0.203)$

$\boxed{P = 11.716°}$

14. A lamppost tilts toward the sun at a 2° angle from the vertical and casts a 25-foot shadow. The angle from the tip of the shadow to the top of the lamppost is 45°. Find the length of the lamppost. 180-92-45=43

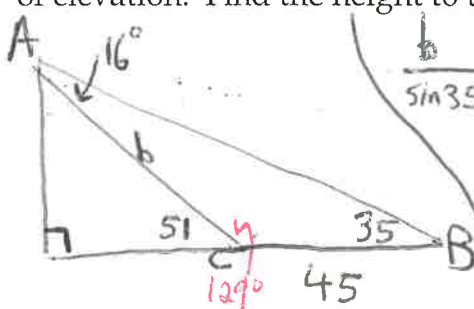


$\frac{b}{\sin 45} = \frac{25}{\sin 43}$

$b = \frac{25\sin 45}{\sin 43}$

$\boxed{b = 25.920 \text{ ft}}$

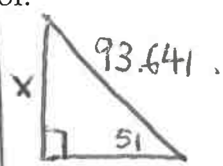
15. To estimate the height of Milton High School all the way to the top of the eagle weathervane, two students stand on the front lawn looking up at it. Jack looks up with a 35° angle of elevation. From a point 45 feet closer to the building, Emily looks up with a 51° angle of elevation. Find the height to the top of the school.



$\frac{b}{\sin 35} = \frac{45}{\sin 16}$

$b = \frac{45\sin 35}{\sin 16}$

$b = 93.641$



$\sin 51 = \frac{x}{93.641}$

$x = 93.641\sin 51$

$\boxed{x = 72.773 \text{ feet}}$

16. Find the area of a regular decagon inscribe in a circle with radius 10 cm.

$\frac{360}{10} = 36°$

$\text{Area} = \frac{1}{2}(10)(10)(\sin 36) = 29.389$

$\text{Area (decagon)} = 29.389 \times 10 = \boxed{293.893 \text{ cm}^2}$