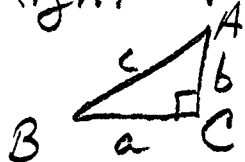


Geometry Monday 11-26-12 Class Notes

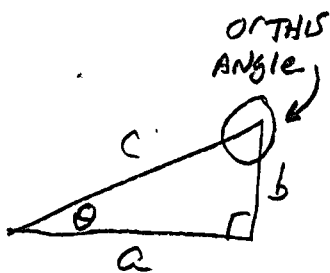
Triangle tools we have used so far:

Right Triangle: know 2 sides

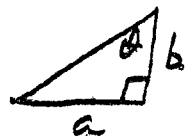
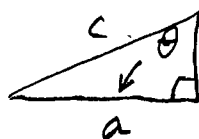
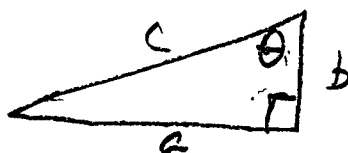
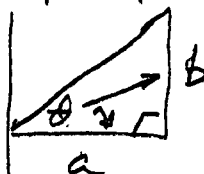
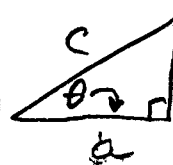


$\Rightarrow$ Pythagorean Theorem
 $c^2 = a^2 + b^2$

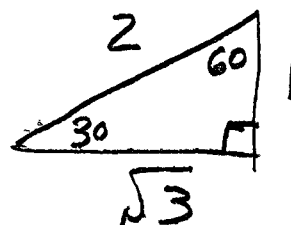
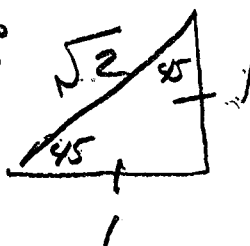
Right Triangle: know an acute angle and a side



$\Rightarrow$ SOH CAH TOA



Right Triangles:



These are All Right Triangles.

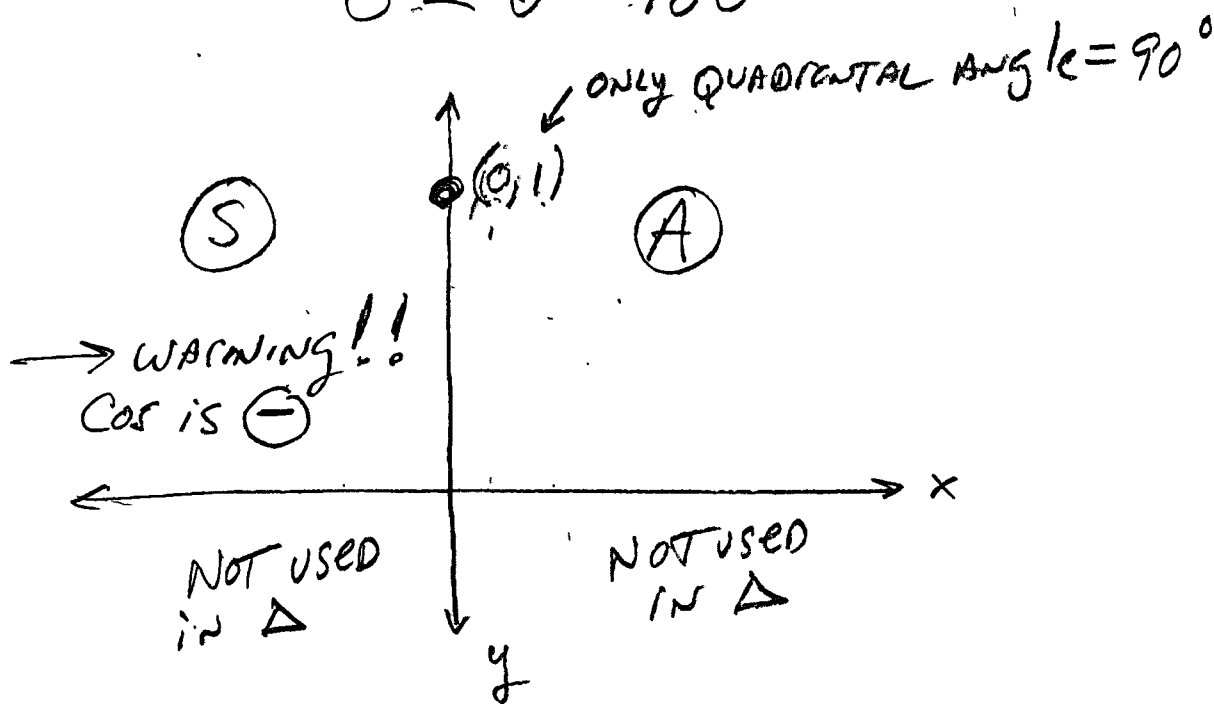
YOUR TWO TOOLS FOR NON-RIGHT TRIANGLES

WHAT KINDS OF ANGLES will you see in "ANY" triangle? WHAT kinds of SIN. & COS & TAN VALUES will you see? HINT, ACUTE, right, obtuse Δ

$$\Delta \Rightarrow \text{ONLY ANGLES } 0 \text{ to } 180^\circ \Rightarrow$$

∴ QUADRANT 1 or 2

$$0^\circ < \theta < 180^\circ$$



⇒ SIN is OK, Always $\oplus$

⇒ COS is $\ominus$ for the large angle in AN OBTUSE Δ

Geometry I Monday 11-26-12 Class Notes

Ch. 8-5 LAW OF SINES (LOS)
LAW OF COSINES (LOC)

Tools for Right $\triangle$

- Pythagorean Theorem ($90^\circ + 2 \text{ sides}$)
- SOH CAH TOH ($90^\circ + 1 \text{ side} + 1 \text{ angle}$)
- 30/60/90 or 45/45/90 ($AAA + 1 \text{ side}$)

Tools for Acute or Obtuse $\triangle$ (NOT Right)

- LOS (ASA or AAS)
- LOC (SAS, or SSS)

AAA = CAN'T SOLVE

SSA = LOS or LOC

↓
GET ABOUT
4
FLASHCARDS

↓
USE
QUADRATIC
FORMULA
0, 1, or 2

LOS

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

Really, 3 forms also:

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

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

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

Need 3 out
of 4 to
solve,

want 2 angles

⇒ ASA or AAS

* must use 1 angle and
its opposite side

LOC

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

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

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

3 forms

NOTE:

in A, B, or C = 90°

$$\cos 90^\circ = 0$$

Left with

$$c^2 = a^2 + b^2 \checkmark$$

Need 3 out of 4
to solve,

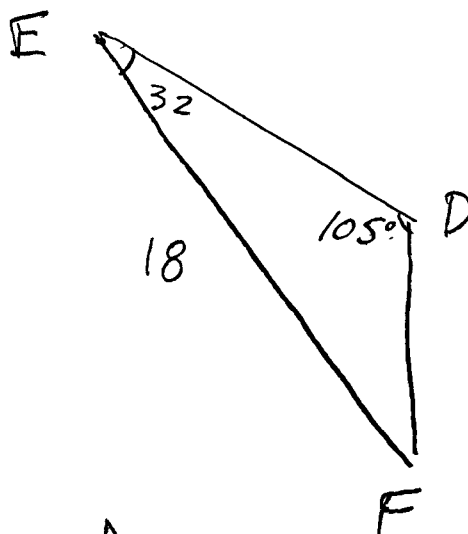
want ≥ 2 sides

SAS or SSS { or SSA
* SPECIAL
CASE
QUADRATIC
EQUATION

Ex 2
Pg 570

MEANS FIND ALL MISSING ANGLES/sides

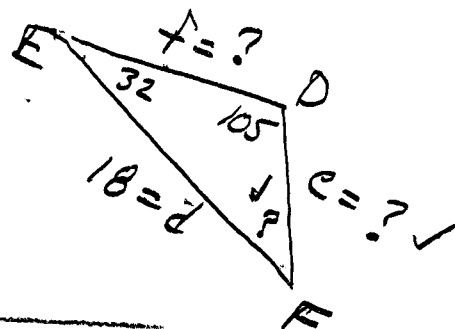
Solve the Δ , sides to nearest tenth, angles to nearest degree



Label $\overline{DE}$ as f
 $\overline{EF}$ as d
 $\overline{FD}$ as e

EASIEST,
DO FIRST

112 L IS ALWAYS
MEANS 3



$$\angle F = 180 - (32 + 105) = \boxed{43^\circ = \angle F}$$

OBTUSE Δ , AAS $\Rightarrow$ LOS

$$\frac{\sin 105}{18} = \frac{\sin 32}{e}$$

$$e \sin 105 = 18 \sin 32$$

HOORAY!

$$e = \frac{18 \sin 32}{\sin 105} = \frac{18 \sin 32}{\sin 75} = \frac{18(0.5299)}{(0.9659)}$$

SIN IS
⊕ IN Q II

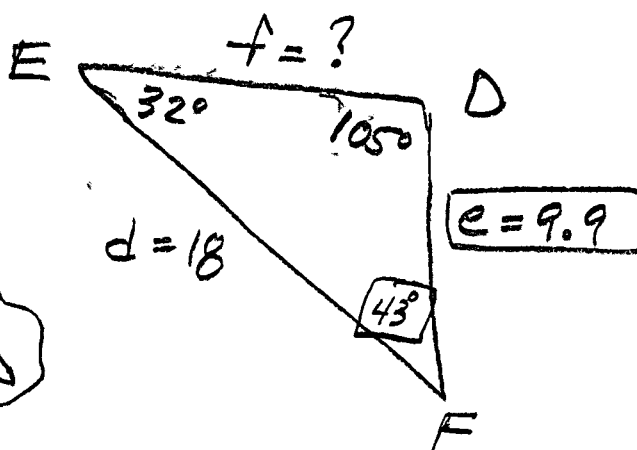
5 1 A

$e_{\text{REF}} = 75^\circ$

$$= \frac{9.5382}{0.9659} = 9.87 \approx \boxed{9.9} = e$$

(CONTINUE)

EX2
CART



Use $\frac{D}{d}$ from original problem to find f , don't use $\frac{E}{e}$ since you might have made a mistake in finding $e = 9.9$. If so, you can still get side f right.

$$\frac{\sin D}{d} = \frac{\sin F}{f} \quad \text{Know "3 of 4"}$$

$$\frac{\sin 105}{18} = \frac{\sin 43}{f}$$

$$f \sin 75 = \frac{18 \sin 43}{\sin 75}$$

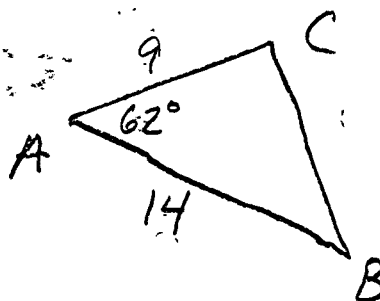
↙ Def Angle

$$f = \frac{18 (.6820)}{(.9659)} \approx 12.709 \approx \boxed{12.7 = f}$$

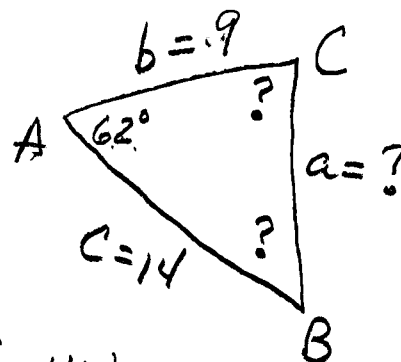
See Mr. C's
Wolfram Alpha Widgets

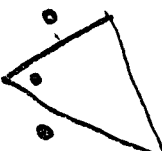
Ex 3
Pg 571

Solve:



Label EVERYTHING:



Since  SAS, you

CAN'T use LOS $\Rightarrow \frac{\sin 62}{a} = \frac{\sin C}{14}$
TWO UNKNOWN!

Since ≥ 2 sides $\Rightarrow$ LOC

MUST use KNOWN Angle = 62° = A

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

$$a^2 = 9^2 + 14^2 - 2(9)(14) \cos 62^\circ$$

↑
QUADRANT I, hooray

$$a^2 = 81 + 196 - (18)(14)(0.4695) \quad \boxed{\text{E}}$$

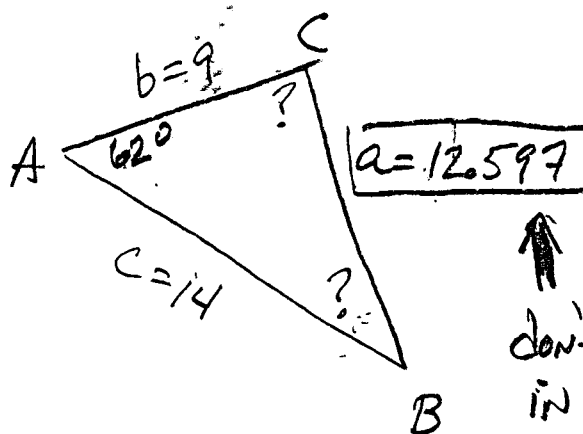
$$277 - 118.314$$

$$a^2 = 158.686$$

$$a = 12.597$$

$$\boxed{a \approx 12.6} \text{ (CONTINUE)}$$

Ex 3
Cont



don't use rounded 12.6
in next calculation!

To find $m\angle C$ or $m\angle B$, must use LOC AGAIN.
(Sometimes you will be able to use LOR for
next step)

Let's find $\angle B$ next (EASIER way - next pg)

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

$$9^2 = (12.597)^2 + 14^2 - 2(12.597)(14) \cos B$$

$$\boxed{81} = 158.684 + 196 - 352.716 \cos B$$

$$81 = 354.684 - 352.716 \cos B$$

$$-354.684 \quad -354.684$$

$$\frac{-273.684}{-352.716} = \frac{-352.716 \cos B}{-352.716}$$

$$.7759 = \cos B$$

$$\cos^{-1}(.7759) = \boxed{B = 39.11^\circ \approx 39^\circ}$$

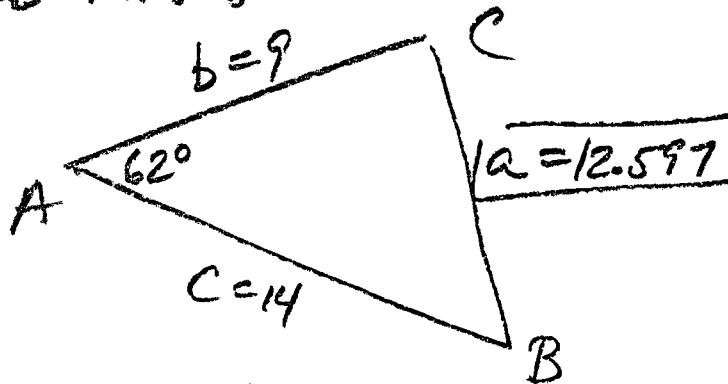
∴ (CONTINUE)

↑
⊕ cos
⇒ ACUTE
Angle, ⊖
THIS WOULD
BE REF. Angle

9.

Usually - after using the Law of Cosines
it will be easier to use the Law of

Sines next:



Find B $\Rightarrow$

$$\frac{\sin B}{9} = \frac{\sin 62}{12.597} \quad \text{MULT. EACH SIDE BY 9}$$

$$\sin B = \frac{9 \sin 62}{12.597}$$

$$B = \sin^{-1} \left[\frac{9 (.8829)}{12.597} \right]$$

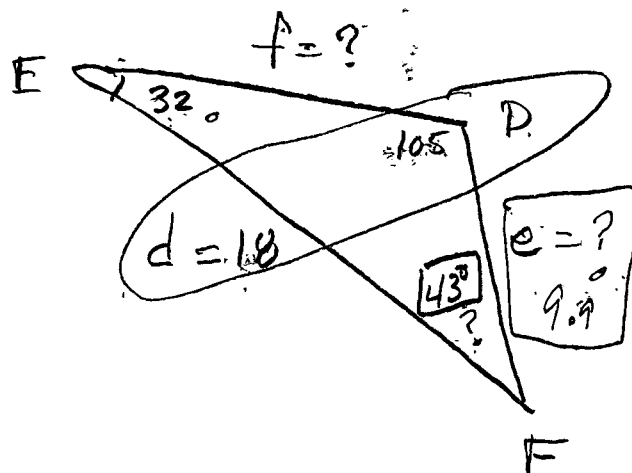
$$B = \sin^{-1} [.6308]$$

$$\boxed{B = 39^\circ}$$

$$\therefore C = 180 - (39 + 62)$$

$$\boxed{C = 79^\circ}$$

EX



AAS = LOS

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

$$\frac{\sin D}{d} = \frac{\sin E}{e}$$

$$m\angle F = 180 - (105 + 32) = 43^\circ = m\angle F$$

$$\frac{\sin 105}{18} = \frac{\sin 32}{e}$$

$$\frac{e \sin 75}{\sin 75} = \frac{18 \sin 32}{\sin 75}$$

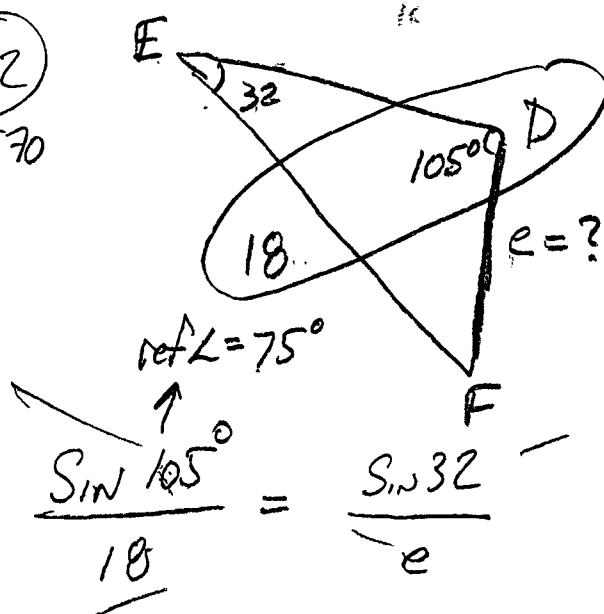
$$e = \frac{18(.5299)}{(.9659)} = 9.875 = 9.9 = e$$

$$\frac{\sin 75}{18} = \frac{\sin 43}{f}$$

$$f \frac{\sin 75}{\sin 75} = \frac{18 \sin 43}{\sin 75}$$

$$f = \frac{18 \sin 43}{\sin 75} = \frac{18(.6820)}{(.9659)} = 12.709 = 12.7 = f$$

EX2
pg. 570



FIND: $\overline{DF}$

AAS

LOS

$$\frac{\sin 105^\circ}{18} = \frac{\sin 32^\circ}{e}$$

$$\frac{e \sin 75^\circ}{\sin 75^\circ} = \frac{18 \sin 32^\circ}{\sin 75^\circ}$$

$$e = \frac{18(.5299)}{(.9659)} \boxed{2} = 9.8749$$

$$\boxed{e = 9.9}$$

LOS

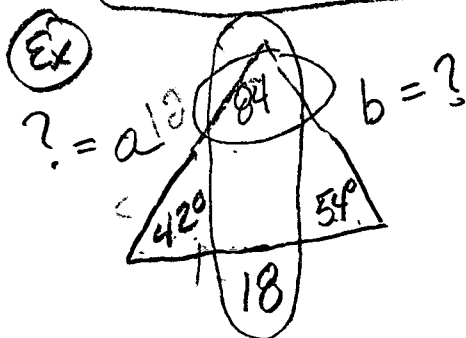
$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

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

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

ASA, AAS

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



$$\frac{\sin 84}{18} = \frac{\sin 54}{a}$$

$$a \sin 84 = \frac{18 \sin 54}{\sin 84}$$

$$a = \frac{18(.8090)}{(.9945)} = 14.642$$

$$a = 14.6$$

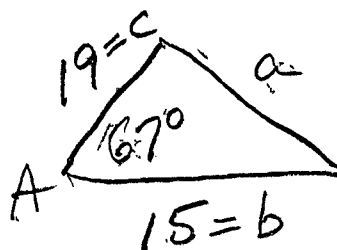
LOC

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

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

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

SAS, SSS



Ex

$$a^2 = 15^2 + 19^2 - 2(15)(19) \cos 67^\circ$$

$$a^2 = 225 + 361 - 570(.3907)$$

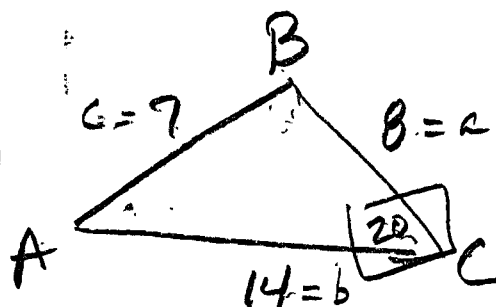
$$a^2 = 586 - 222.699$$

$$a^2 = 363.301$$

$$a = 19.060$$

$$a = 19.1$$

ex 3 SIDES
8, 7, 14
SSS



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

$$7^2 = 8^2 + 14^2 - 2(8)(14) \cos C$$

$$49 = 64 + 196 - (16)(14) \cos C$$

$$49 = 260 - 224 \cos C$$

-260 -260

$$\frac{-211}{-224} = \frac{-224 \cos C}{-224}$$

$$.9420 = \cos C$$

$$\cos^{-1}(.9420) = C \approx 19.6 \approx 20^\circ$$