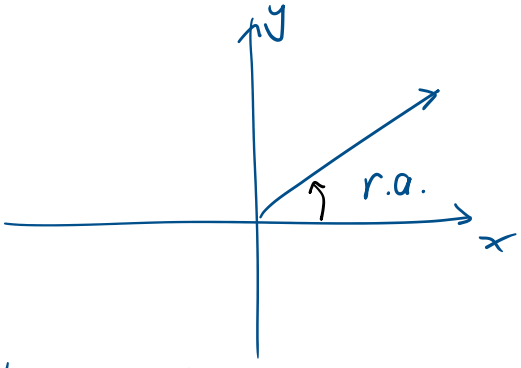
VIII. Reference Angle ← most important

A reference angle is the smaller closest angle to the x-axis.

Book's Defn: It is any non-acute angle that is acute to the x-axis, after the reduction from 180°, 270°, 360°, ...

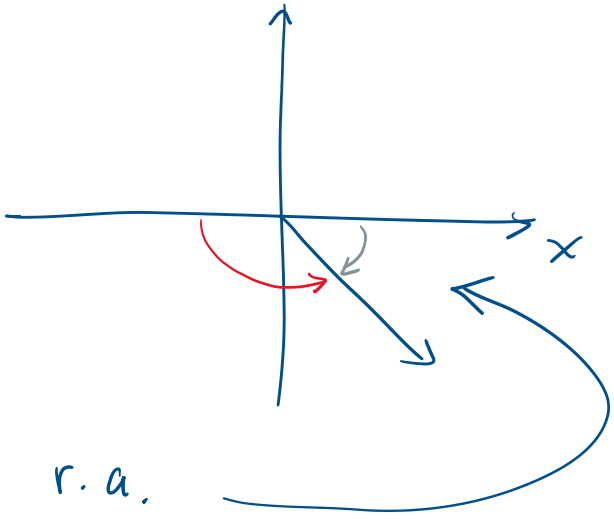
Remember: Angles go in counter-clockwise. ↶

eg.



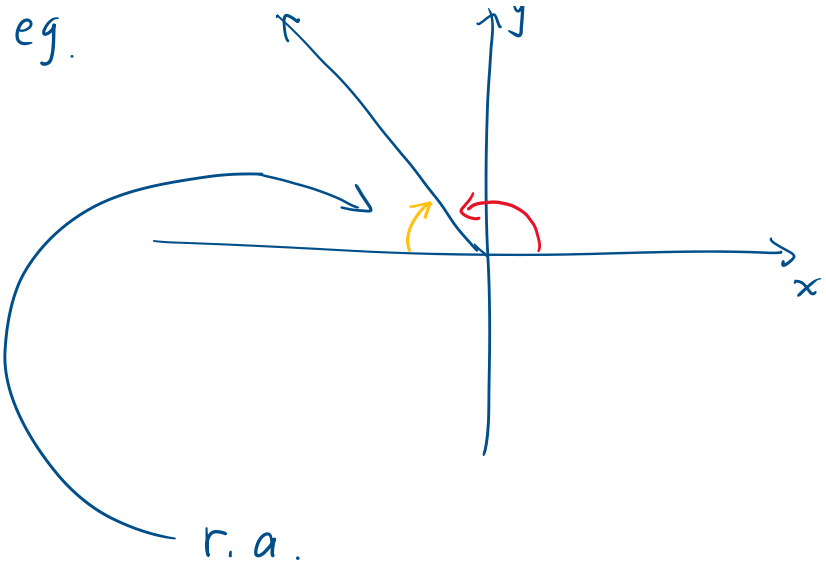
Only 1 angle, automatically a r. a..

eg.

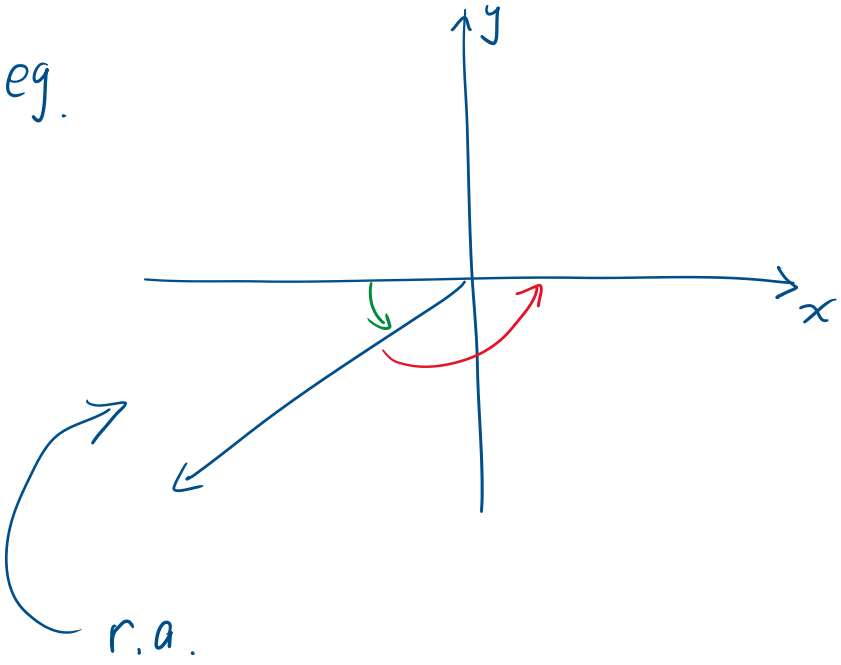


eg.

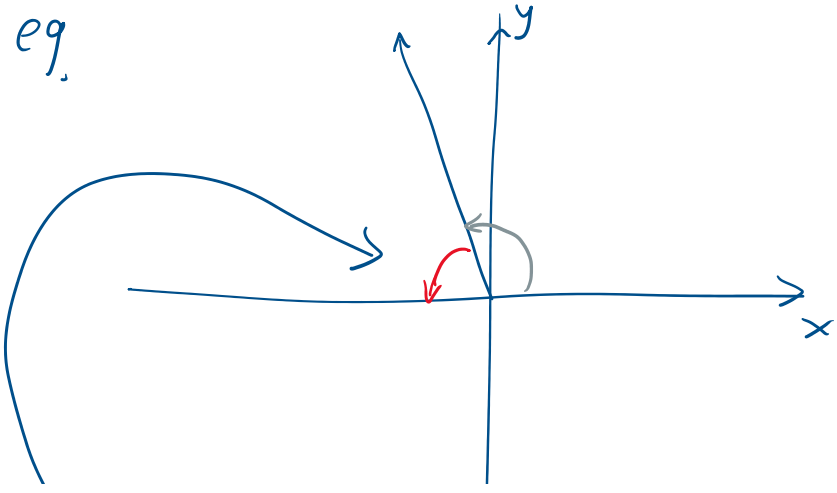
eg.



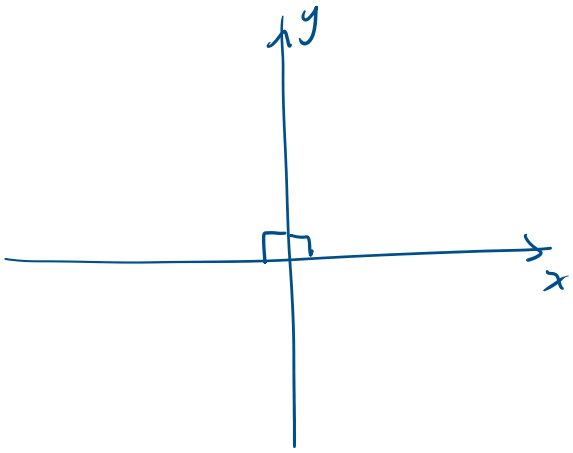
eg.



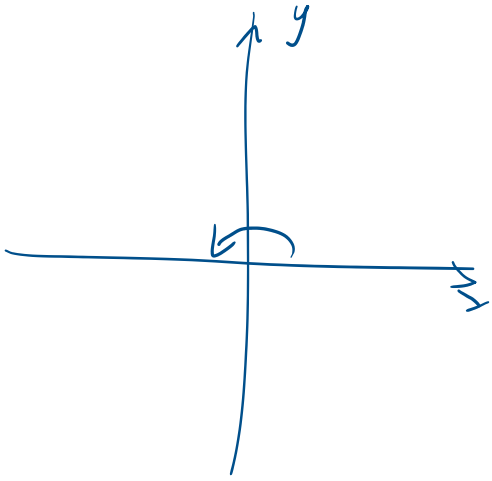
eg.



* eg.



r.a. : None



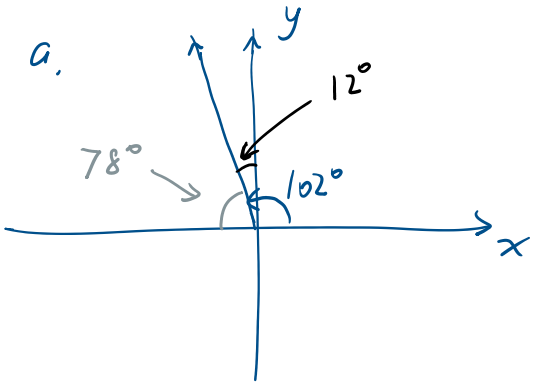
r.a. : None

eg. Find the reference angle:

a. 102°

b. 218°

Sol: a.



102° connects to 90°

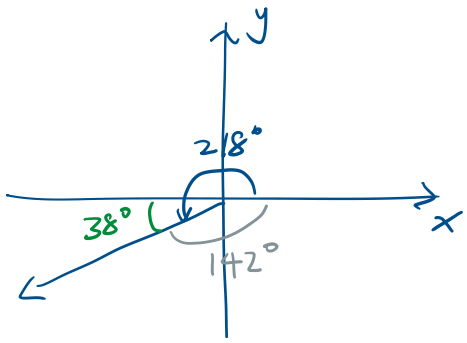
$102° - 90°$

$= 12°$

$90° - 12° = 78°$

r.a. = $\boxed{78°}$

b.



$218°$ connects to $180°$

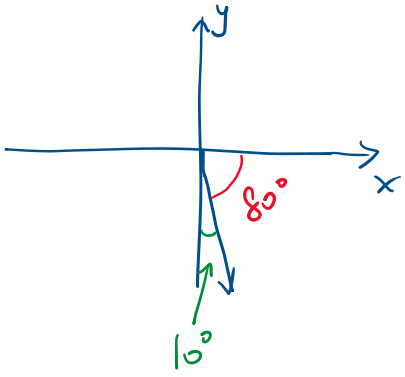
$218° - 180° = 38°$ ✓

$180° - 38° = 142°$

r.a. = $\boxed{38°}$

eg. Find a reference angle for an angle of $280°$.

Sol:



$280°$ connects to $270°$

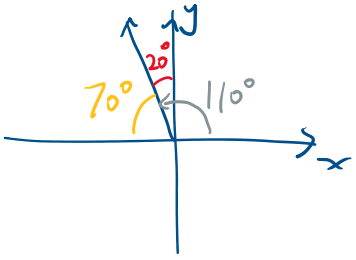
$280° - 270° = 10$

$90° - 10° = 80$

r.a. = $\boxed{80°}$

eg. Find a reference angle for an angle of $470°$.

Sol:



$470°$ connects to $360°$, because $>360°$

$470° - 360° = 110°$

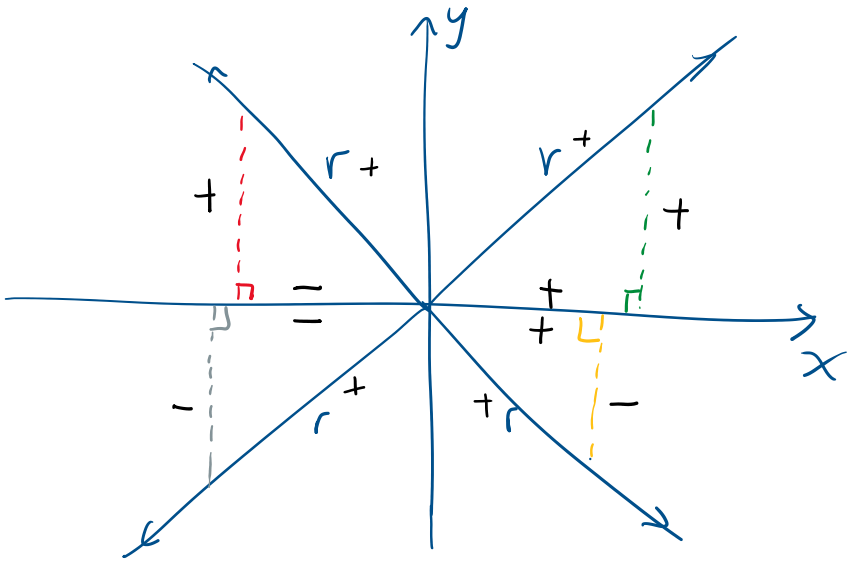
$110°$ connects to $90°$

$110° - 90° = 20°$

$90° - 20° = 70°$

r.a. = $70°$

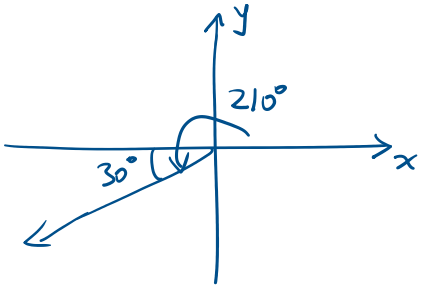
Now, because of the reference angle, we have the following:



Remember the + or − from above

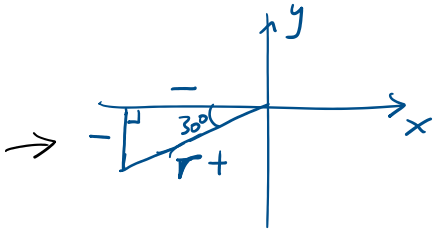
eg. Find the exact value (non-decimal) for $\sin 210°$.

Sol:



$210° - 180° = 30$

⇒

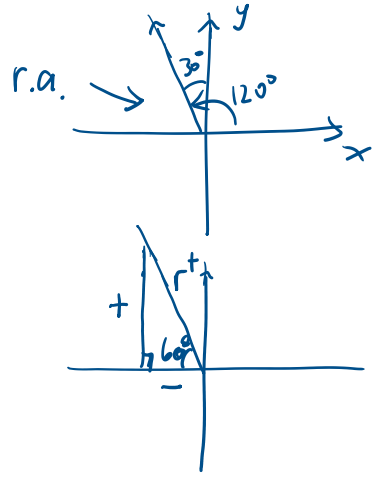


$\sin 210° = \sin 30°$ in r.a.

$= \boxed{-\frac{1}{2}}$

eg. Find the exact value of $\tan 120°$

Sol:



$120° - 90° = 30°$

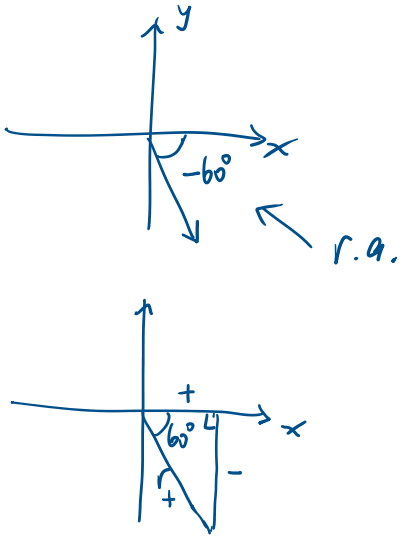
r.a. $= 90° - 30° = 60°$

$\tan 120° = \tan 60°$ in r.a.

$= \boxed{-\sqrt{3}}$

eg. Find the exact value of $\cos 300°$,

Sol:



$300°$: $300° - 360° = -60°$

$\cos 300° = \cos 60°$ in r.a.

$= \boxed{\frac{1}{2}}$