

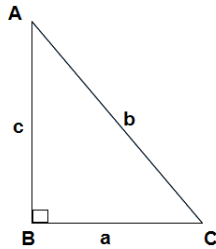


GRAAD 10_KABV Kurrikulum

10.9 Trigonometrie

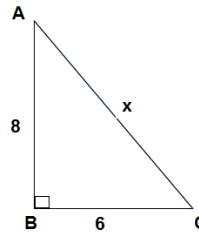
1.1 Definieer trigonometriese verhoudings as $\sin \theta$, $\cos \theta$ en $\tan \theta$ deur reghoekige driehoeke te gebruik.

(a)



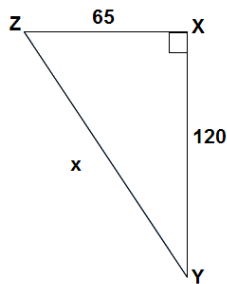
$\cos A = \dots$
 $\sin C = \dots$
 $\tan A = \dots$

(b)



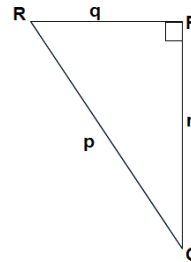
$\sin A = \dots$
 $\tan C = \dots$
 $\cos C = \dots$

(c)



$\sin Z = \dots$ $\sin Y = \dots$
 $\cos Z = \dots$ $\cos Y = \dots$
 $\tan Z = \dots$ $\tan Y = \dots$

(d)



$\sin Q = \dots$
 $\tan R = \dots$
 $\cos Q = \dots$

1.2 Brei die definisies uit vir $\sin \theta$, $\cos \theta$ en $\tan \theta$ as $0^\circ \leq \theta \leq 360^\circ$.

(a) $\cos 100^\circ$

(b) $\tan 210^\circ$

(c) $\sin 300^\circ$

(d) $\tan 135^\circ$

(e) $\sin 315^\circ$

(f) $\cos 120^\circ$

(g) $\sin 240^\circ$

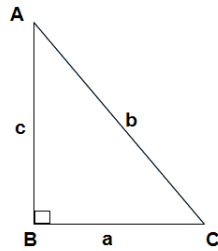
(h) $\cos 225^\circ$

(i) $\tan 150^\circ$

(j) $\sin 135^\circ$



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$\sin A = \dots$	$\operatorname{cosec} C = \dots$
$\cos A = \dots$	$\sec C = \dots$
$\tan A = \dots$	$\cot C = \dots$
$\operatorname{cosec} A = \dots$	$\sin C = \dots$
$\sec A = \dots$	$\cos C = \dots$
$\cot A = \dots$	$\tan C = \dots$

1.4 Lei die waardes van die trigonometriese verhoudings vir spesiale hoeke af (sonder die gebruik van 'n sakrekenaar).

(a) $\frac{\tan 225^\circ \cdot \sin 135^\circ \cdot \tan 300^\circ}{\cos 315^\circ \cdot \cos 225^\circ \cdot \cos 150^\circ}$

(b) $\frac{\tan 120^\circ}{\tan 330^\circ}$

(c) $\sin 60^\circ \cdot \cos 30^\circ \cdot \tan 60^\circ$

(d) $\sin 30^\circ \cdot \tan 45^\circ \cdot \cos 45^\circ$

(e) $\frac{\tan 120^\circ \cdot \cos 210^\circ}{\sin 240^\circ \cdot \sin 240^\circ}$

(f) $\frac{\cos 330^\circ}{\cos 225^\circ \cdot \cos 315^\circ \cdot \tan 225^\circ}$

1.5 Los 2D probleme op m.b.v. reghoekige driehoeke.

(a) Die lengte van 'n mas is 8.5m, en die lengte van die skaduwee van die mas is 7.25m. Bereken die hoogtehoek van die son op daardie oomblik.

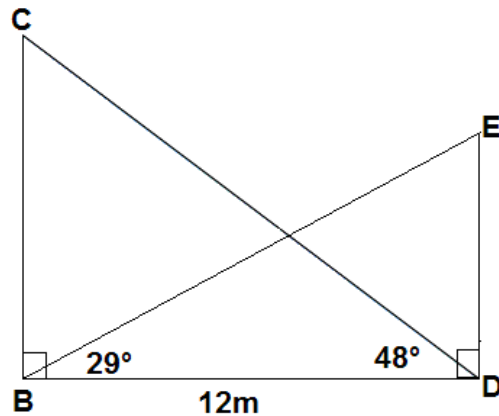
(b) Die dieptehoek van 'n sweeftuig na 'n vrou op die grond is 43° . As die



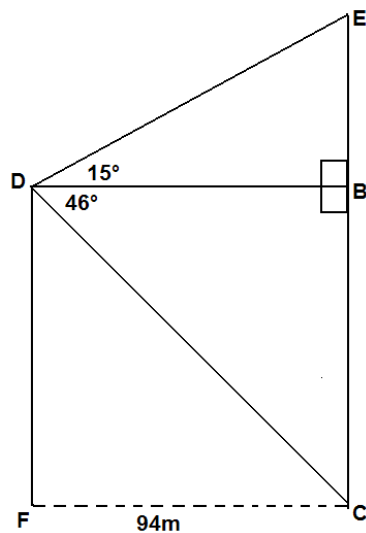
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sweeftuig 2 340m van die vrou af is, bereken die hoogte van die sweeftuig.

(c) Twee torings is 12m van mekaar af. Vanaf B is die hoogthoek na DE, 29° en vanaf D is die hoogthoek na BC, 48° . Bereken die verskil in die hoogte van die twee torings.



(d) 'n Gebou (DF) en 'n toring (CE) is 94m van mekaar af. Vanaf die dak van die gebou is die hoogthoek na die top van die toring 15° en die diepthoek na die voet van die toring is 46° . Bereken die hoogte van die toring.



1.6 Los die trigonometriese vergelykings op vir hoeke tussen 0° en 90° .

(a) $\sin 51^\circ = \cos \beta$

(b) $\cos 33^\circ = \sin \alpha$



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- (c) $\sin 75^\circ = \cos 3\theta$
- (d) $\cos 4\alpha = \sin 5\alpha$
- (e) $\cos(\beta - 43^\circ) = \sin 65^\circ$
- (f) $\sin(\theta + 54^\circ) = \cos(\theta - 8^\circ)$

1.7 Gebruik sketse om die getalwaardes van die verhoudings te bereken vir die hoeke tussen 0° and 360° .

- (a) As $17\sin A = 15$, $0^\circ \leq A \leq 90^\circ$, bereken $\tan A$.
- (b) As $9\tan \beta = 40$ en β is 'n skerphoek, bereken $\sin \beta$.
- (c) As $6\sin \alpha - 5 = 0$ en $\alpha \in [90^\circ; 180^\circ]$, bereken $\cos \alpha$.
- (d) As $-5\cos \beta - 4 = 0$ en $\beta \in [180^\circ; 270^\circ]$, bereken $\sin \beta$.
- (e) As $5\sin \theta - 4 = 0$ en $90^\circ \leq \theta \leq 180^\circ$, bereken $\cos \theta$.

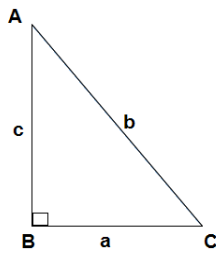


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MEMO

1.1 Definieer trigonometriese verhoudings as $\sin \theta$, $\cos \theta$ en $\tan \theta$ deur reghoekige driehoeke te gebruik. [7.2.1.1]

(a)

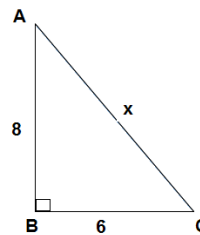


$$\cos A = \frac{c}{b}$$

$$\sin C = \frac{c}{b}$$

$$\tan A = \frac{a}{c}$$

(b)

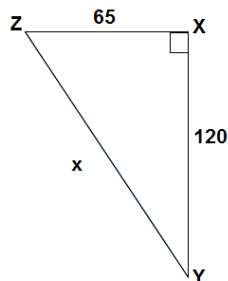


$$\sin A = \frac{6}{x}$$

$$\tan C = \frac{8}{6}$$

$$\cos C = \frac{6}{x}$$

(c)

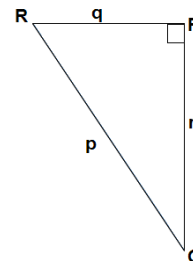


$$\sin Z = \frac{120}{x}; \sin Y = \frac{65}{x}$$

$$\cos Z = \frac{65}{x}; \cos Y = \frac{120}{x}$$

$$\tan Z = \frac{120}{65}; \tan Y = \frac{65}{120}$$

(d)



$$\sin Q = \frac{q}{p}$$

$$\tan R = \frac{r}{q}$$

$$\cos Q = \frac{r}{p}$$

1.2 Brei die definisies uit vir $\sin \theta$, $\cos \theta$ en $\tan \theta$ as $0^\circ \leq \theta \leq 360^\circ$.
[7.4.2.2; 7.4.2.3]

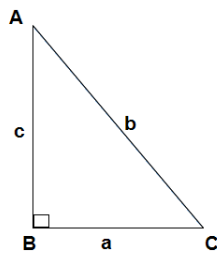
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- (a) $\cos 100^\circ = -\cos 80^\circ$ (b) $\tan 210^\circ = \tan 30^\circ$
(c) $\sin 300^\circ = -\sin 60^\circ$ (d) $\tan 135^\circ = -\tan 45^\circ$
(e) $\sin 315^\circ = -\sin 45^\circ$ (f) $\cos 120^\circ = -\cos 60^\circ$
(g) $\sin 240^\circ = -\sin 60^\circ$ (h) $\cos 225^\circ = -\cos 45^\circ$
(i) $\tan 150^\circ = -\tan 30^\circ$ (j) $\sin 135^\circ = \sin 45^\circ$

1.3 Definieer die resiproke van die trigonometriese verhoudings as cosec θ , sec θ en cot θ , deur reghoekige driehoeke te gebruik. [7.2.1.3; 7.2.1.4; 7.2.1.5; 7.2.1.2]



$\sin A = \frac{a}{b}$	$\operatorname{cosec} C = \frac{b}{c}$
$\cos A = \frac{c}{b}$	$\sec C = \frac{b}{a}$
$\tan A = \frac{a}{c}$	$\cot C = \frac{a}{c}$
$\operatorname{cosec} A = \frac{b}{a}$	$\sin C = \frac{c}{b}$
$\sec A = \frac{b}{c}$	$\cos C = \frac{a}{b}$
$\cot A = \frac{c}{a}$	$\tan C = \frac{c}{a}$

1.4 Lei die waardes van die trigonometriese verhoudings vir spesiale hoeke af (sonder die gebruik van 'n sakrekenaar). [7.3.2.1; 7.3.2.3; 7.3.1.5; 7.3.1.1]

(a)



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$$\begin{aligned} & \frac{\tan 225^\circ \cdot \sin 135^\circ \cdot \tan 300^\circ}{\cos 315^\circ \cdot \cos 225^\circ \cdot \cos 150^\circ} \\ &= \frac{\tan 45^\circ \cdot \sin 45^\circ \cdot (-\tan 60^\circ)}{\cos 45^\circ \cdot (-\cos 45^\circ) \cdot (-\cos 30^\circ)} \\ &= \frac{1 \cdot \frac{1}{\sqrt{2}} \cdot (-\sqrt{3})}{\frac{1}{\sqrt{2}} \cdot (-\frac{1}{\sqrt{2}}) \cdot (-\frac{\sqrt{3}}{2})} \\ &= -2\sqrt{2} \end{aligned}$$

(b)

$$\begin{aligned} & \frac{\tan 120^\circ}{\tan 330^\circ} \\ &= \frac{-\tan 60^\circ}{-\tan 30^\circ} \\ &= \frac{\sqrt{3}}{\frac{1}{\sqrt{3}}} \\ &= 3 \end{aligned}$$

(c)

$$\begin{aligned} & \sin 60^\circ \cdot \cos 30^\circ \cdot \tan 60^\circ \\ &= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} \cdot \sqrt{3} \\ &= \frac{3\sqrt{3}}{4} \end{aligned}$$

(d)

$$\begin{aligned} & \sin 30^\circ \cdot \tan 45^\circ \cdot \cos 45^\circ \\ &= \frac{1}{2} \cdot 1 \cdot \frac{1}{\sqrt{2}} \\ &= \frac{1}{2\sqrt{2}} \end{aligned}$$

(e)



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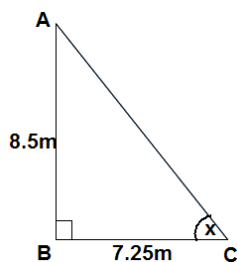
$$\begin{aligned} & \frac{\tan 120^\circ \cdot \cos 210^\circ}{\sin 240^\circ \cdot \sin 240^\circ} \\ &= \frac{(-\tan 60^\circ) \cdot (-\cos 30^\circ)}{(-\sin 60^\circ) \cdot (-\sin 60^\circ)} \\ &= \frac{\sqrt{3} \cdot \frac{\sqrt{3}}{2}}{\left(\frac{\sqrt{3}}{2}\right)^2} \\ &= 2 \end{aligned}$$

(f)

$$\begin{aligned} & \frac{\cos 330^\circ}{\cos 225^\circ \cdot \cos 315^\circ \cdot \tan 225^\circ} \\ &= \frac{\cos 30^\circ}{(-\cos 45^\circ) \cdot \cos 45^\circ \cdot \tan 45^\circ} \\ &= \frac{\frac{\sqrt{3}}{2}}{-\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} \cdot 1} \\ &= -\sqrt{3} \end{aligned}$$

1.5 Los 2D probleme op m.b.v. reghoekige driehoeke. [7.7.1.1; 7.7.1.2; 7.7.1.3]

(a) Die lengte van 'n mas is 8.5m, en die lengte van die skaduwee van die mas is 7.25m. Bereken die hoogtehoek van die son op daardie oomblik.



$$\frac{AB}{BC} = \tan x$$

$$\frac{8.5}{7.25} = \tan x$$

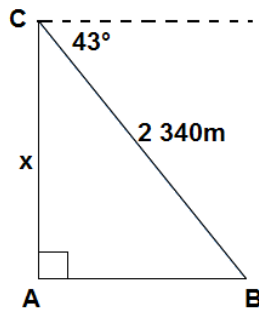
$$x = \tan^{-1}\left(\frac{8.5}{7.25}\right)$$

$$x = 49.5^\circ$$



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(b) Die dieptehoek van 'n sweeftuig na 'n vrou op die grond is 43° . As die sweeftuig 2 340m van die vrou af is, bereken die hoogte van die sweeftuig.



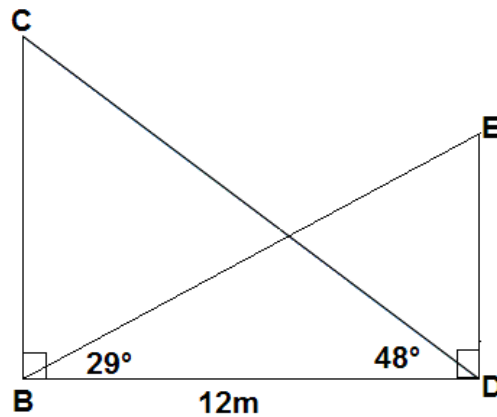
$$\frac{AC}{BC} \sin x$$

$$\frac{x}{2340} = \sin 43^\circ$$

$$x = 2340 \times \sin 43^\circ$$

$$x = 1595.9m$$

(c) Twee torings is 12m van mekaar af. Vanaf B is die hoogtehoek na DE, 29° en vanaf D is die hoogtehoek na BC, 48° . Bereken die verskil in die hoogte van die twee torings.



$\triangle BCD$:

$$\frac{BC}{BD} = \tan 48^\circ$$

$$\frac{x}{12} = \tan 48^\circ$$

$$x = 12 \times \tan 48^\circ$$

$$x = 13.33m$$

$\triangle BDE$:

$$\frac{DE}{BD} = \tan 29^\circ$$

$$\frac{y}{12} = \tan 29^\circ$$

$$y = 12 \times \tan 29^\circ$$

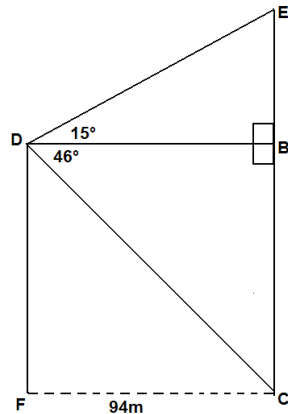
$$y = 6.65m$$



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$$BC - DE = 13.33 - 6.65 = 6.68m$$

(d) 'n Gebou (DF) en 'n toring (CE) is 94m van mekaar af. Vanaf die dak van die gebou is die hoogtehoek na die top van die toring 15° en die dieptehoek na die voet van die toring is 46° . Bereken die hoogte van die toring.



$\triangle BCD$:

$$\frac{BC}{DB} = \tan 46^\circ$$

$$\frac{x}{94} = \tan 46^\circ$$

$$x = 94 \times \tan 46^\circ$$

$$x = 97.34m$$

$\triangle BDE$:

$$\frac{BE}{DB} = \tan 15^\circ$$

$$\frac{y}{94} = \tan 15^\circ$$

$$y = 94 \times \tan 15^\circ$$

$$y = 25.19m$$

$$EC = 97.34 + 25.19 = 122.53m$$

1.6 Los die trigonometriese vergelykings op vir hoeke tussen 0° en 90° . [7.6.2.1; 7.6.2.3; 7.6.2.5]

(a) $\sin 51^\circ = \cos \beta$
 $\sin 51^\circ = \cos \beta$
 $\sin 51^\circ = \sin(90^\circ - \beta)$
 $\therefore 51^\circ = 90^\circ - \beta$
 $\therefore \beta = 90^\circ - 51^\circ$
 $\therefore \beta = 39^\circ$

(b) $\cos 33^\circ = \sin \alpha$



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$$\cos 33^\circ = \sin \alpha$$

$$\cos 33^\circ = \cos(90^\circ - \alpha)$$

$$\therefore 33^\circ = 90^\circ - \alpha$$

$$\therefore \alpha = 90^\circ - 33^\circ$$

$$\therefore \alpha = 57^\circ$$

(c) $\sin 75^\circ = \cos 3\theta$

$$\sin 75^\circ = \cos 3\theta$$

$$\sin 75^\circ = \sin(90^\circ - 3\theta)$$

$$\therefore 75^\circ = 90^\circ - 3\theta$$

$$\therefore 3\theta = 90^\circ - 75^\circ$$

$$\therefore 3\theta = 15^\circ$$

$$\therefore \theta = 5^\circ$$

(d) $\cos 4\alpha = \sin 5\alpha$

$$\cos 4\alpha = \sin 5\alpha$$

$$\cos 4\alpha = \cos(90^\circ - 5\alpha)$$

$$\therefore 4\alpha = 90^\circ - 5\alpha$$

$$\therefore 9\alpha = 90^\circ$$

$$\therefore \alpha = 10^\circ$$

(e) $\cos(\beta - 43^\circ) = \sin 65^\circ$

$$\cos(\beta - 43^\circ) = \sin 65^\circ$$

$$\cos(\beta - 43^\circ) = \cos(90^\circ - 65^\circ)$$

$$\therefore \beta - 43^\circ = 90^\circ - 65^\circ$$

$$\therefore \beta = 68^\circ$$

(f) $\sin(\theta + 54^\circ) = \cos(\theta - 8^\circ)$

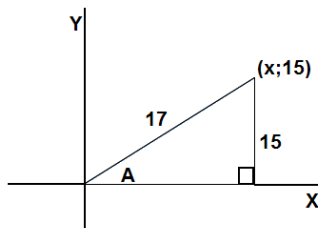


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$$\begin{aligned}\sin(\theta + 54^\circ) &= \cos(\theta - 8^\circ) \\ \sin(\theta + 54^\circ) &= \sin(90^\circ - (\theta - 8^\circ)) \\ \sin(\theta + 54^\circ) &= \sin(90^\circ - \theta + 8^\circ) \\ \therefore \theta + 54^\circ &= 90^\circ - \theta + 8^\circ \\ \therefore 2\theta &= 90^\circ - 54^\circ + 8^\circ \\ \therefore 2\theta &= 44^\circ \\ \therefore \theta &= 22^\circ\end{aligned}$$

1.7 Gebruik sketse om die getalwaardes van die verhoudings te bereken vir die hoeke tussen 0° and 360° . [7.6.3.1; 7.6.3.3; 7.6.3.5; 7.6.5.1]

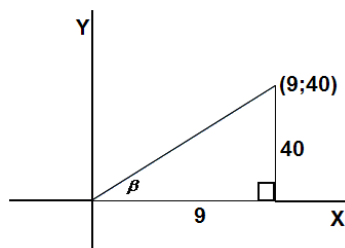
(a) As $17\sin A = 15$, $0^\circ \leq A \leq 90^\circ$, bereken $\tan A$.



$$\begin{aligned}x^2 + y^2 &= r^2 \\ x^2 + (15)^2 &= (17)^2 \\ x^2 &= 64 \\ x &= 8\end{aligned}$$

$$\therefore \tan A = \frac{15}{8}$$

(b) As $9\tan \beta = 40$ en β is 'n skerphoek, bereken $\sin \beta$.



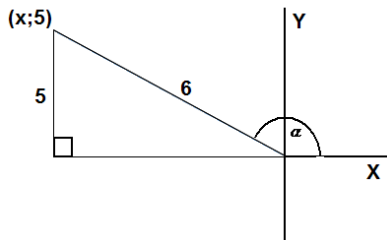
$$\begin{aligned}x^2 + y^2 &= r^2 \\ (9)^2 + (40)^2 &= r^2 \\ 81 + 1600 &= r^2 \\ r^2 &= 1681 \\ r &= 41\end{aligned}$$

$$\therefore \sin \beta = \frac{40}{41}$$



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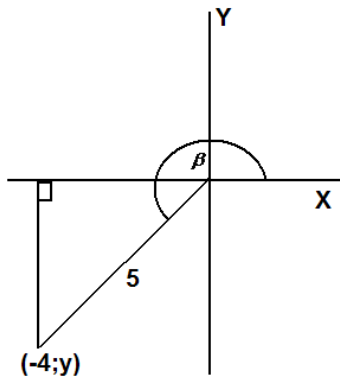
(c) As $6\sin \alpha - 5 = 0$ en $\alpha \in [90^\circ; 180^\circ]$, bereken $\cos \alpha$.



$$\begin{aligned}x^2 + y^2 &= r^2 \\x^2 + (5)^2 &= (6)^2 \\x^2 &= 36 - 25 \\x &= -\sqrt{11}\end{aligned}$$

$$\therefore \cos \alpha = \frac{-\sqrt{11}}{6}$$

(d) As $-5\cos \beta - 4 = 0$ en $\beta \in [180^\circ; 270^\circ]$, bereken $\sin \beta$.



$$\begin{aligned}x^2 + y^2 &= r^2 \\(-4)^2 + y^2 &= (5)^2 \\16 + y^2 &= 25 \\y &= -3\end{aligned}$$

$$\therefore \sin \beta = \frac{-3}{5}$$

(e) As $5\sin \theta - 4 = 0$ en $90^\circ \leq \theta \leq 180^\circ$, bereken $\cos \theta$.



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