Analytic Geometry

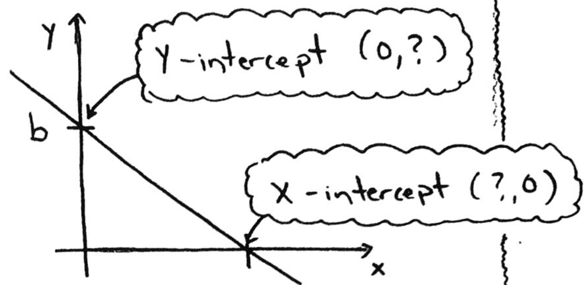
$y = a \cdot x + b$

$a \rightarrow$ (slope, R.O.C)

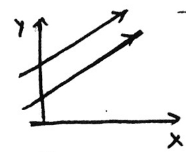
$b \rightarrow$ (initial value, y-intercept)

$$'a' = \frac{y_2 - y_1}{x_2 - x_1}$$

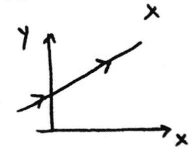
- y - intercept : (x must $= 0$) 'b'
- x - intercept : (y must $= 0$)



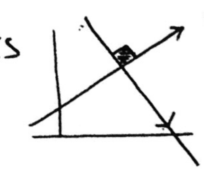
- PARALLEL LINES (//) → SAME SLOPE ('a') → DIFF y-int ('b')



- COINCIDENT LINES → SAME SLOPE ('a') → SAME y-int ('b')



- PERPENDICULAR ($\perp$) → NEG. RECIPROCAL SLOPES (FLIP & SWITCH).



- DISTANCE $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

  $A(x_1, y_1)$
  $B(x_2, y_2)$

- MIDPOINT : $\left(x_M = \frac{x_1 + x_2}{2}, \quad y_M = \frac{y_1 + y_2}{2}\right)$

- DIVISION POINT (x_D, y_D) $= \left[x_1 + \frac{a}{b}(x_2 - x_1), \quad y_1 + \frac{a}{b}(y_2 - y_1)\right]$

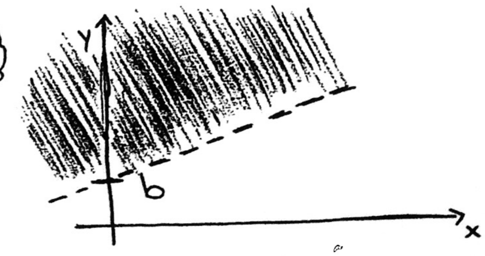
  (★ ALWAYS START FROM (x_1, y_1) !)

INEQUALITIES

(★ IF YOU × OR ÷ BY A NEGATIVE #, SWITCH THE DIRECTION OF THE SIGN.)

$\underbrace{y >}\ a \cdot x + b$

SHADE ABOVE, WITH DOTS



SYSTEM of EQUATIONS

1. MAKE EQUATIONS LOOK LIKE $y = a \cdot x + b$
2. LOSE THE ys & MAKE THE EQUATIONS = EACH OTHER.
3. SOLVE FOR 'x'
4. PLUG THE 'x' NUMBER INTO ONE OF THE ORIGINAL EQUATIONS, & SOLVE FOR 'y'
5. GIVE THE 'x' AND 'y' COORDINATES TOGETHER.

- $y = 2x - 10$
- $y = 3x + 5$

$$2x - 10 = 3x + 5$$
$$-2x \qquad -2x$$
$$-10 = x + 5$$
$$-5 \qquad -5$$
$$\boxed{-15 = x}$$

$$y = 2x - 10$$
$$y = 2(-15) - 1$$
$$y = -30 - 1$$
$$\boxed{y = -40}$$

TRIGONOMETRY.

SOH - CAH - TOA. (only for $\triangle$)

① MARK THE ANGLE YOU ARE WORKING WITH.

② LABEL THE SIDES ACCORDING TO THE ANGLE.

(OPPOSITE / ADJACENT / HYPOTENUSE)

* HYP. is ALWAYS ACROSS from the 90°

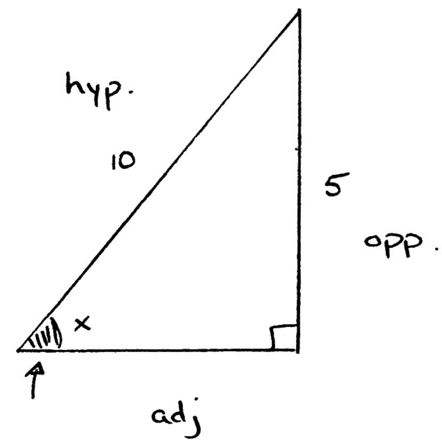
③ LIST YOUR HAVES & WANTS.

④ CHOOSE THE RIGHT SOH - CAH - TOA.

* if LOOKING FOR THE ANGLE,

un - SIN , un - COS , or un - TAN @ THE END.
($\sin^{-1}$) ($\cos^{-1}$) ($\tan^{-1}$)

SOH - CAH - TOA.



HAVE : OPP / HYP

WANT : x

$$\frac{\sin x}{1} = \frac{opp}{hyp.}$$

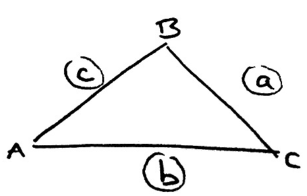
$$\sin x = \frac{5}{10}$$

$$\sin^{-1} \cancel{\sin} x = \sin^{-1} 0.5$$

$$x = 30°$$

SINE - LAW. (for any $\triangle$)

→ ANGLES & OPPOSITE SIDES GET SAME LETTER.



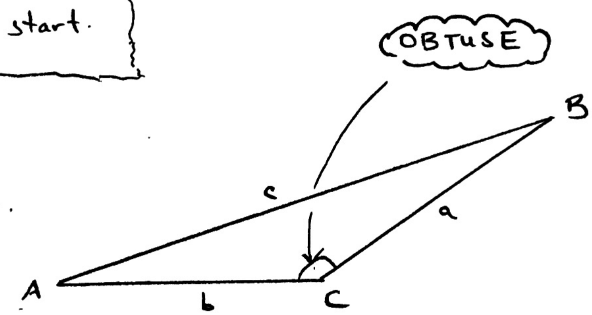
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

↳ ONLY NEED 3 of 4 to start.

* OBTUSE (bigger THAN 90°)

→ CALCULATOR ALWAYS gives small ANGLE.

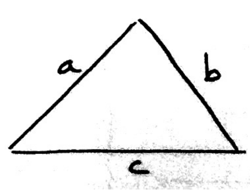
$$\text{OBTUSE} = 180° - \text{ACUTE}$$



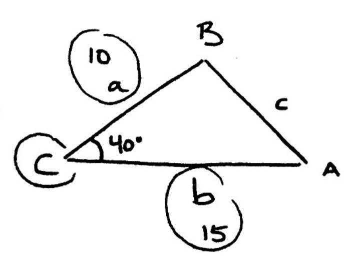
AREA of a Δ (HERO'S).

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

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



· AREA Δ given 2 sides & angle in between.



$$A_\Delta = \frac{a \cdot b \cdot \sin C}{2}$$

$$= \frac{(10)(15)(\sin 40)}{2}$$

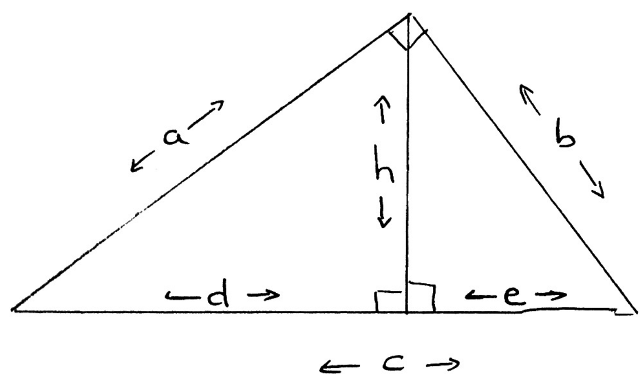
$$= 96.418 \text{ units}^2$$

METRIC RELATIONS

3 Δ all together.

- 'c' IS ALWAYS THE HYPOTENUSE (OPPOSITE THE 90°) ON THE BIG Δ
- 'a' & 'd' go in the same Δ
- 'b' & 'e' go in the same Δ

a=
b=
c=
d=
e=
h=



formulas

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

$a^2 = c \cdot d$

$b^2 = c \cdot e$

$h^2 = d \cdot e$

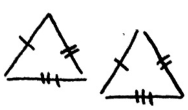
$a \cdot b = c \cdot h$

$c = d + e$

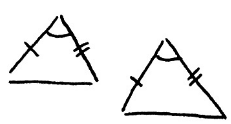
$a^2 = h^2 + d^2$

$b^2 = h^2 + e^2$

ISOMETRIC (CONGRUENT) PROOFS.

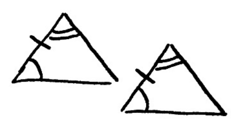


$\boxed{\text{SSS}}$



$\boxed{\text{SAS}}$

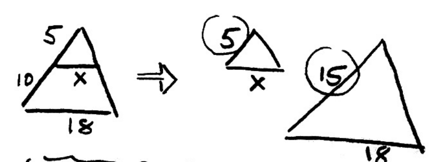
must be in the middle



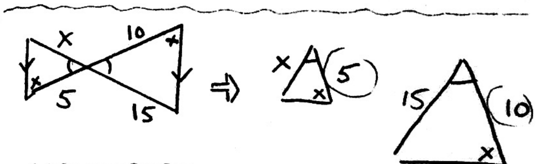
$\boxed{\text{ASA}}$

must be in between the same angles.

FINDING UNKNOWNS

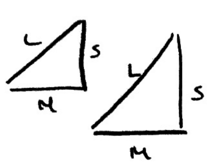


$\frac{15}{5} = \frac{18}{x}$ $x = \frac{18 \cdot 5}{15} = 6$

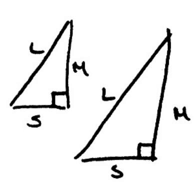


$\frac{10}{5} = \frac{15}{x}$ $x = \frac{15 \cdot 5}{10} = 7.5$

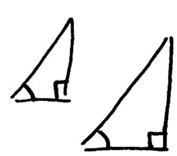
SIMILAR (same shape, diff sizes) PROOFS.



$\boxed{\text{SSS}}$



$\boxed{\text{SAS}}$



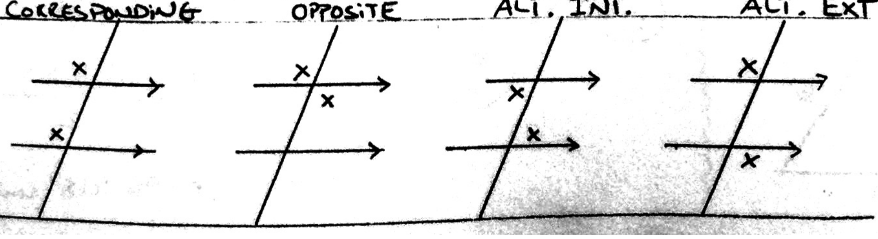
$\boxed{\text{AA}}$

$\frac{\text{ongest}}{\text{longest}} = \frac{\text{med}}{\text{med}} = \frac{\text{smallest}}{\text{smallest}}$

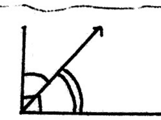
- Same scale factor
- matching ∠ in middle.

ALL CONGRUENT (≅) → SAME MEASURE.

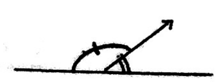
CORRESPONDING | VERT OPPOSITE | ALT. INT. | ALT. EXT



- COMPLEMENTARY (90°)



- SUPPLEMENTARY (180°)



- ∠s IN A Δ. (180°)