9.3 The Law of Sines

HW pg. 347 #3 – 13odd, 15 – 21odd

For △ABC: $K = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B = \frac{1}{2}ab\sin C$, divide each by $\frac{1}{2}abc$. What results?

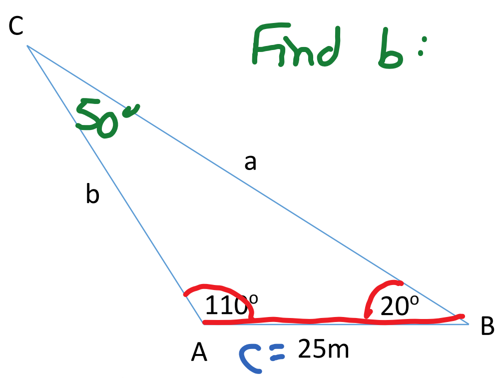
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

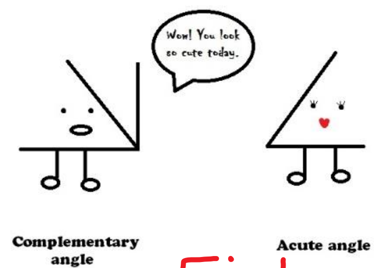
Law of Sines

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

- Only works with ASA, AAS, SSA (ASS) * Danger
- ASA or AAS (YEA!!!!)
- SSA (BOOO!!!)
- Working with $\sin\theta$ can often yield 2 possible angles.

1. Solve the Triangle (Find all missing sides and missing angles)





*ASA

$\angle C = 180° - (110° + 20°) = 50°$

$\angle C = 50°$

Find b:

$$\frac{\sin C}{c} = \frac{\sin B}{b}$$

$$\frac{\sin 50°}{25} = \frac{\sin 20°}{b}$$

$b\sin 50° = 25\sin 20°$

$$b = \frac{25\sin 20°}{\sin 50°}$$

$b \approx 11.2$ m

Find a:

$$\frac{\sin A}{a} = \frac{\sin C}{c}$$

$$\frac{\sin 110°}{a} = \frac{\sin 50°}{25}$$

$25\sin 110° = a\sin 50°$

$$a = \frac{25\sin 110°}{\sin 50°}$$

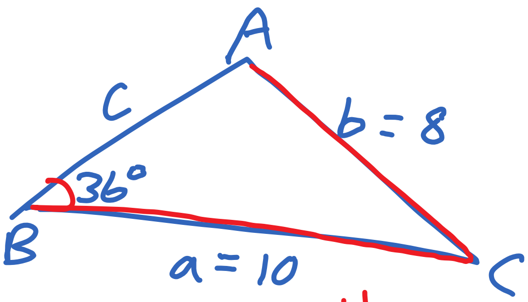
$a \approx 30.7$ m

Law of Sines in the SSA case (Oh no, we only have 1 angle…Boo!!!)

- You may be able to construct 0, 1, or 2 triangles.
- SSA is known as the ambiguous case.

9.3 **The Law of Sines**
HW pg. 347 #3 – 13odd, 15 – 22

2. ∠B = 36°, a = 10, b = 8. Solve △ABC. (Find all sides & angles)



* SSA - evil

No △
1 △
2 △

Find ∠A: $\frac{\sin A}{10} = \frac{\sin 36°}{8}$

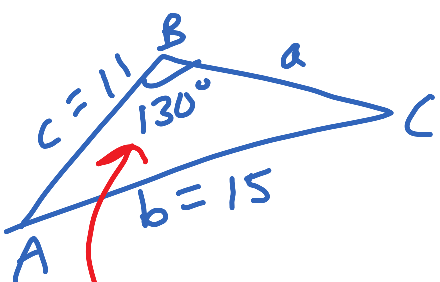
$\sin^{-1}$ $\sin A = \frac{10\sin 36°}{8}$

ref ∠ ≈ 47.3°

Q2: 132.7°

	△I	△II
∠A	47.3°	132.7°
∠C	180° − (36 + 47.3) 96.7°	180° − (36 + 132.7) 11.3°
c	$\frac{\sin 96.7°}{c} = \frac{\sin 36°}{8}$ c ≈ 13.5	$\frac{\sin 11.3°}{c} = \frac{\sin 36°}{8}$ c ≈ 2.67

3. ∠B = 130°, b = 15, c = 11. Solve △ABC.



Find ∠C: $\frac{\sin C}{11} = \frac{\sin 130°}{15}$

$\sin^{-1}$ $\sin C = \frac{11\sin 130°}{15}$

ref ∠ ≈ 34.2°

QI: 34.2°

Q2: ~~145.8°~~

can't have 2 obtuse ∠'s

∠C	34.2°
∠A	180° − (34.2° + 130°) = 15.8°
a	$\frac{\sin 130°}{15} = \frac{\sin 15.8°}{a}$ a ≈ 5.33

4. Redo # 23 from pg. 336. From points A and B, 10 m apart, the angles of elevation of the top of a tower are 40° and 54°, respectively, as shown at the right. Find the tower's height.