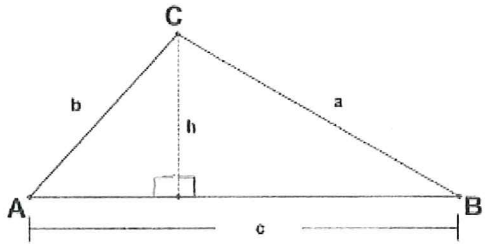
We use Law of sines + cosines to solve w/ in non right Δs. Use pyth. thm, special RTΔ + trig on Right Δs.

Acc: Law of Sines Notes

The Law of Sines In any triangle, there is a special relationship between the angles of the triangle and the lengths of the sides opposite the angles.

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



Prove the law of sines: $\frac{\sin A}{a} = \frac{\sin B}{b}$

Step 1:

Sin A= $\frac{h}{b}$ Sin B= $\frac{h}{a}$

Step 2: get h alone $h = b \cdot \sin A$ $h = a \cdot \sin B$

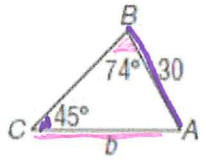
$h = h$

$b \sin A = a \sin B$ ← now divide both sides by "a" and "b".

Step 3: If two things are equal to the same thing, then they are....

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

Example 1 In $\triangle ABC$, find b.



$\frac{\sin 45}{30} = \frac{\sin 74}{b}$

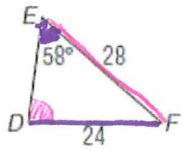
$b \sin 45 = 30 \sin 74$

$\frac{b \cdot \sin 45}{\sin 45} = \frac{30 \sin(74)}{\sin 45}$

$\boxed{b \approx 40.78 \text{ units}}$

make sure to close ( ) before ÷

Example 2 In $\triangle DEF$, find $m\angle D$.



$\frac{\sin D}{28} = \frac{\sin 58}{24}$

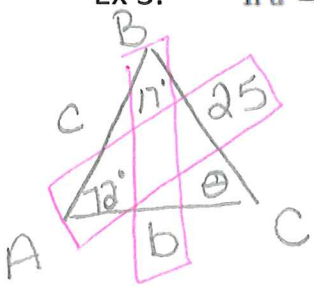
$\sin D = \frac{28 \cdot \sin(58)}{24}$

$\angle D = \sin^{-1}\left(\frac{28 \sin(58)}{24}\right)$

$\angle D \approx 81.64°$

Find the missing variable and solve the triangle. means find all missing ∠s + sides.

Ex 3. If $a = 25$, $m\angle A = 72$, and $m\angle B = 17$, find b.



$\frac{\sin 17}{b} = \frac{\sin 72}{25}$

$b \sin 72 = 25 \sin 17$

$b = \frac{25 \sin(17)}{\sin 72}$

$\boxed{b \approx 7.68}$

$\angle C = \theta$ use Δ sum theorem

$180 = 17 + 72 + \theta$

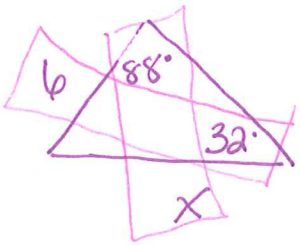
$\boxed{\angle C = 91°}$

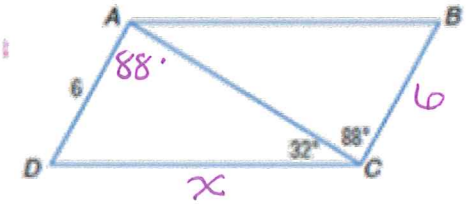
$\frac{\sin 91°}{c} = \frac{\sin 72}{25}$

$c = \frac{25 \sin(91)}{\sin 72}$

$\boxed{c \approx 26.28}$

Ex 4. Find the perimeter of the parallelogram





$\frac{\sin 88}{x} = \frac{\sin 32}{6}$

$x = \frac{6 \cdot \sin(88)}{\sin 32}$

$x \approx 11.32$ units

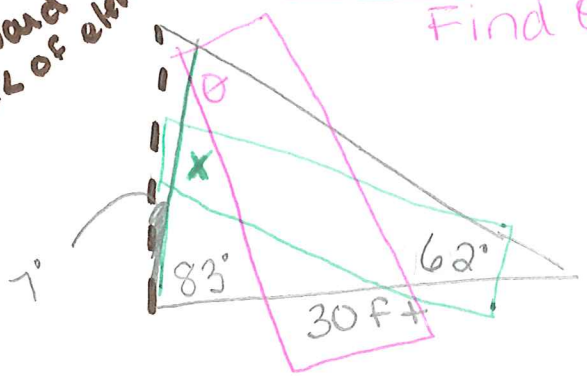
Now find Perimeter

$P \approx 11.32 + 11.32 + 6 + 6$

$P \approx 34.64$ units

Ex 5. **ENGINEERING** When the angle of elevation to the Sun is 62°, a telephone pole tilted at an angle of 7° from the vertical casts a shadow 30 feet long on the ground. Find the length of the telephone pole to the nearest tenth of a foot.

toward the ∠ of elevation



Find θ 1st using Δ sum theorem.

$\theta = 35°$

$\frac{\sin 62}{x} = \frac{\sin 35}{30}$

$x = \frac{30 \cdot \sin(62)}{\sin 35}$

$x \approx 46.2$ ft