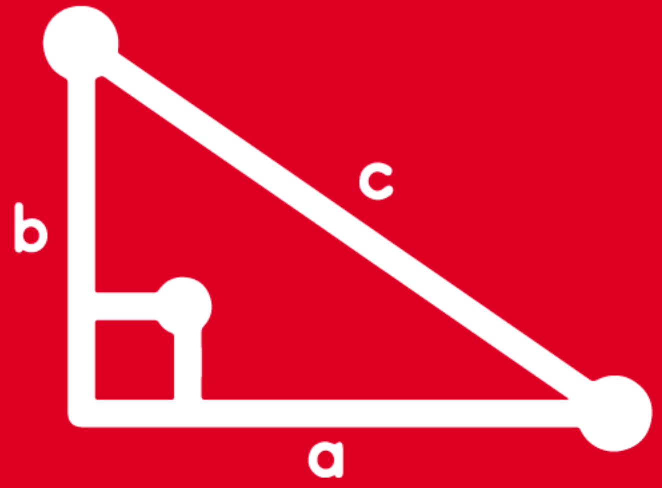
# TRIGONOMETRY

## Chapter 17

**2nd**
**SECONDARY**




**SIGNOS DE LAS RAZONES TRIGONOMÉTRICAS DE ÁNGULOS EN POSICIÓN NORMAL**

SACO OLIVEROS

# MOTIVATING STRATEGY

## EVOLUCIÓN DE LOS SIGNOS MATEMÁTICOS

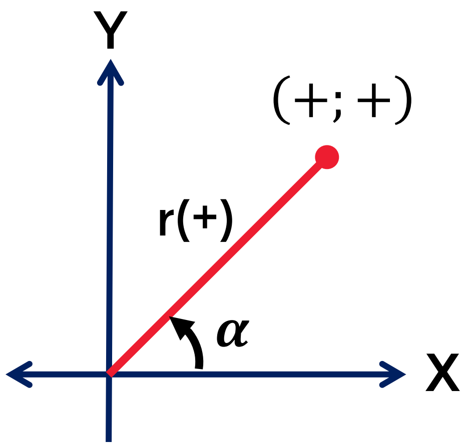
Estamos en el siglo XV y poco a poco se van imponiendo abreviaturas para indicar algunas operaciones matemáticas. Por ejemplo, los italianos utilizaban una p y una m para indicar la suma y la resta (plus y minus, en latín). Sin embargo, acabó imponiéndose la abreviatura alemana + y -. Estos signos se 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 $\alpha \in$ IC

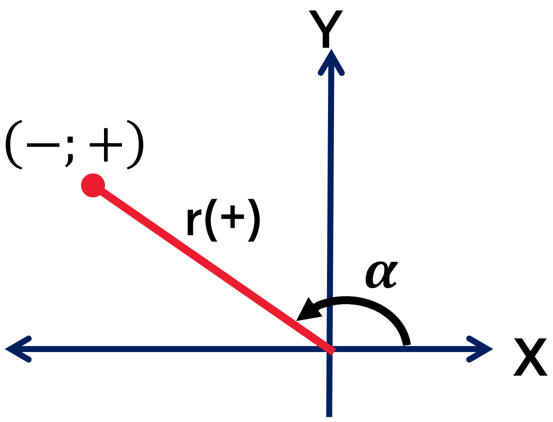
$0° < \alpha < 90°$




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

➤ Si $\alpha \in$ IIC

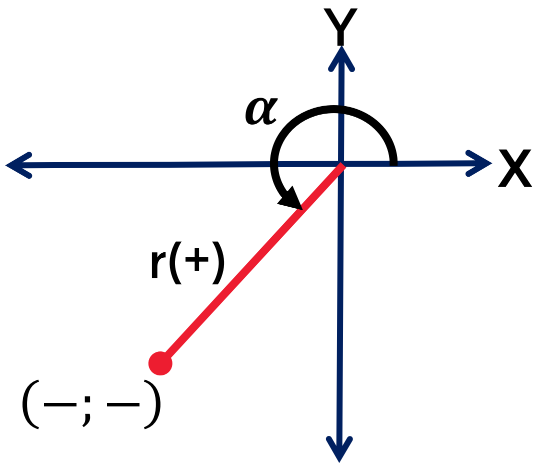
$90° < \alpha < 180°$




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

➤ Si $\alpha \in$ IIIC

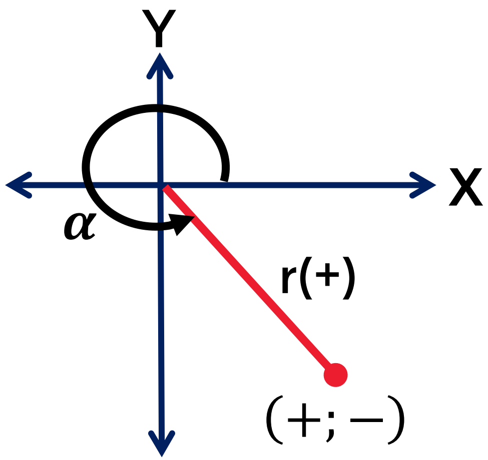
$180° < \alpha < 270°$




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

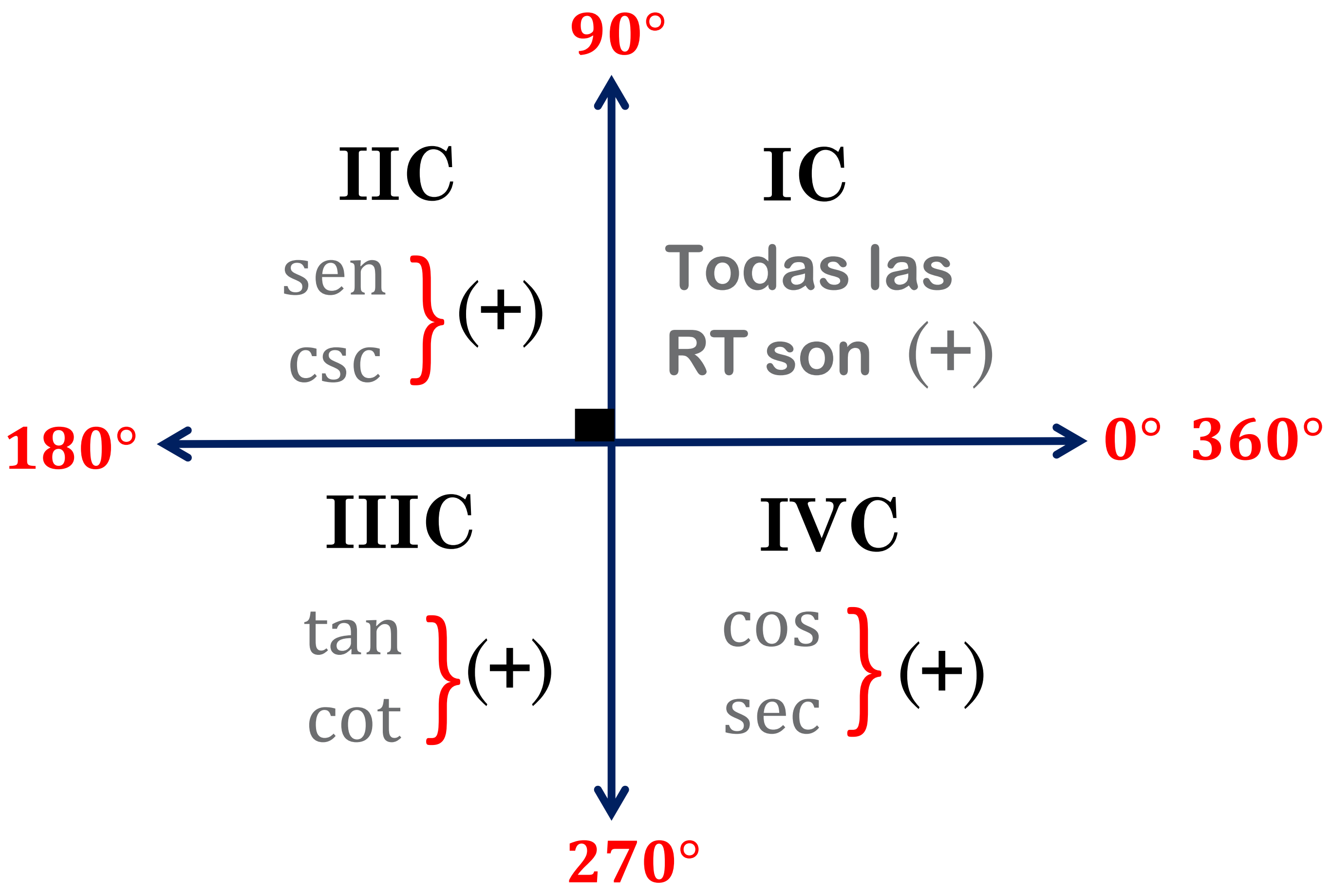
➤ Si $\alpha \in$ IVC

$270° < \alpha < 360°$




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

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




## Ejemplos:

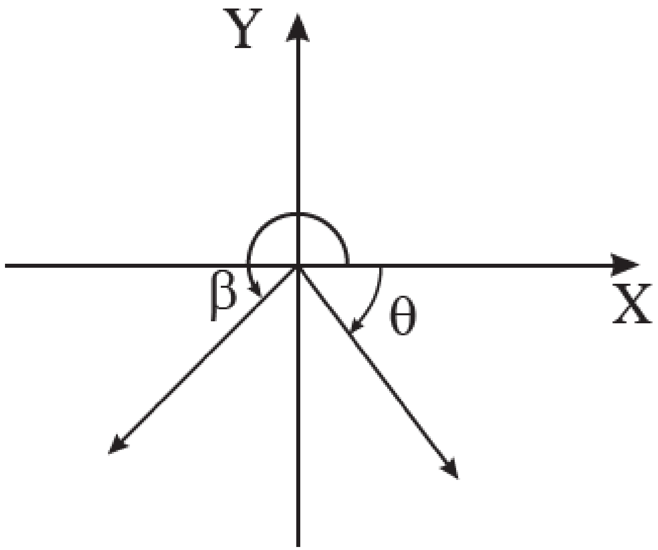
$$\underbrace{\text{sen}54°}_{\text{IC}} = (+)$$

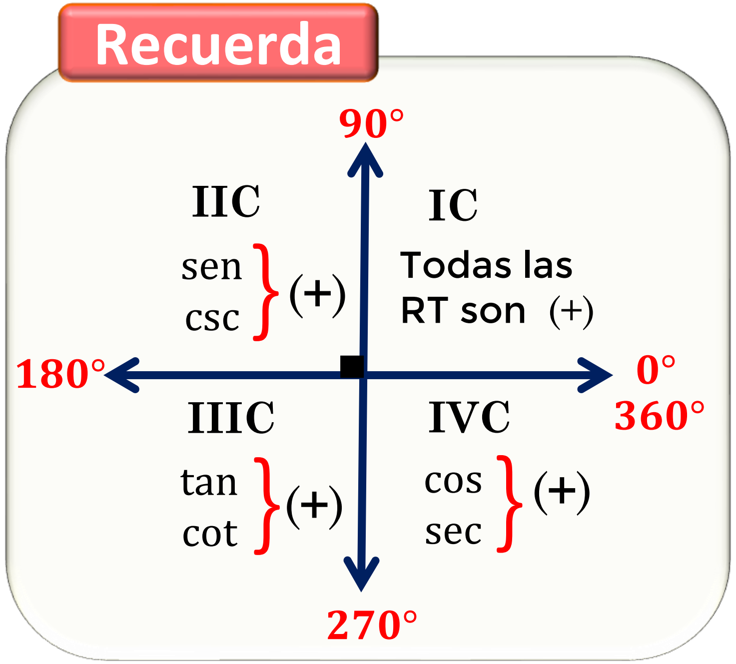
$$\underbrace{\tan 150°}_{\text{IIC}} = (-)$$

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

# HELICOPRACTICE 1

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




**Resolución:**

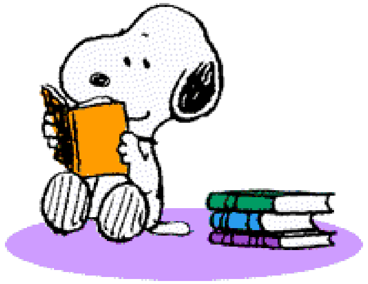
$\beta \in \text{IIIC}$

$\tan\beta = (+)$

$\theta \in \text{IVC}$

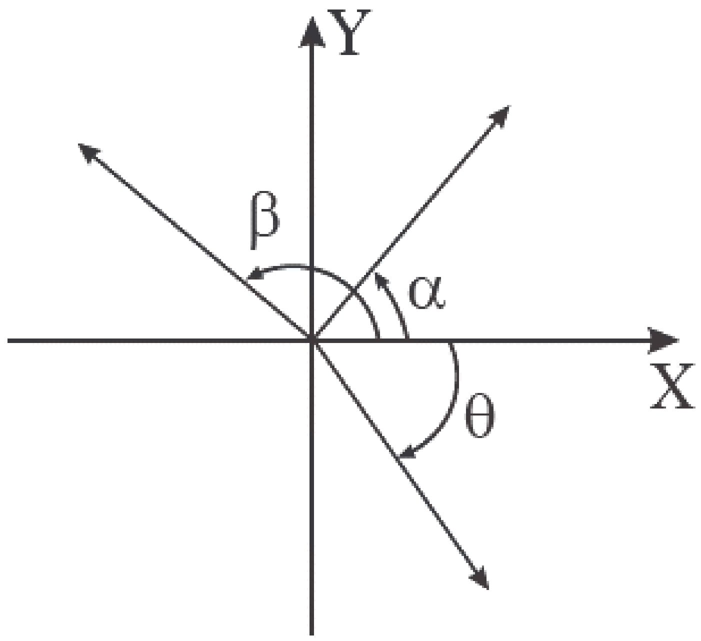
$\text{sen}\theta = (-)$

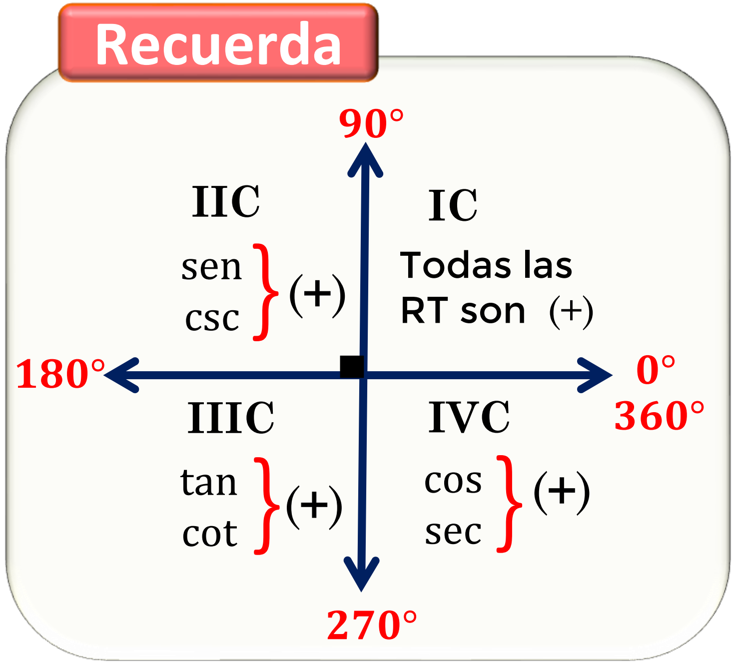
$\therefore +; -$



# HELICOPRACTICE 2

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




## Resolución:

$\alpha \in IC$ $\quad$ $\beta \in IIC$ $\quad$ $\theta \in IVC$

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

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

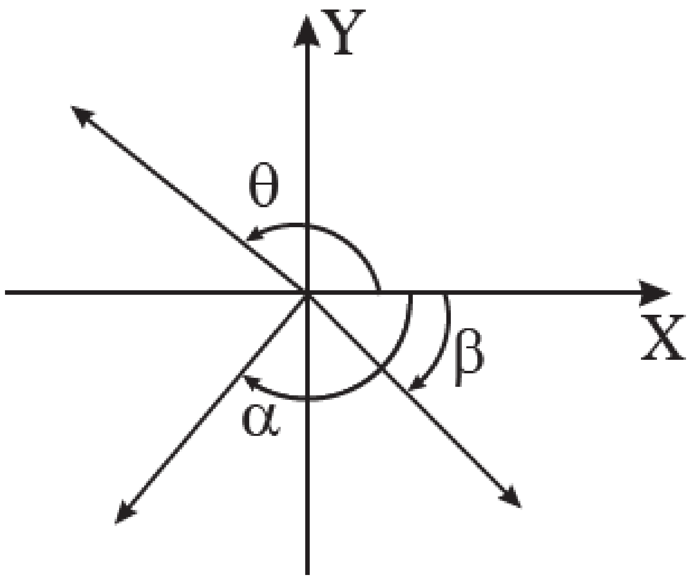
$$E = \frac{(-)}{(-)}$$

$$\therefore E = (+)$$

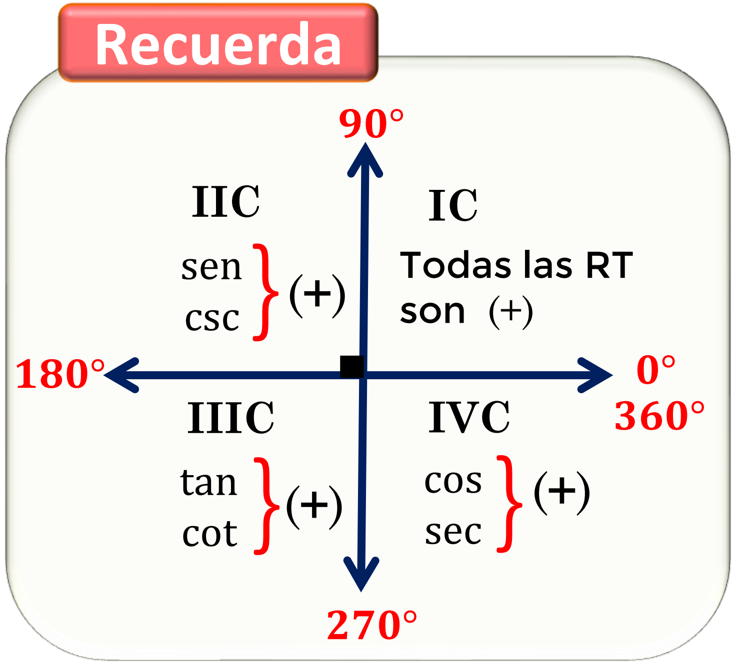
# HELICOPRACTICE 3

Del gráfico, determine el signo de:

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




**Recuerda**




**Resolución:**

$\theta \in IIC$ | $\alpha \in IIIC$ | $\beta \in IVC$

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

$$\therefore A = (-)$$

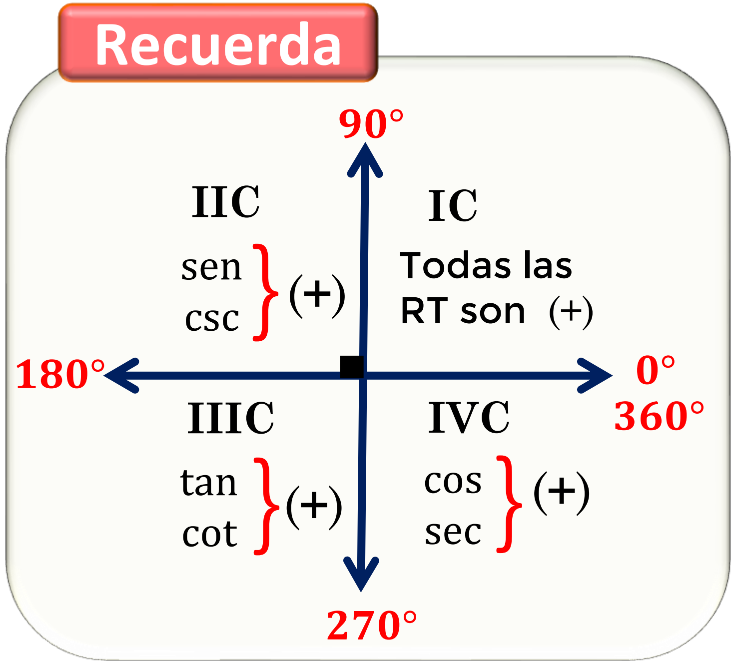
$$B = \frac{\overbrace{\sec\alpha}^{IIIC}}{\underbrace{\cot\theta}_{IIC}} \Rightarrow B = \frac{(-)}{(-)}$$

$$\therefore B = (+)$$

# HELICOPRACTICE 4

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

$$E = \operatorname{sen}\alpha . \tan\beta \qquad Q = \frac{\cos\alpha}{\sec\beta}$$




**Resolución:**

Del dato: $\alpha \in IC$ $\quad \beta \in IIC$

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

$$\boxed{\therefore E = (-)}$$

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

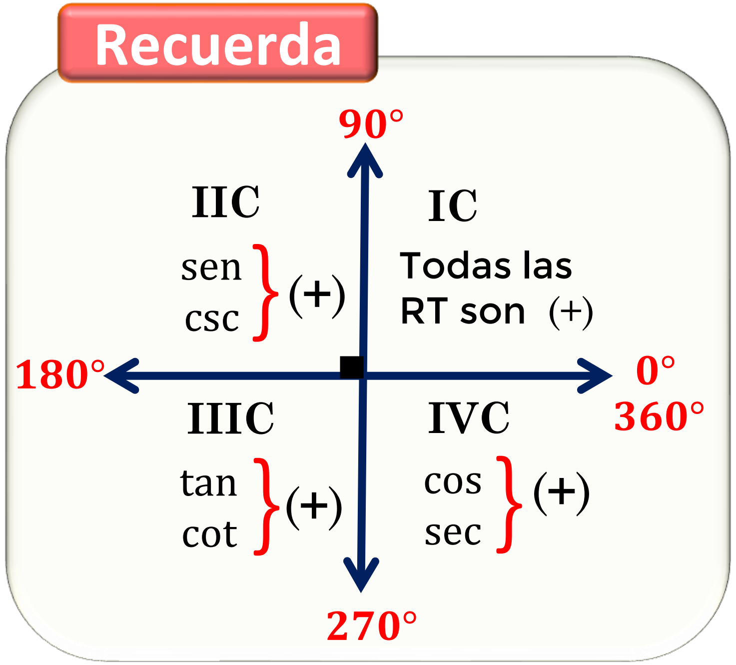
$$\boxed{\therefore Q = (-)}$$

# HELICOPRACTICE 5

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

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

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




**Resolución:**

Del dato: $\boxed{\alpha \in \text{IIIC}}$ $\boxed{\theta \in \text{IVC}}$

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

$$\boxed{\therefore A = (+)}$$

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

$$B = (+)(+)$$

$$\boxed{\therefore B = (+)}$$

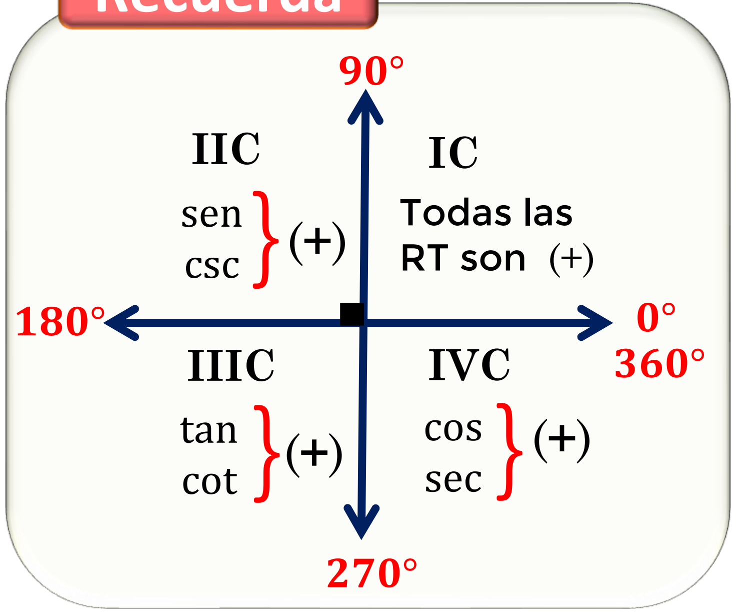
# HELICOPRACTICE 6

Determine el signo en cada caso:

$$A = \tan 48° . \operatorname{sen} 125°$$

$$B = \frac{\sec 140° . \cot 20°}{\operatorname{sen} 200°}$$

**Recuerda**




## Resolución:

$$A = \underbrace{\tan 48°}_{\text{IC}} . \underbrace{\operatorname{sen} 125°}_{\text{IIC}} \Rightarrow A = (+)(+)$$

$$\therefore A = (+)$$

$$B = \frac{\overbrace{\sec 140°}^{\text{IIC}} . \overbrace{\cot 20°}^{\text{IC}}}{\underbrace{\operatorname{sen} 200°}_{\text{IIIC}}} \Rightarrow B = \frac{(-)\,(+)}{(-)}$$

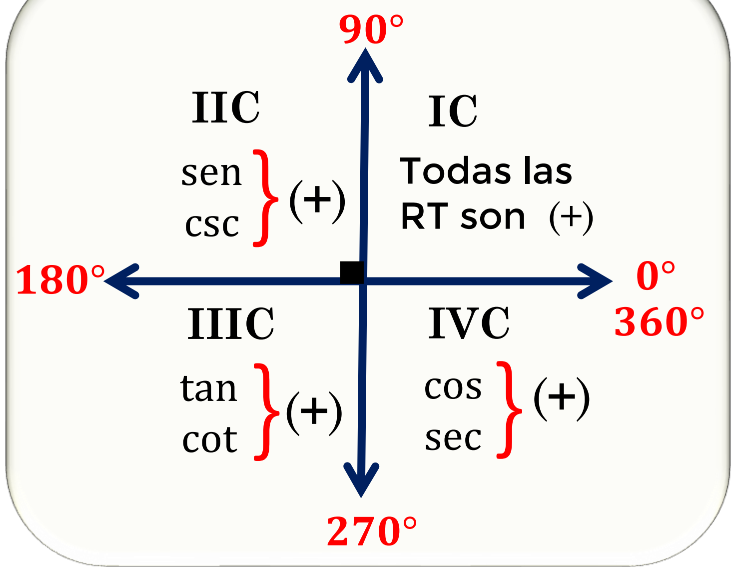
$$B = \frac{(-)}{(-)}$$

$$\therefore B = (+)$$

# HELICOPRACTICE 7

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

**Recuerda**




**Resolución:**

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

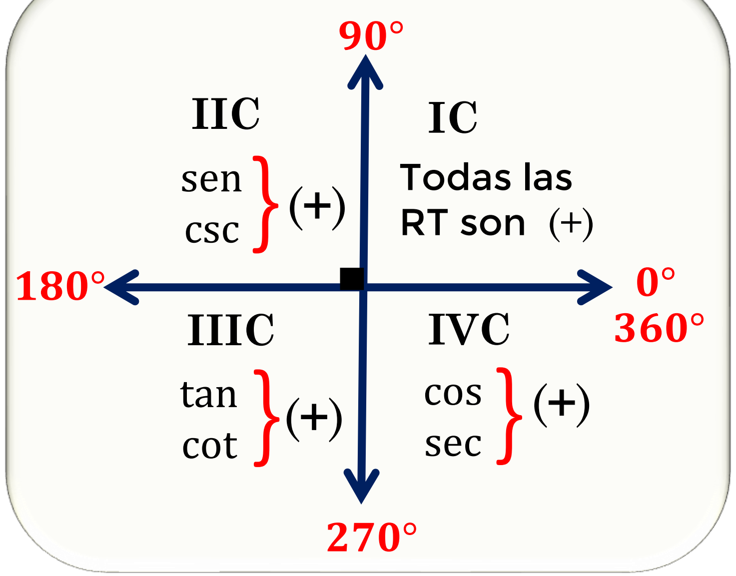
$$M = \frac{(+).(+)}{(+)\ (+)} \Rightarrow M = \frac{(+)}{(+)}$$

$$\therefore M = (+)$$

# HELICOPRACTICE 8

Si 180°< θ < 270°, determine el signo de $P = \text{sen}\left(\frac{\theta}{2}\right).\tan\left(\frac{\theta}{3}\right)$

**Recuerda**




## Resolución:

**Del dato:**

$$\frac{180°}{2} < \frac{\theta}{2} < \frac{270°}{2}$$

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

$$\frac{180°}{3} < \frac{\theta}{3} < \frac{270°}{3}$$

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

**Piden:**

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

$$\therefore P = (+)$$