Trigonometric Ratios

Primary Trigonometric Ratios

Reference angle

θ

?

?

?

$$\sin\theta = \frac{opp}{hyp}$$

$$\cos\theta = \frac{adj}{hyp}$$

$$\tan\theta = \frac{opp}{adj}$$

Memory Aid: "SOH CAH TOA"

Reciprocal Trigonometric Ratios

$$\text{cosecant}\,\theta = \frac{hypotenuse}{opposite}$$

$$\text{secant}\,\theta = \frac{hypotenuse}{adjacent}$$

$$\text{cotangent}\,\theta = \frac{adjacent}{opposite}$$

Notice that these ratios are each the reciprocal of one of the primary trig ratios
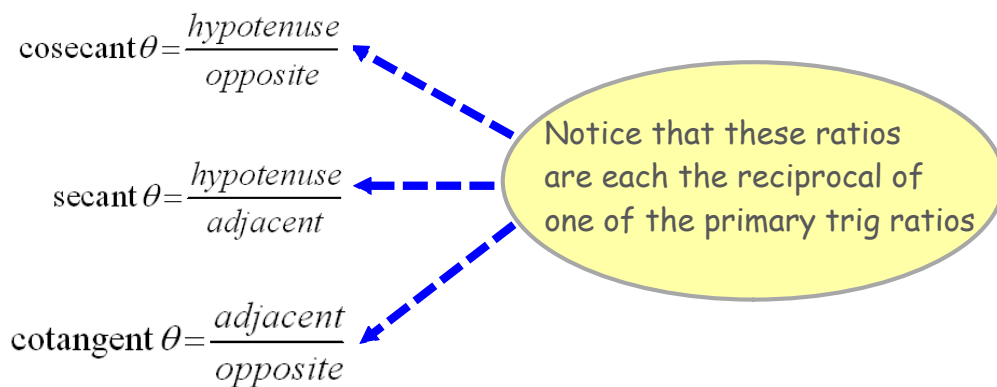
Summary

Primary Ratios	Reciprocal Ratios
$\sin\theta = \dfrac{opp}{hyp}$	$\csc\theta = \dfrac{hyp}{opp}$
$\cos\theta = \dfrac{adj}{hyp}$	$\sec\theta = \dfrac{hyp}{adj}$
$\tan\theta = \dfrac{opp}{adj}$	$\cot\theta = \dfrac{adj}{opp}$

Check up...

State the six trigonometric ratios of angle R. Express your ratios as
fractions in simplest form.

$$x^2 = 2^2 + (3\sqrt{2})^2$$
$$x^2 = 4 + 18$$
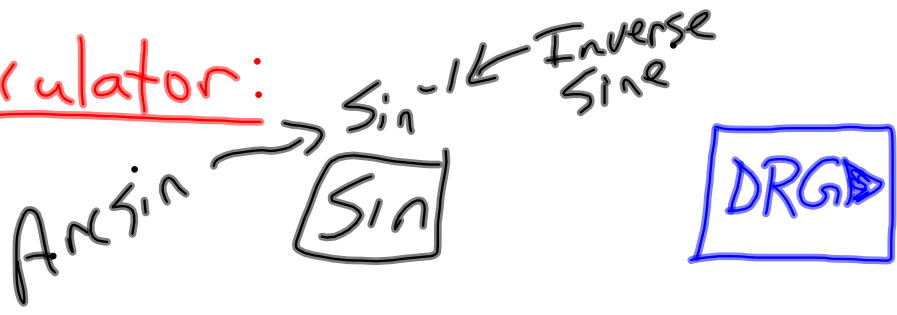$$x = \sqrt{22}$$

R

$x = \sqrt{22}$

2

$3\sqrt{2}$
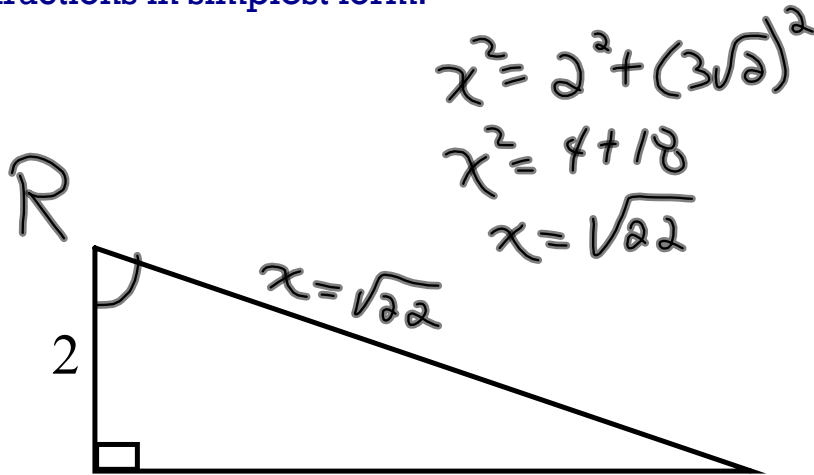
$$\sin R = \frac{3\sqrt{2}}{\sqrt{22}} = \frac{3}{\sqrt{11}}\left(\frac{\sqrt{11}}{\sqrt{11}}\right) = \frac{3\sqrt{11}}{11}$$

$$\csc R = \frac{\sqrt{11}}{3}$$

$$\cos R = \frac{2}{\sqrt{22}}\left(\frac{\sqrt{22}}{\sqrt{22}}\right) = \frac{2\sqrt{22}}{22} = \frac{\sqrt{22}}{11}$$

$$\sec R = \frac{\sqrt{22}}{2}$$

$$\tan R = \frac{3\sqrt{2}}{2}$$

$$\cot R = \frac{2}{3\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right) = \frac{2\sqrt{2}}{6} = \frac{\sqrt{2}}{3}$$

Calculator:

Arcsin $\rightarrow$ Sin^{-1} $\leftarrow$ Inverse Sine

[Sin]

[DRG▶]

$\sin 78° =$

```
sin(78)
      .9781476007
■
```

$\cos 104° = {}^-0.2419$

$\tan\theta = 2.7843$

$\theta = 70°$

```
tan⁻¹(2.7843
        70.24390915
tan(Ans
          2.7843
```

$\cos\theta = 0.7833$

$\theta = 38°$

Reciprocal Functions------------> x^{-1} or $1/x$

Inverse Trigonometric Functions
(Arc Trig Functions)

$\sin^{-1}$ D $\cos^{-1}$ $\tan^{-1}$

sin   cos   tan

Trigonometric Functions

```
n⁻      SCI  ENG
FLOAT 0123456789
RADIAN DEGREE
FUNC  PAR  POL  SEQ
CONNECTED  DOT
SEQUENTIAL  SIMUL
REAL  a+bi  re^θi
FULL  HORIZ  G-T
SET CLOCK 12/02/07 11:16PM
```

Evaluate each of the following:

$\sin 78° = $ _____

$\cos \theta = 0.6469$

$\theta = $ _____

$(\cos^{-1} 3.2361)^{-1}$

$\cot 118° = $ _____

$\sec \theta = 3.2361$

$\theta = \underline{72°}$

```
tan(118)
    -1.880726465
Ans⁻¹
    -.5317094317
■
```

```
cos⁻¹(3.2361⁻¹)
        72.00018422
■
```

or

```
3.2361⁻¹
        .3090139365
cos⁻¹(Ans)
        72.00018422
■
```

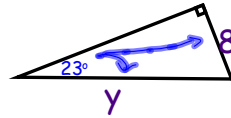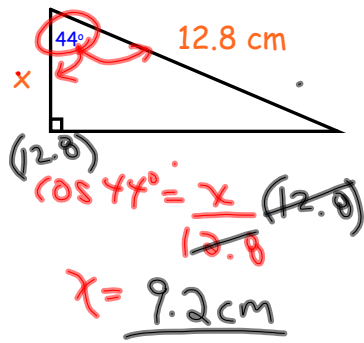$\text{Sec } 74° = 3.6280$

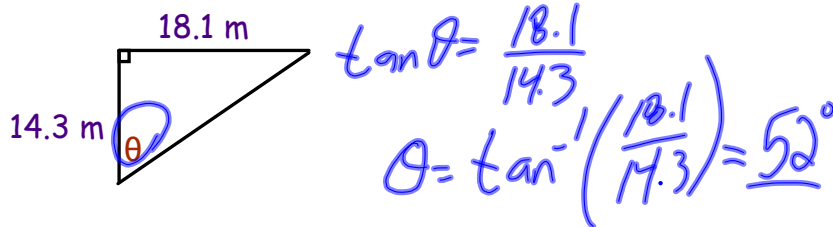$\csc \theta = 4.7321$

$\theta = 12°$

$\csc 23° = 2.5593$

$\cot \theta = 0.4893$

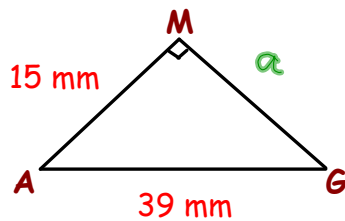$\theta = 64°$

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EXAMPLE - Finding an unknown side

12.8 cm

44°

x

$$\cos 44° = \frac{x}{12.8} (12.8)$$

$$x = \underline{9.2 \text{ cm}}$$

23°   y   8

$$\sin 23° = \frac{8}{y} (y)$$

$$\frac{y \sin 23°}{\sin 23°}$$

$$\boxed{y = 20.5}$$

$$\csc 23° = \frac{y}{8}$$

EXAMPLE - Finding an unknown angle

18.1 m

14.3 m   θ

$$\tan \theta = \frac{18.1}{14.3}$$

$$\theta = \tan^{-1}\left(\frac{18.1}{14.3}\right) = \underline{52°}$$

EXAMPLE - Solve the triangle (find ALL sides and angles)

M   a

15 mm

A   G
   39 mm

$$\cos A = \frac{15}{39}$$

$$A = 67° \quad \therefore \ \underline{G = 23°}$$

$$\sqrt{a^2} = \sqrt{39^2 - 15^2}$$

$$\boxed{a = 36} \text{ mm}$$

$$\text{)} \ \sin 67° = \frac{a}{39}$$

$$a = 35.9 \text{ mm}$$

b

L   35°   I

ℓ   10.25

B

$$\tan 35° = \frac{10.2}{b}$$

$$b = \underline{14.6} \qquad \underline{\angle B = 55°}$$
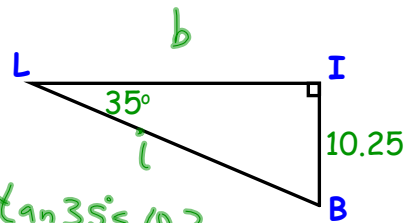
$$\sin 35° = \frac{10.2}{\ell}$$

$$\ell = \underline{17.8}$$

HOMEWORK...

Worksheet - Primary Trig Ratios.doc

Attachments

Worksheet - Primary Trig Ratios.doc