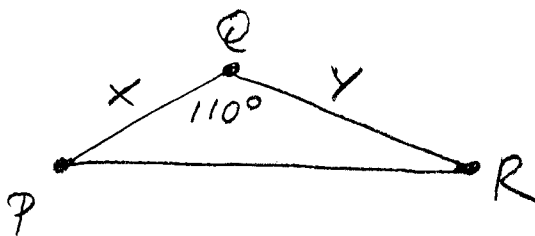
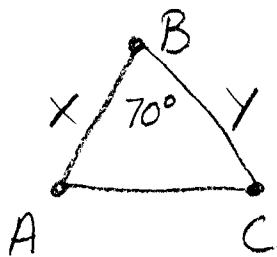


ACT ① $\triangle ABC$ AND $\triangle PQR$ ARE SHOWN BELOW.
 THE GIVEN SIDE LENGTHS ARE IN CENTIMETERS.
 THE AREA OF $\triangle ABC$ IS 30 SQUARE CENTIMETERS.
 WHAT IS THE AREA OF $\triangle PQR$ IN SQUARE CENTIMETERS?



$$A_{\triangle ABC} = 30 = xy \sin 70$$

$$A_{\triangle PQR} = xy \sin 110^\circ$$

$$\frac{30}{\sin 70} = xy$$

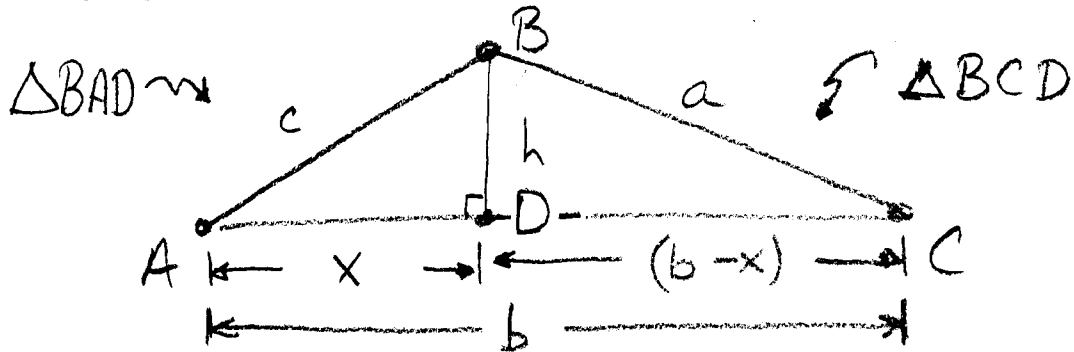
$$\therefore A = \frac{30 \sin 110^\circ}{\sin 70^\circ}$$

\nearrow
 $\theta' = 70^\circ$

$$A = \frac{30 \cancel{\sin 70}}{\cancel{\sin 70}}$$

$$A = 30 \text{ cm}^2$$

LETS LOOK AT ANOTHER \triangle WITH "STANDARD" labels and lets include h . Since we don't know how h (the altitude or height) divides side b , we will label them x and $b-x$ and see where that leads:



$$a^2 = (b-x)^2 + h^2 \quad \text{P.T. } \triangle BCD$$

$$a^2 = b^2 - 2bx + \underbrace{x^2 + h^2}_{\text{"FOIL"}}$$

$$c^2 = \underbrace{x^2 + h^2}_{\text{P.T. } \triangle BAD}$$

$$a^2 = b^2 - 2b\underbrace{x}_{\text{Substitution}} + c^2$$

$$\cos A = \frac{x}{c} \quad \therefore x = \underbrace{c \cos A}_{\text{Substitution}}$$

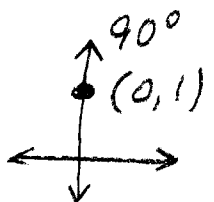
$$a^2 = b^2 - 2b(c \cos A) + c^2$$

$$\boxed{a^2 = b^2 + c^2 - 2bc \cos A} \quad \text{LAW OF COSINES}$$

↑ SAME ENDS ↑

P.T.

WHAT IS $\cos 90^\circ$?



Ch. 13-5 LAW OF COSINES

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

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

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

"3 out of 4" problems

Best if you know 2 sides

eg. SSS, SAS, or SSA

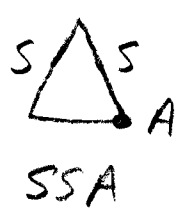
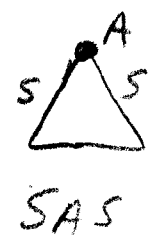
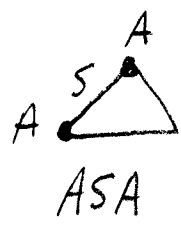
SPECIAL CASE IF angle is opposite SHORT SIDE

For ASA or AAS use LOS

For any Δ , you have seen that in Right Δ 's, the sin, cos, tan and P.T. are all you need. But for non-right Δ 's think

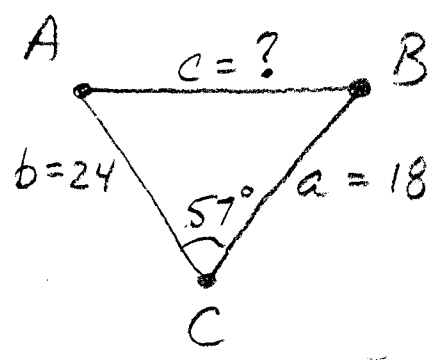
LOS \Rightarrow know 2 angles

LOC \Rightarrow know 2 sides



EX1
PS 734

Solve $\triangle ABC$



SAS \Rightarrow LOC \Rightarrow NO WORRIES MATE

Know a, b, C, perfect for $c^2 =$ 3 KNOWNS form

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

$$c^2 = 18^2 + 24^2 - 2(18)(24)(\cos 57^\circ)$$

$$c^2 = 324 + 576 - 864(.5446)$$

$$c^2 = 900 - 470.53 = 429.47$$

$$c = \sqrt{429.47} \approx \boxed{20.7 = c}$$

Use LOS to find A or B, lets find A

$$\frac{\sin A}{18} = \frac{\sin 57}{20.7} \quad \therefore \sin A = 18 \left(\frac{\sin 57}{20.7} \right)$$

$$\sin A = 18 \left(\frac{.8387}{20.7} \right)$$

$$\sin A = .7293$$

$$A = \sin^{-1}(.7293)$$

$$\boxed{A \approx 46.8^\circ}$$

$$\therefore B = 180 - 46.8 - 57$$

$$\boxed{B = 76.2^\circ}$$

Memory Aid: For 2 Angles \Rightarrow LOS
 2 sides \Rightarrow LOC

LOS \Rightarrow Full of Angles

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

LOC \Rightarrow Full of sides

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

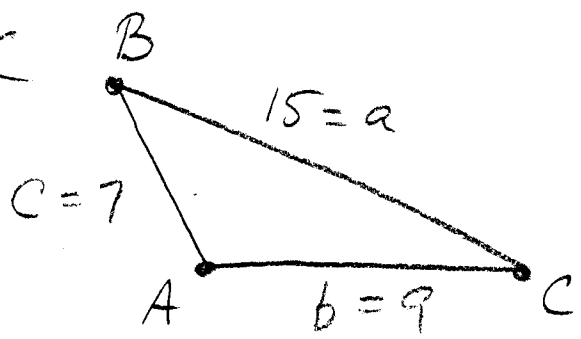
AAS } LOS
 ASA }

SSS } LOC
 SAS }

SSA } use LOC \Rightarrow SOLVING THE
 QUADRATIC WILL
 TAKE CARE OF
 SPECIAL CASE \Rightarrow
 2, 1, or 0 POSITIVE,
 REAL SOLUTIONS

Ex 2
Pg 734

Solve $\triangle ABC$



SSS

Pick any of the 3 Law of Cosines \Rightarrow
TIP \Rightarrow Find the largest angle first \Rightarrow

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

$$15^2 = 9^2 + 7^2 - 2(9)(7) \cos A$$

$$225 = 81 + 49 - 126 \cos A$$

$$225 = 130 - 126 \cos A$$

$$\frac{95}{-126} = \frac{-126 \cos A}{-126}$$

$$-.7540 = \cos A \quad \therefore A = \cos^{-1}(-.7540)$$

$$A \approx 138.9^\circ$$

$\begin{matrix} \textcircled{S} & \textcircled{A} \\ \textcircled{7} & \textcircled{9} \\ \textcircled{C} & \textcircled{B} \end{matrix}$
 COS NEG. IN Q II
 $\theta' = 41.1^\circ$
 $\therefore \theta = 180 - 41.1 = 138.9$

Use LOS to find B or C:

$$\frac{\sin B}{9} = \frac{\sin 138.9^\circ}{15} \quad \therefore \sin B = 9 \left[\frac{\sin 138.9^\circ}{15} \right]$$

$$\sin B = 9 \left[\frac{.6574}{15} \right]$$

$$\sin B = .3944$$

$$B = \sin^{-1}(.3944)$$

$$B = 23.2^\circ$$

$$\therefore C = 180 - 138.9 - 23.2 = 17.9^\circ = C$$

LOOK
 HW = Pg 736 #4, 11, 17.