

Contas com unidades sexagesimais

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**Grau de arco ($^{\circ}$),
minuto de arco ($'$) e
segundo de arco ($''$)**

$1^{\circ} = 1/360$
circunferência

$1' = 1/60$
do grau

$1'' = 1/60$
do minuto

**Unidades sexagesimais
para medição de ângulos**

Unidades sexagesimais para medição de tempo



1 h = 60 min
1 min = 60 s

1 hora (^h),
minuto de tempo (^m)
segundo de tempo (^s)

$1^h = 1/24$ $1^m = 1/60$
circunferência da hora

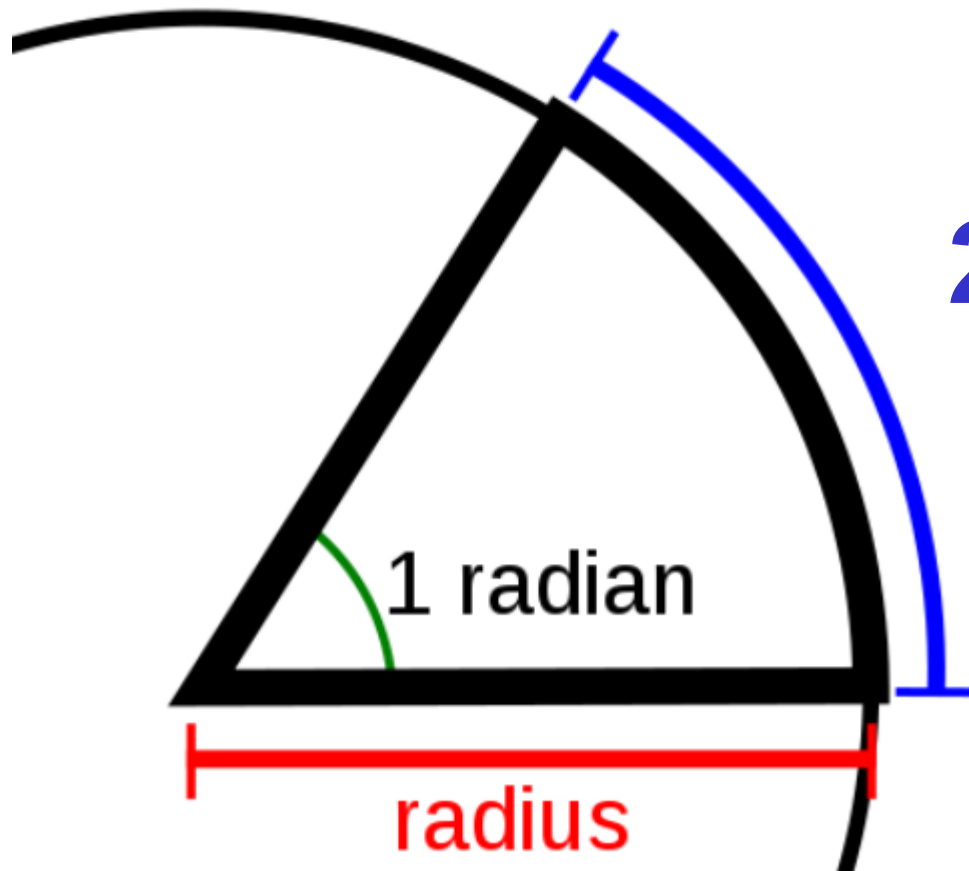
$1^s = 1/60$
do minuto de tempo

24 h = 360 graus

**Medição de ângulos usando
unidades sexagesimais de tempo**

Radiano: o comprimento do arco = raio

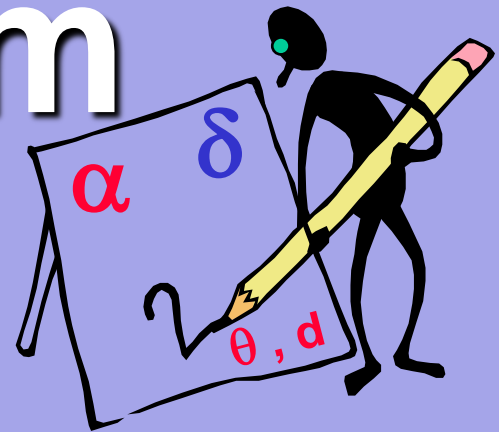
arc length = radius



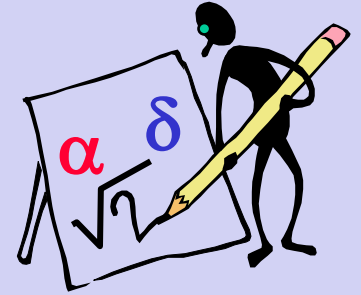
$$2 \pi \text{ rad} = 360^{\circ}$$

$$1 \text{ rad} \sim 57,3^{\circ}$$

Contas com valores sexagesimais



Graus (DEGree) vs Grados (GRA)

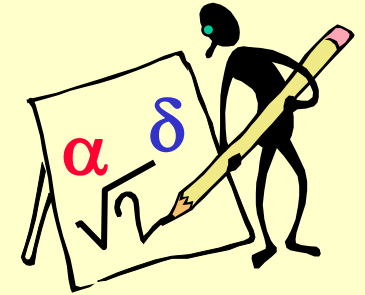
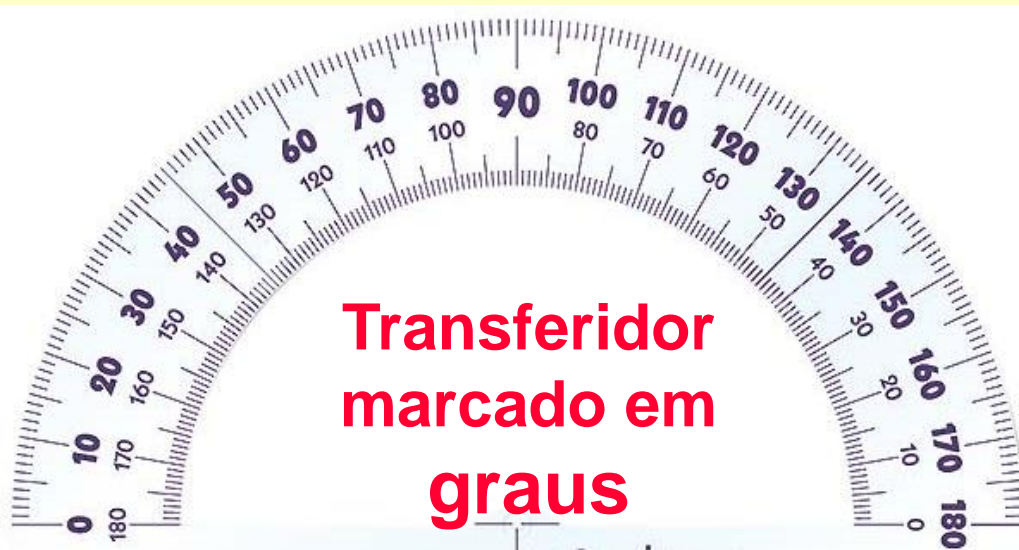


90 graus = 100 grados

O grado não é usado atualmente (exceto por alguns grupos)

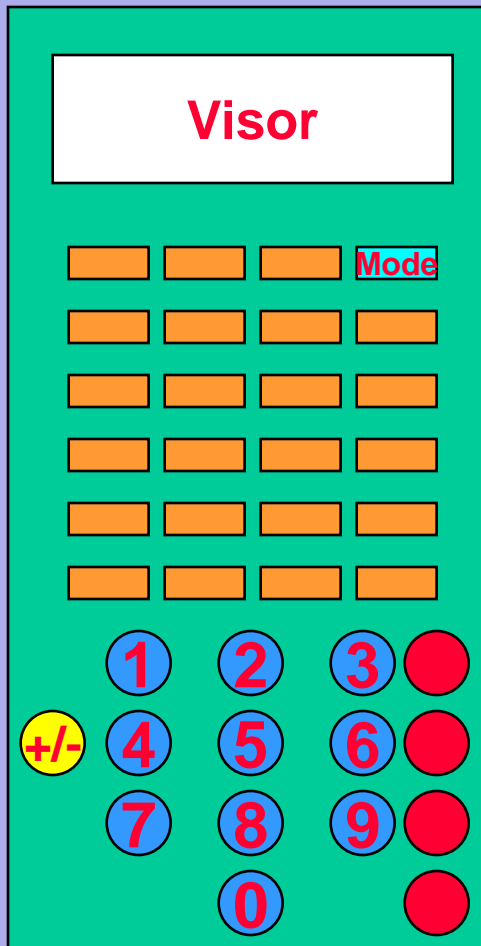
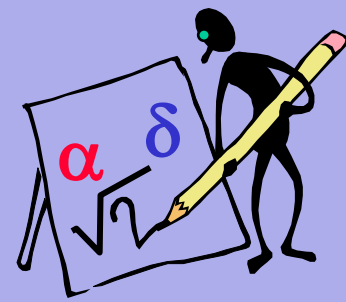


Graus (DEGree) vs horas

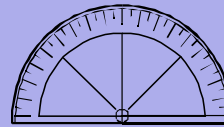


180 graus = 12 horas

Modo de operação de uma calculadora



Trocar o sinal do valor teclado



Deg
Gra
Rad



Degree (grau)



Grado ($90^0 = 100$ grados)



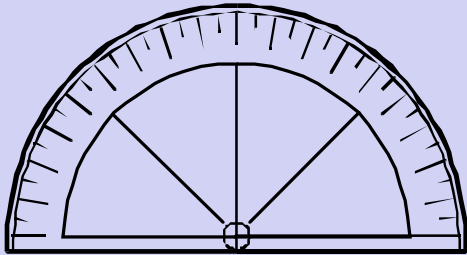
Radiano

2π radianos = 360 graus

Grafia das unidades Graus e Horas na forma sexagesimal

Graus

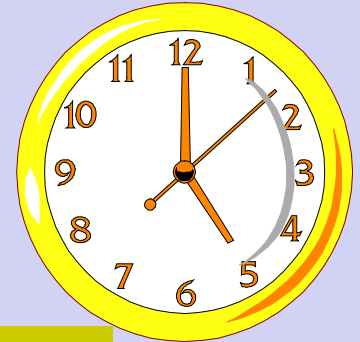
10^o 20' 30"



Horas

(correto)

10 h 20 min 30 s



Horas

(simplificado)

10 h 20 m 30 s



1" ≠ 1s

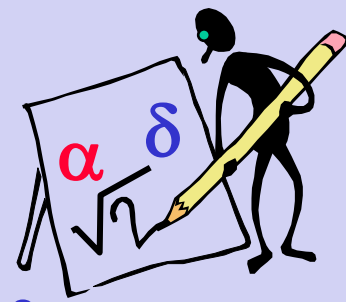
Cuidado!

Horas

(uso prático)

10^h 20^m 30^s

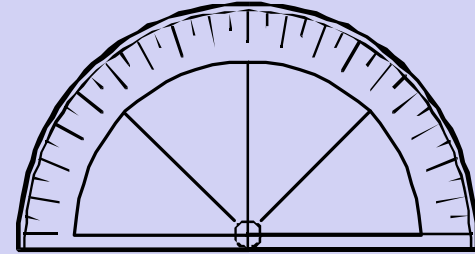
Passar medida angular sexagesimal para decimal



GRAUS. Por exemplo: $15^{\circ} 20' 20'' \rightarrow \text{G.d}^{\circ} ?$

$G^{\circ} M' S'' \rightarrow \text{G.d}^{\circ}$

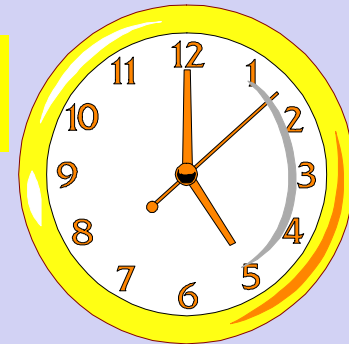
$$\text{G.d}^{\circ} = G^{\circ} + (M' / 60) + (S'' / 3600)$$



HORAS. Por exemplo: $15^{\text{h}} 20^{\text{m}} 20^{\text{s}} \rightarrow \text{H.d}^{\text{h}} ?$

$H^{\text{h}} M^{\text{m}} S^{\text{s}} \rightarrow \text{H.d}^{\text{h}}$

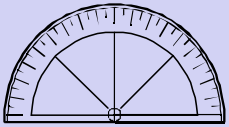
$$\text{H.d}^{\text{h}} = H^{\text{h}} + (M^{\text{m}} / 60) + (S^{\text{s}} / 3600)$$





Passar medida angular sexagesimal para decimal

$$10^{\circ}20'30''$$



$G^{\circ} M' S'' \rightarrow G.d^{\circ}$

$$\begin{aligned} &= 10 + 20/60 + 30/3600 \\ &= 10 + 0,333\ 333\dots + 0,008\ 333\dots \\ &= 10,341\ 666\ 6667^{\circ} \end{aligned}$$

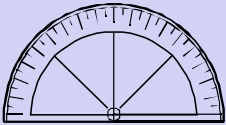
$$10^{\text{h}}20^{\text{m}}30^{\text{s}}$$



$H^{\text{h}} M^{\text{m}} S^{\text{s}} \rightarrow H.d^{\text{h}}$

$$\begin{aligned} &= 10 + 20/60 + 30/3600 \\ &= 10 + 0,333\ 333\dots + 0,008\ 333\dots \\ &= 10,341\ 666\ 6667^{\text{h}} \end{aligned}$$

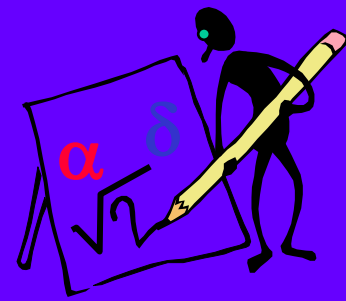
$$-30^{\circ}20'10''$$



$G^{\circ} M' S'' \rightarrow G.d^{\circ}$

$$\begin{aligned} &= -(30 + 20/60 + 10/3600) \\ &= -(30 + 0,333\ 333\dots + 0,002\ 777\dots) \\ &= -30,336\ 111\ 1111^{\circ} \end{aligned}$$

Passar medida angular sexagesimal para decimal



$$10^{\circ}20'30'' = 10^{\circ} 20' 30''$$

ou

$$10.203000$$

G° M' S" → G.d °

0' ''

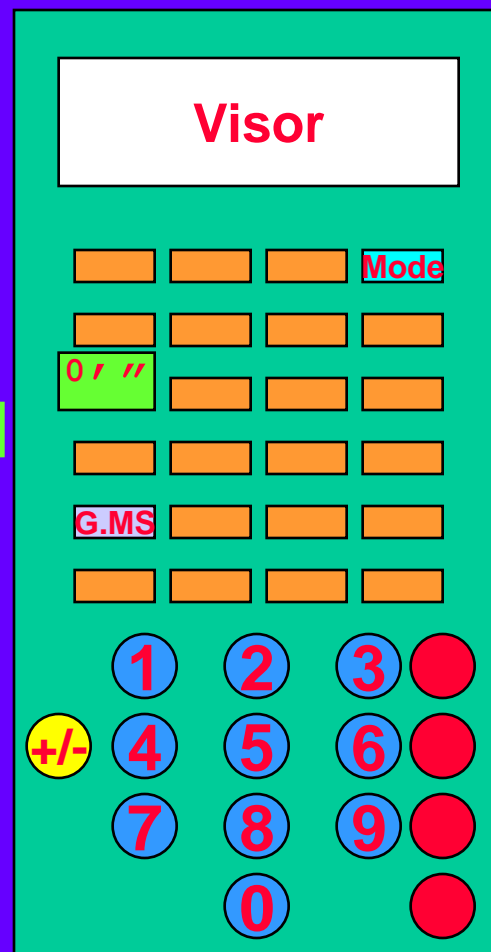
0' ''

0' ''

0' ''

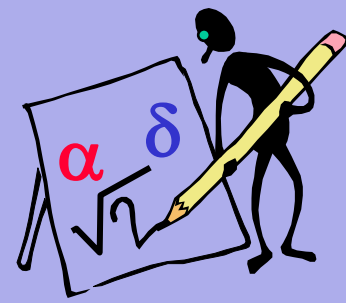
10.203000 D.MS ou G.MS

Visor final
10,341 666 6667

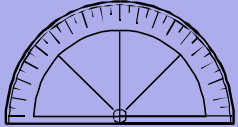




Passar medida angular decimal para sexagesimal



Graus



$$G.d^0 \rightarrow G^0 M' S''$$

G

$$M.d' = 0.d^0 * 60$$

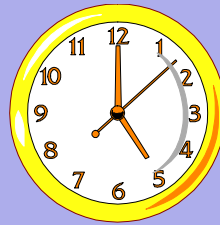
M

$$S.d'' = 0.d' * 60$$

S

G⁰ M^m S^s

Horas



$$H.d^h \rightarrow H^h M^m S^s$$

H

$$M.d^m = 0.d^h * 60$$

M

$$S.d^s = 0.d^m * 60$$

S

H^h M^m S^s

Passar ângulo decimal para sexag.

$$30,76010^{\circ} = \text{G.d}^{\circ} \rightarrow \text{G}^{\circ} \text{ M}' \text{ S}''$$

$$[30^{\circ}]$$

$$0,76010^{\circ} * 60 = 45,606'$$

$$[45']$$

$$0,606' * 60 = [36,36'']$$

$$30^{\circ} 45' 36,36''$$

$$-130,375^{\circ} = \text{G.d}^{\circ} \rightarrow \text{G}^{\circ} \text{ M}' \text{ S}''$$

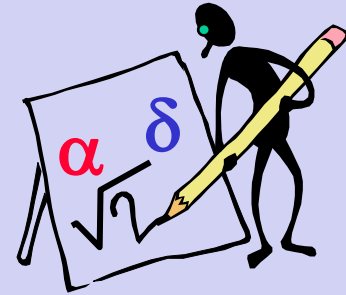
$$[-130^{\circ}]$$

$$0,375^{\circ} * 60 = 22,5'$$

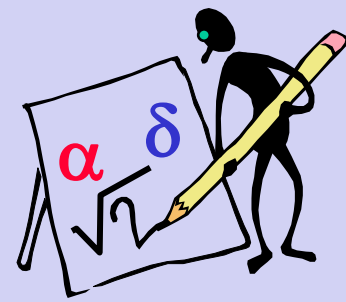
$$[22']$$

$$0,5' * 60 = [30'']$$

$$-130^{\circ} 22' 30''$$



Passar medida angular decimal para sexagesimal



Visor inicial
10,341 666 6667

$$G.d^0 \rightarrow G^0 M' S''$$

Shift 0 / ''

ou

2nd 0 / ''

ou

f 0 / ''

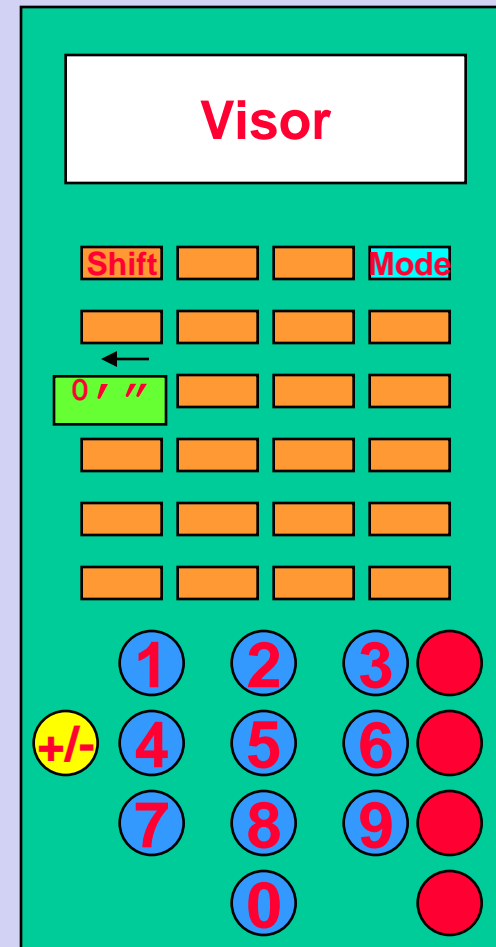
ou

Inv 0 / ''

Visor final
10.203000

Visor final
102030.00

Visor final
10⁰20' 30.0''



Somar ou subtrair ângulos na forma sexagesimal

12° 34' 56"

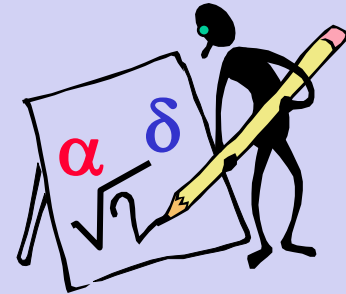
19° 28' 37"

31° 62' 93" (subtrair 60 dos ")

31° (62+1)' 33" (subtrair 60 dos ')

(31+1)° 03' 33"

32° 03' 33"



ou passando para decimal

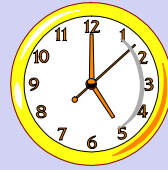
12° 34' 56" + 19° 28' 37" =

12,582 222 2222 + 19,476 944 4444 = 32,059 166 6666

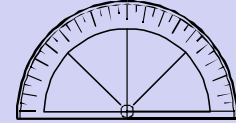
32° 03' 33"

G.d° → G° M' S"

Transformar horas em graus



$$1^{\text{h}} \equiv 15^{\circ}$$



$$(5^{\text{h}} \ 10^{\text{m}} \ 20^{\text{s}}) * 15 =$$

$H^{\text{h}} \ M^{\text{m}} \ S^{\text{s}} \rightarrow H.d^{\text{h}}$

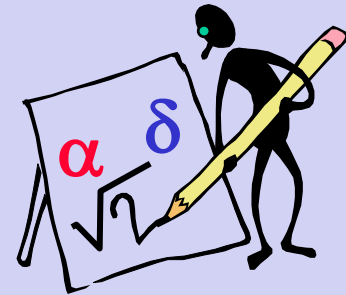
$$5,172 \ 222 \ 2222 * 15 =$$

$$77,583 \ 333 \ 3333 =$$

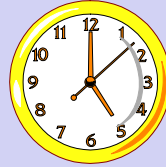
$G.d^{\circ} \rightarrow G^{\circ} \ M' \ S''$

$$77^{\circ} \ 35' \ 00''$$

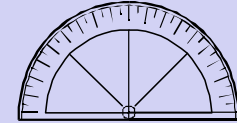
$$5^{\text{h}} \ 10^{\text{m}} \ 20^{\text{s}} = 77^{\circ} \ 35' \ 00''$$



Transformar graus em horas



$$1^{\text{h}} \equiv 15^{\circ}$$



$$(60^{\circ} 50' 40'') / 15 =$$

$$60,844 444 4444 / 15 =$$

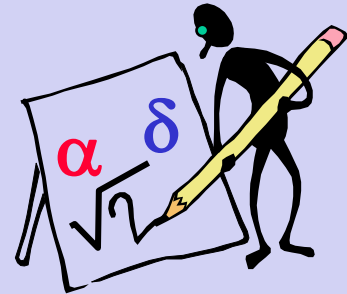
G^o M' S'' → G.d^o

$$4,056 296 2963 =$$

H.dh → Hh Mm Ss

$$4^{\text{h}} 03^{\text{m}} 22,667^{\text{s}}$$

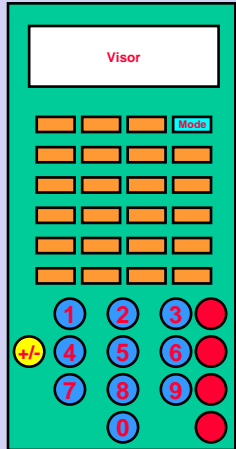
$$60^{\circ} 50' 40'' = 4^{\text{h}} 03^{\text{m}} 22,667^{\text{s}}$$



Funções trigonométricas

$$x = 10^{\circ} 20' 30''$$

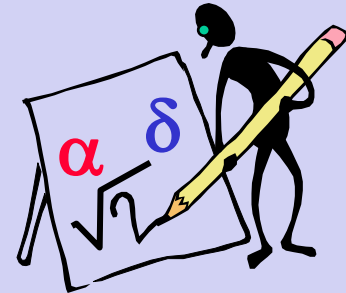
Mode = Degree



$$\text{sen } x = 0,179 517 6692$$

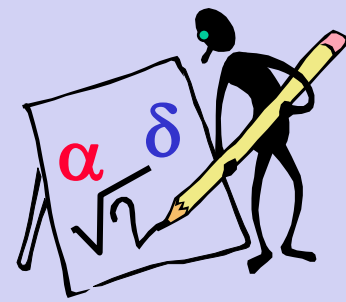
$$\text{cos } x = 0,983 754 7491$$

$$\text{tan } x = 0,182 482 1373$$

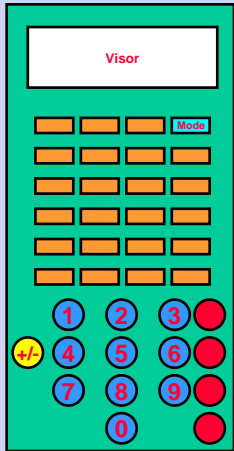


Entrar com o valor angular e depois teclar SIN, COS ou TAN. Em algumas calculadoras deve-se passar o valor angular para a forma decimal antes de aplicar a função desejada.

Funções trigonométricas inversas



Mode = Degree



$$\arcsen(0,179\ 517\ 6692) = 10^{\circ}\ 20'\ 30''$$

$$\arccos(0,983\ 754\ 7491) = 10^{\circ}\ 20'\ 30''$$

$$\arctan(0,182\ 482\ 1373) = 10^{\circ}\ 20'\ 30''$$

Entrar com o valor da função e depois teclar [INV] ou [f] ou [g] ou [2nd] ou [f⁻¹] e finalmente a função desejada [SIN], [COS] ou [TAN].

Em algumas calculadoras existem as funções [ASIN], [ACOS] e [ATAN] diretamente aplicáveis aos valores das funções dadas.