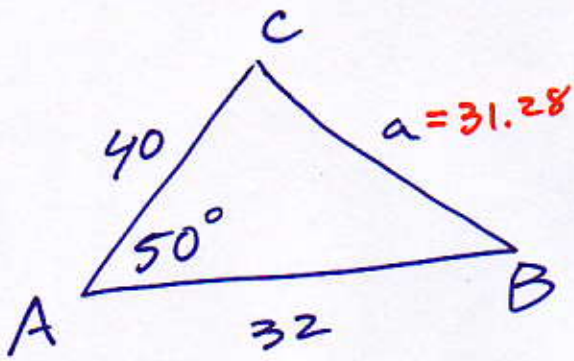
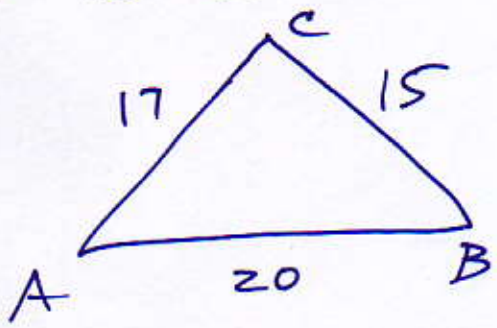
SEC. 4.2 LAW OF COSINES

1. LAW OF COSINES: USED WHEN A SAS OR SSS IS GIVEN.



SAS

OR



SSS

$$* a^2 = b^2 + c^2 - 2bc\cos A \qquad \cos A = \frac{(b^2+c^2-a^2)}{(2bc)}$$

$$b^2 = a^2 + c^2 - 2ac\cos B \qquad \cos B = \frac{(a^2+c^2-b^2)}{(2ac)}$$

$$c^2 = a^2 + b^2 - 2ab\cos C \qquad \cos C = \frac{(b^2+a^2-c^2)}{(2ba)}$$

EXAMPLE

$$a^2 = 40^2 + 32^2 - 2\cdot(40)(32)\cos 50^\circ$$

$$\sqrt{a^2} = \sqrt{978.46}$$

$$\boxed{a = 31.28}$$

$$\frac{40 \sin 50}{31.28} = \frac{\sin B}{40}$$

$$\sin^{-1}\ .9796 = \sin^{-1} \sin B$$

$$\boxed{78.4^\circ = B}$$

$180 - 28.4 - 50$

$$\boxed{C = 51.6}$$

2. AREA OF A TRIANGLE

$$K = \frac{1}{2}bc\sin A$$

OR

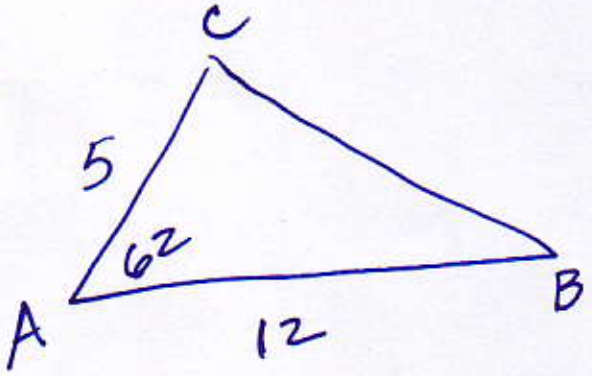
$$K = \frac{1}{2}ac\sin B$$

OR

$$K = \frac{1}{2}ab\sin C$$

WHERE K IS THE AREA OF THE TRIANGLE.

EX.



$$K = \frac{1}{2}\cdot 5\cdot 12\cdot \sin 62$$

$K = 26.5$ SQ. UNITS

3. HERON'S THEOREM (AREA OF A TRIANGLE GIVEN SSS.)

$$K = \sqrt{s(s-a)(s-b)(s-c)}$$

WHERE K = AREA AND

$$s = \frac{a+b+c}{2}$$

EXAMPLE:

H.W. 29. $a = 16$ $b = 12$ $c = 14$

FIND $S = \frac{16+12+14}{2}$ $\frac{42}{2} = 21 = S$

$$K = \sqrt{21(21-16)(21-12)(21-14)}$$

$$K = \sqrt{6615}$$

$K = 81.33$ SQ. UNITS