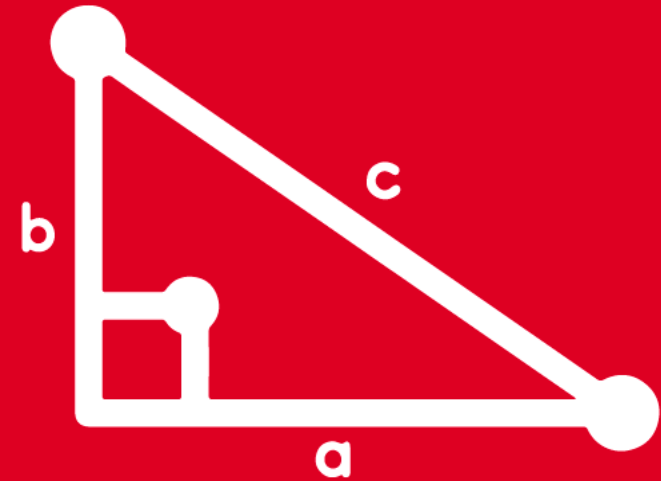




TRIGONOMETRY

Chapter 17

2nd
SECONDARY



SIGNOS DE LAS RAZONES TRIGONOMÉTRICAS
DE ÁNGULOS EN POSICIÓN NORMAL



SACO OLIVEROS



MOTIVATING STRATEGY

EVOLUCIÓN DE LOS SIGNOS MATEMÁTICOS

Estamos en el siglo XV y poco a poco se van imponiendo abreviaturas para indicar algunas operaciones matemáticas. Por ejemplo, los italianos utilizaban una p y una m para indicar la suma y la resta (plus y minus, en latín). Sin embargo, acabó imponiéndose la abreviatura alemana + y -. Estos signos se utilizaban originariamente para indicar exceso y defecto en la medida de las mercancías en los almacenes.



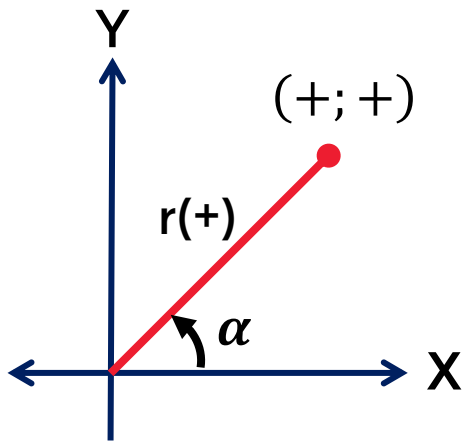


SIGNOS DE LAS RAZONES TRIGONOMÉTRICAS EN LOS CUADRANTES

Los signos de las razones trigonométricas dependen de los signos de la abscisa (**x**) y la ordenada (**y**), ya que el radio vector (**r**) siempre será positivo.

➤ Si $\alpha \in \text{IC}$

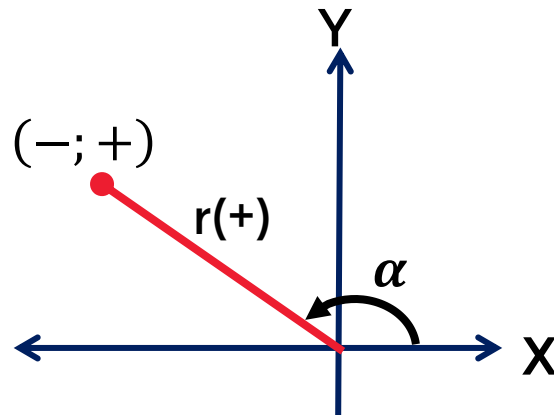
$$0^\circ < \alpha < 90^\circ$$



$$\text{sen} \alpha = \frac{y}{r} = \frac{(+)}{(+)} = (+)$$

➤ Si $\alpha \in \text{IIC}$

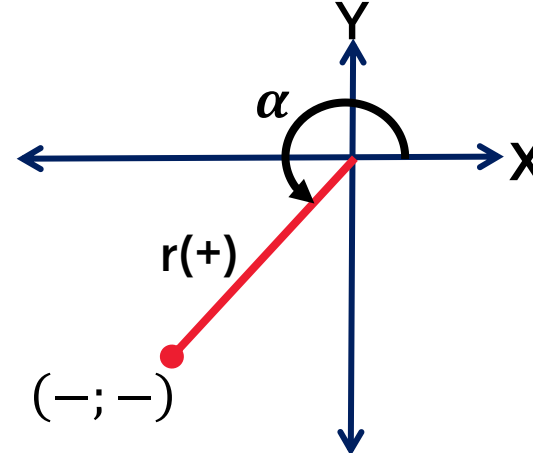
$$90^\circ < \alpha < 180^\circ$$



$$\text{cos} \alpha = \frac{x}{r} = \frac{(-)}{(+)} = (-)$$

➤ Si $\alpha \in \text{IIIC}$

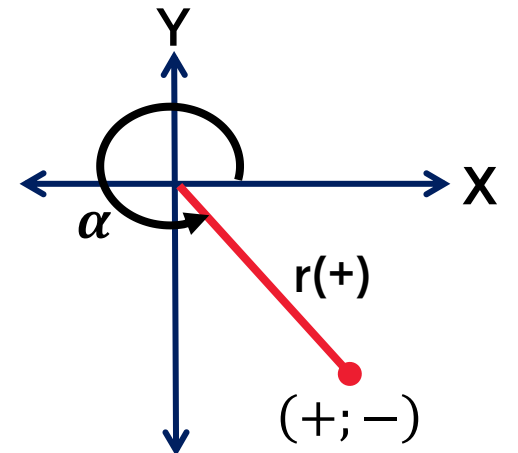
$$180^\circ < \alpha < 270^\circ$$



$$\text{tan} \alpha = \frac{y}{x} = \frac{(-)}{(-)} = (+)$$

➤ Si $\alpha \in \text{IVC}$

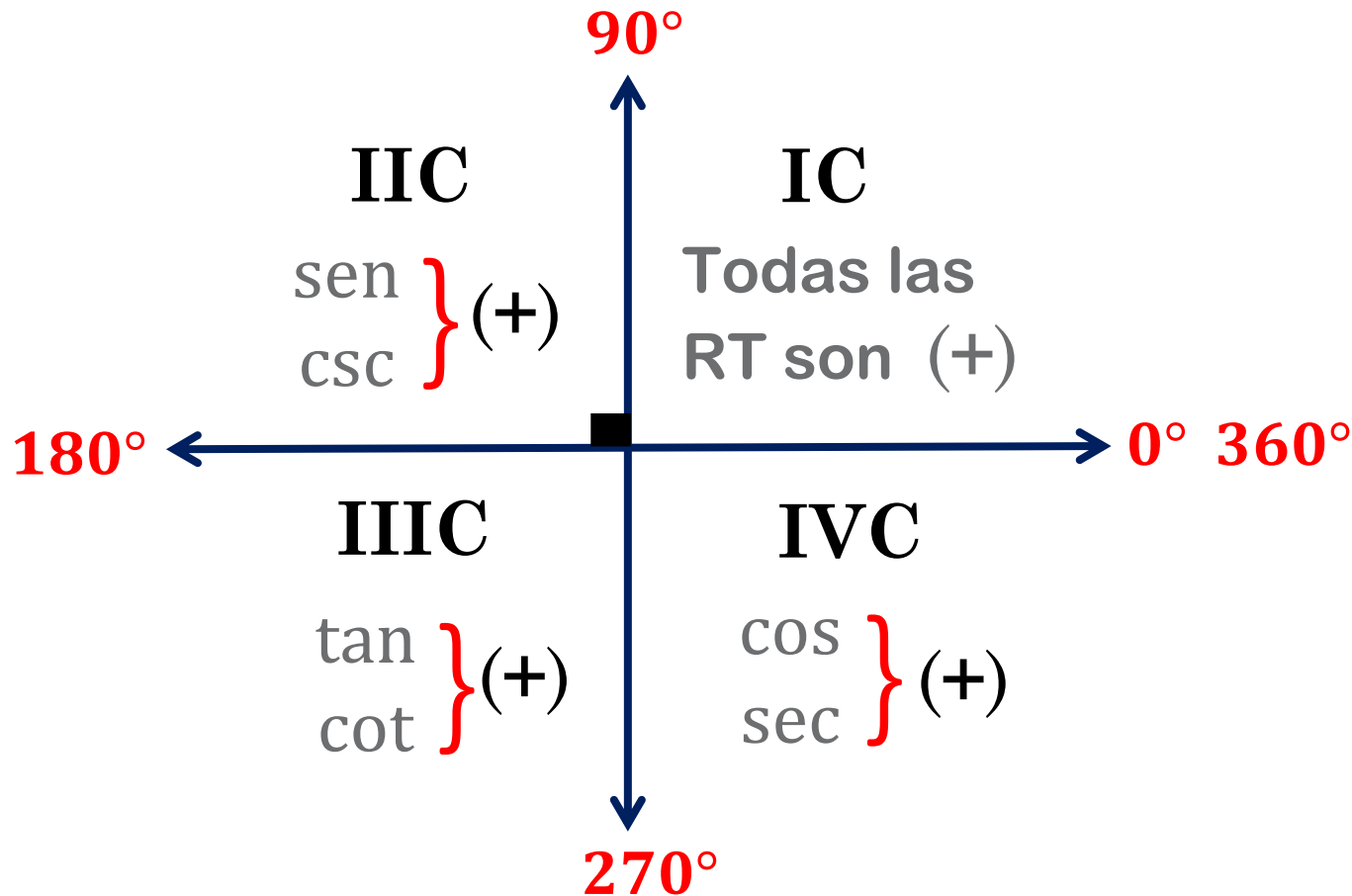
$$270^\circ < \alpha < 360^\circ$$



$$\text{csc} \alpha = \frac{r}{y} = \frac{(+)}{(-)} = (-)$$



Esquema práctico de los signos de las razones trigonométricas en los cuadrantes



Ejemplos:

$$\underbrace{\text{sen} 54^\circ}_{\text{IC}} = (+)$$

$$\underbrace{\text{tan} 150^\circ}_{\text{IIC}} = (-)$$

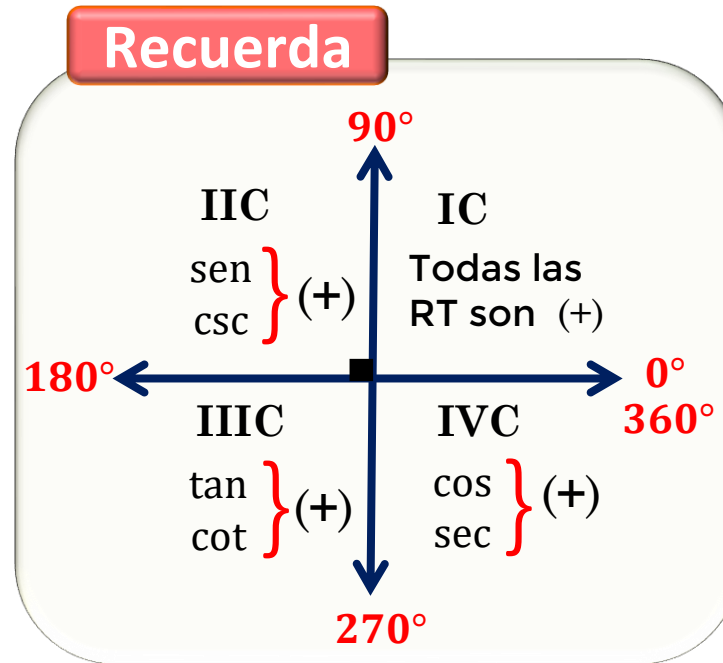
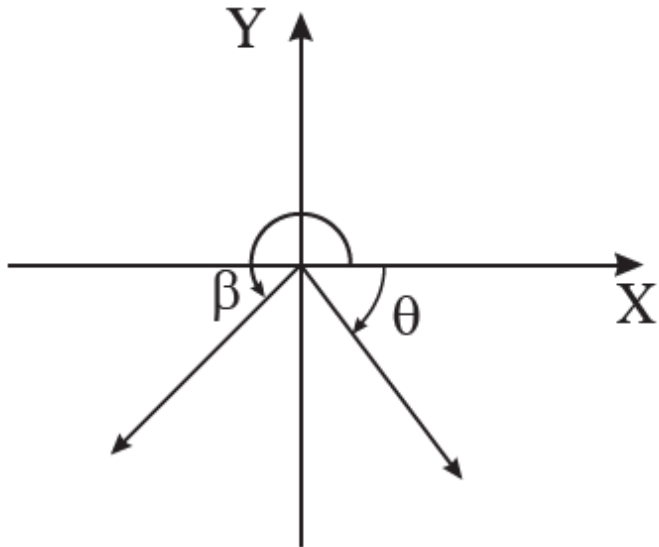
$$\underbrace{\text{cos} 230^\circ}_{\text{IIIC}} = (-)$$





HELICOPRACTICE 1

Del gráfico, determine el signo de $\tan\beta$ y $\text{sen}\theta$.



Resolución:

$$\beta \in \text{IIC}$$

$$\tan\beta = (+)$$

$$\theta \in \text{IVC}$$

$$\text{sen}\theta = (-)$$

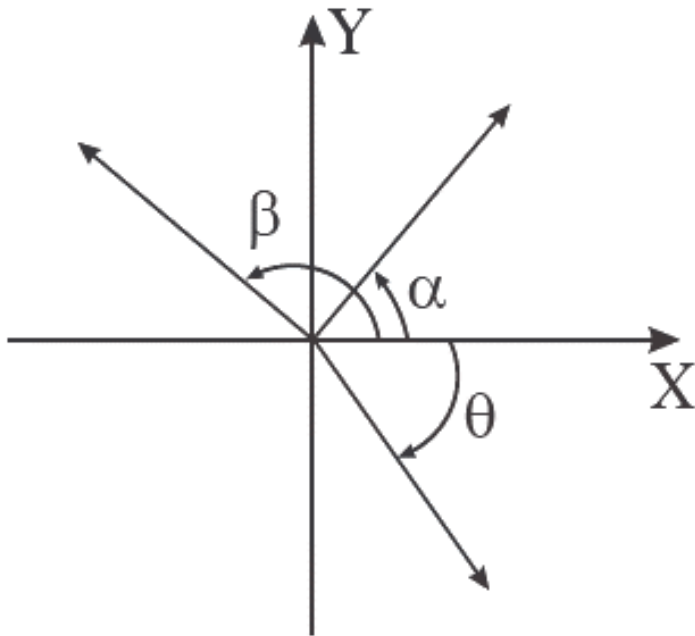
$$\therefore +; -$$



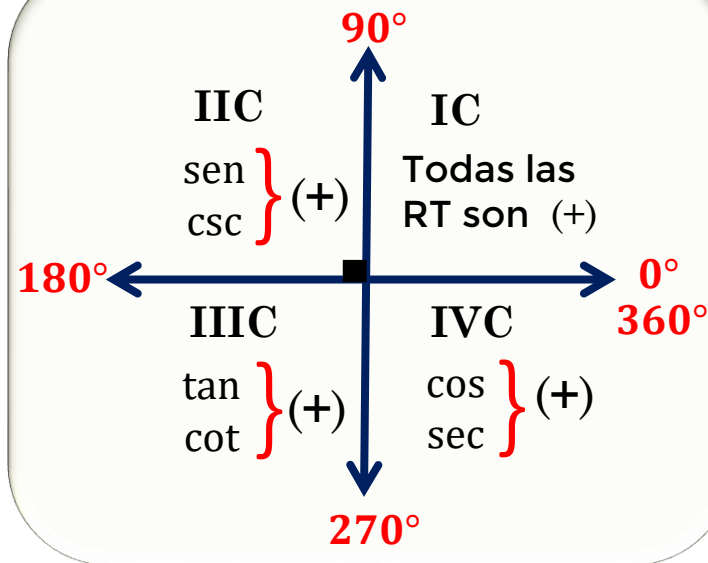


HELICOPRACTICE 2

Del gráfico, determine el signo de $E = \frac{\text{sen}\theta \cdot \text{tan}\alpha}{\cos\beta}$



Recuerda



Resolución:

$$\alpha \in \text{IC}$$

$$\beta \in \text{IIC}$$

$$\theta \in \text{IVC}$$

$$E = \frac{\overbrace{\text{sen}\theta}^{\text{IVC}} \cdot \overbrace{\text{tan}\alpha}^{\text{IC}}}{\underbrace{\cos\beta}_{\text{IIC}}}$$

$$E = \frac{(-)(+)}{(-)}$$

$$E = \frac{(-)}{(-)}$$

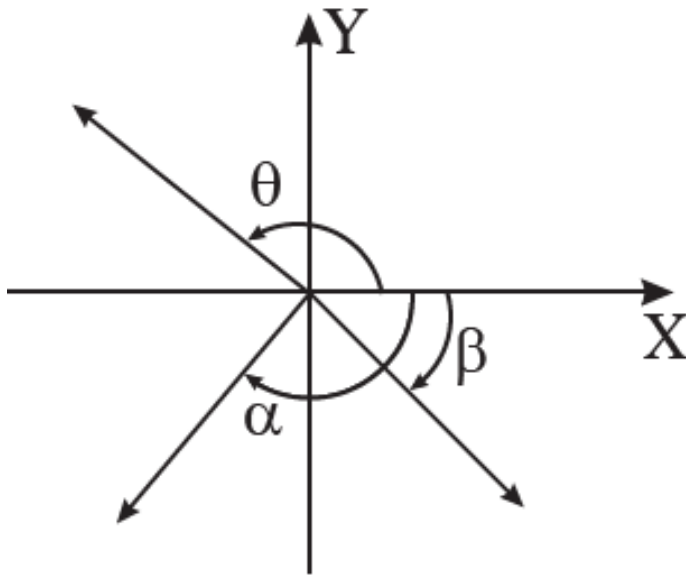
$$\therefore E = (+)$$



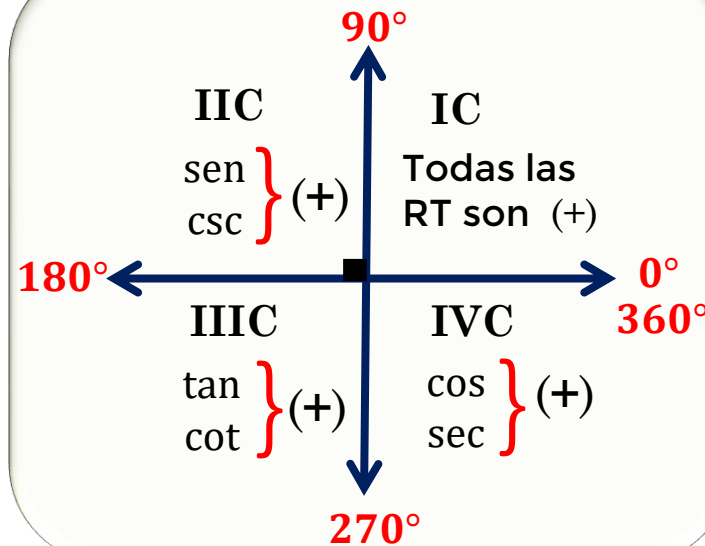
HELICOPRACTICE 3

Del gráfico, determine el signo de:

$$A = \operatorname{sen} \theta \cdot \tan \beta \quad \text{y} \quad B = \frac{\sec \alpha}{\cot \theta}$$



Recuerda



Resolución:

$$\theta \in \text{IIC}$$

$$\alpha \in \text{IIIC}$$

$$\beta \in \text{IVC}$$

$$A = \underbrace{\operatorname{sen} \theta}_{\text{IIC}} \cdot \underbrace{\tan \beta}_{\text{IVC}} \Rightarrow A = (+)(-)$$

$$\therefore A = (-)$$



$$B = \frac{\overbrace{\sec \alpha}^{\text{IIIC}}}{\underbrace{\cot \theta}_{\text{IIC}}} \Rightarrow B = \frac{(-)}{(-)}$$

$$\therefore B = (+)$$



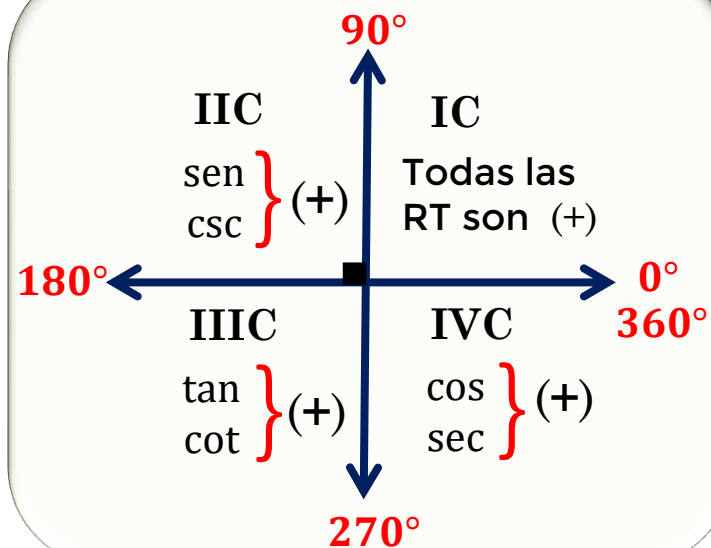
HELICOPRACTICE 4

Si $\alpha \in \text{IC}$ y $\beta \in \text{IIC}$, determine el signo de:

$$E = \text{sen}\alpha \cdot \tan\beta$$

$$Q = \frac{\cos\alpha}{\sec\beta}$$

Recuerda



Resolución:

Del dato:

$$\alpha \in \text{IC}$$

$$\beta \in \text{IIC}$$

$$E = \underbrace{\text{sen}\alpha}_{\text{IC}} \cdot \underbrace{\tan\beta}_{\text{IIC}} \Rightarrow E = (+)(-)$$

$$\therefore E = (-)$$

$$Q = \frac{\overbrace{\cos\alpha}^{\text{IC}}}{\underbrace{\sec\beta}_{\text{IIC}}} \Rightarrow Q = \frac{(+)}{(-)}$$

$$\therefore Q = (-)$$





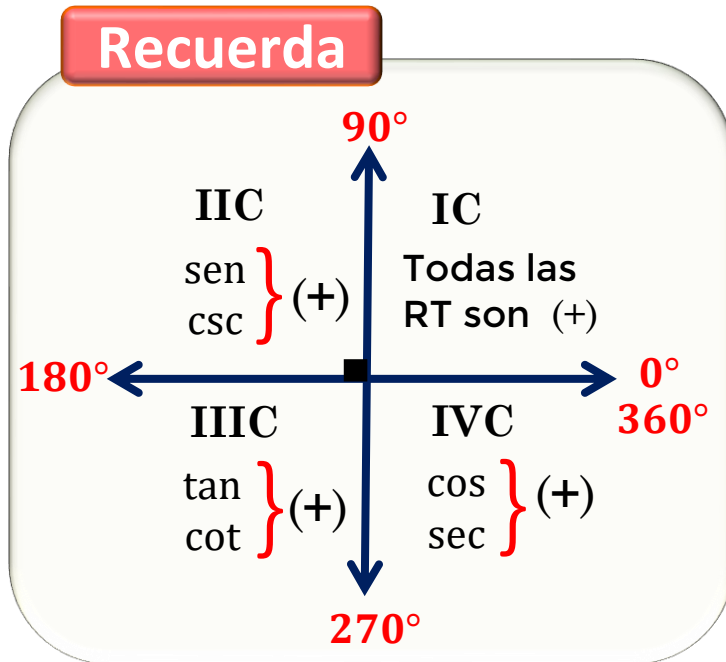
HELICOPRACTICE 5

Si $\alpha \in \text{IIIC}$ y $\theta \in \text{IVC}$, determine el signo de:

$$A = \frac{\text{sen}\alpha}{\tan\theta}$$

$$B = \cos^2\alpha \cdot \sec^3\theta$$

Recuerda



Resolución:

Del dato:

$\alpha \in \text{IIC}$

$\theta \in \text{IVC}$

$$A = \frac{\overbrace{\text{sen}\alpha}^{\text{IIC}}}{\underbrace{\tan\theta}_{\text{IVC}}} \Rightarrow A = \frac{(-)}{(-)} \quad \therefore A = (+)$$

$$B = \underbrace{\cos^2\alpha}_{\text{IIC}} \cdot \underbrace{\sec^3\theta}_{\text{IVC}} \Rightarrow B = (-)^2 \cdot (+)^3$$

$$B = (+)(+) \quad \therefore B = (+)$$



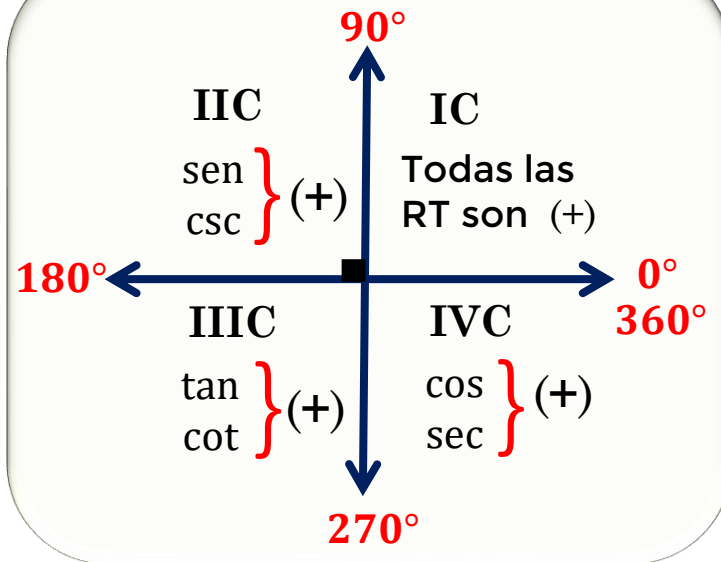
HELICOPRACTICE 6

Determine el signo en cada caso:

$$A = \tan 48^\circ \cdot \sin 125^\circ$$

$$B = \frac{\sec 140^\circ \cdot \cot 20^\circ}{\sin 200^\circ}$$

Recuerda



Resolución:

$$A = \underbrace{\tan 48^\circ}_{\text{IC}} \cdot \underbrace{\sin 125^\circ}_{\text{IIC}}$$

$$A = (+)(+)$$

$$\therefore A = (+)$$

$$B = \frac{\underbrace{\sec 140^\circ}_{\text{IIC}} \cdot \underbrace{\cot 20^\circ}_{\text{IC}}}{\underbrace{\sin 200^\circ}_{\text{IIIC}}}$$

$$B = \frac{(-)(+)}{(-)}$$

$$B = \frac{(-)}{(-)}$$

$$\therefore B = (+)$$

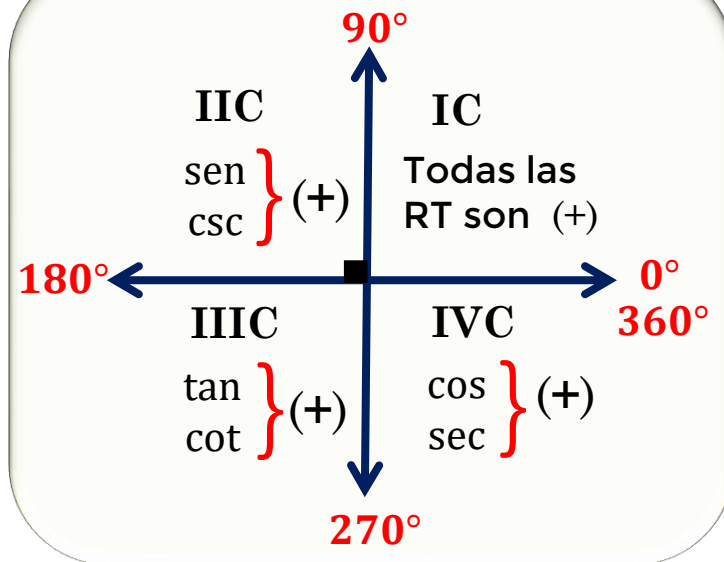




HELICOPRACTICE 7

Al copiar de la pizarra la expresión $\tan^4 150^\circ \cdot \sec^3 290^\circ$, un estudiante cometió un error y escribió $\cot^5 250^\circ \cdot \sin^2 310^\circ$. Determine el signo de que se obtiene al dividir lo que estaba escrito en la pizarra y lo que copio el alumno.

Recuerda



Resolución:

$$M = \frac{\overbrace{\tan^4 150^\circ}^{\text{IIC}} \cdot \overbrace{\sec^3 290^\circ}^{\text{IVC}}}{\underbrace{\cot^5 250^\circ}_{\text{IIIC}} \cdot \underbrace{\sin^2 310^\circ}_{\text{IVC}}} \Rightarrow M = \frac{(-)^4 \cdot (+)^3}{(+)^5 \cdot (-)^2}$$

$$M = \frac{(+).(+)}{(+)(+)} \Rightarrow M = \frac{(+)}{(+)}$$

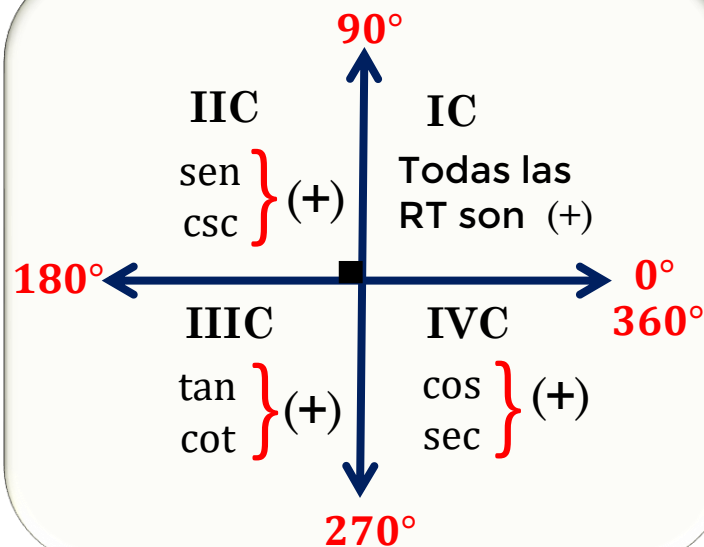
$$\therefore M = (+)$$



HELICOPRACTICE 8

Si $180^\circ < \theta < 270^\circ$, determine el signo de $P = \sin\left(\frac{\theta}{2}\right) \cdot \tan\left(\frac{\theta}{3}\right)$

Recuerda



Resolución:

Del dato:

$$\frac{180^\circ}{2} < \frac{\theta}{2} < \frac{270^\circ}{2}$$

$$90^\circ < \underbrace{\frac{\theta}{2}}_{\text{IIC}} < 135^\circ$$

$$\frac{180^\circ}{3} < \frac{\theta}{3} < \frac{270^\circ}{3}$$

$$60^\circ < \underbrace{\frac{\theta}{3}}_{\text{IC}} < 90^\circ$$

Piden:

$$P = \underbrace{\sin\left(\frac{\theta}{2}\right)}_{\text{IIC}} \cdot \underbrace{\tan\left(\frac{\theta}{3}\right)}_{\text{IC}} \Rightarrow P = (+)(+)$$

$$\therefore P = (+)$$