

TRIGONOMETRIE

Oplossings

Die DBE se eie nasienriglyne, in boekvolgorde

Elke oplossing hier is 'n uitknipsel van die amptelike DBE-nasienriglyn wat saam met die vraestel gepubliseer is waaruit die vraag kom. Die bewerking, die punt-merke en die aanvaarde alternatiewe is die DBE se eie. Niks is oorgeskryf of oor afgelei nie.

Die nommers pas by die vraeboek: oplossing 34 antwoord vraag 34, en die hoofstukke is in dieselfde volgorde.

Die DBE skryf een riglyn vir albei tale, so hierdie bladsye is tweetalig en hul nasienaantekeninge is grootliks in Engels. Dit is die DBE se eie bladsy, presies soos gedruk weergegee.

'n Nasienriglyn word vir nasieners geskryf, nie vir leerders nie. Dit wys die kortste pad na die punte, so waar 'n stap saamgepers lyk, is dit die riglyn wat bondig is eerder as 'n stap wat ontbreek.

1. Vereenvoudig tot een verhouding, dan 'n som van twee sinusse

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V6 · 12 punte

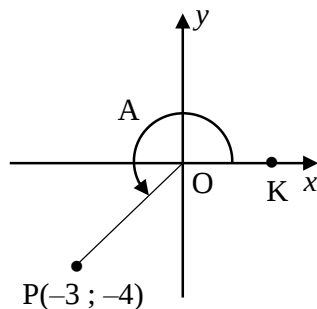
QUESTION/VRAAG 6

6.1	$\frac{\sin 10^\circ}{\cos 440^\circ} + \tan(360^\circ - \theta) \cdot \sin 2\theta$ $= \frac{\cos 80^\circ}{\cos 80^\circ} - \tan \theta (2 \sin \theta \cos \theta)$ $= 1 - \frac{\sin \theta}{\cos \theta} (2 \sin \theta \cos \theta)$ $= 1 - 2 \sin^2 \theta$ $= \cos 2\theta$	✓ $-\tan \theta$ ✓ $\cos 80^\circ$ ✓ co-ratio ✓ double angle ✓ quotient identity ✓ answer (6)
6.2.1	$\sin(60^\circ + 2x) + \sin(60^\circ - 2x) = k \cos 2x$ $(\sin 60^\circ \cos 2x + \cos 60^\circ \sin 2x) + (\sin 60^\circ \cos 2x - \cos 60^\circ \sin 2x) = k \cos 2x$ $2 \sin 60^\circ \cos 2x = k \cos 2x$ $2 \left(\frac{\sqrt{3}}{2} \right) \cos 2x = k \cos 2x$ $\therefore k = \sqrt{3}$	✓ both expansions correct ✓ special $\angle$s ✓ answer (3)
6.2.2	$\tan 60^\circ [\sin(60^\circ + 2x) + \sin(60^\circ - 2x)]$ $= \tan 60^\circ [k \cos 2x]$ $= \sqrt{3} (\sqrt{3} \cos 2x)$ $= 3(2 \cos^2 x - 1)$ $= 3(2(\sqrt{t})^2 - 1)$ $= 6(\sqrt{t})^2 - 3$ $= 6t - 3$	✓ special $\angle$ ✓ double $\angle$s ✓ answer i.t.o t (3)
[12]		

2. $\cos A$ uit 'n punt, dan die dubbel- en saamgestelde hoeke

Amptelike DBE-nasienriglyn · November 2024 · V5 · 12 punte

QUESTION/VRAAG 5



5.1.1	$r = 5$ $\cos A = -\frac{3}{5}$	✓ $r = 5$ ✓ answer (2)
5.1.2	$\cos 2A = 2\cos^2 A - 1$ $= 2\left(-\frac{3}{5}\right)^2 - 1$ $= -\frac{7}{25}$ OR/OF $\cos 2A = \cos^2 A - \sin^2 A$ $= \left(-\frac{3}{5}\right)^2 - \left(-\frac{4}{5}\right)^2$ $= -\frac{7}{25}$ OR/OF $\cos 2A = 1 - 2\sin^2 A$ $= 1 - 2\left(-\frac{4}{5}\right)^2$ $= -\frac{7}{25}$	✓ substitution of $\cos A$ into double angle formula ✓ answer (2) ✓ substitution of $\cos A$ & $\sin A$ into double angle formula ✓ answer (2) ✓ substitution of $\sin A$ into double angle formula ✓ answer (2)
5.1.3	 $x = -3$ $\sin(A - B) = \sin A \cos B - \cos A \sin B$ $= \left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right) - \left(-\frac{3}{5}\right)\left(\frac{4}{5}\right)$ $= \frac{12}{25} + \frac{12}{25}$ $= \frac{24}{25}$	✓ $x = -3$ ✓ ✓ substitution into the compound angle formula ✓ answer (4)

5.2	$\frac{\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2}$ $= \frac{2\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2 \cdot 2}$ $= \frac{\sin(\alpha - 90^\circ)}{4}$ $= \frac{-\cos \alpha}{4}$ $= \frac{-p}{4} \quad \text{OR/OF} \quad = -\frac{1}{4} p$ OR/OF $\frac{\cos\left(\frac{\alpha}{2} - 45^\circ\right) \sin\left(\frac{\alpha}{2} - 45^\circ\right)}{2}$ $= \frac{\left[\cos \frac{\alpha}{2} \cos 45^\circ + \sin \frac{\alpha}{2} \sin 45^\circ\right] \left[\sin \frac{\alpha}{2} \cos 45^\circ - \cos \frac{\alpha}{2} \sin 45^\circ\right]}{2}$ $= \frac{\left[\frac{\sqrt{2}}{2} \cos \frac{\alpha}{2} + \frac{\sqrt{2}}{2} \sin \frac{\alpha}{2}\right] \left[\frac{\sqrt{2}}{2} \sin \frac{\alpha}{2} - \frac{\sqrt{2}}{2} \cos \frac{\alpha}{2}\right]}{2}$ $= \frac{\frac{1}{2} \sin^2 \frac{\alpha}{2} - \frac{1}{2} \cos^2 \frac{\alpha}{2}}{2}$ $= \frac{-\frac{1}{2} \left(\cos^2 \frac{\alpha}{2} - \sin^2 \frac{\alpha}{2}\right)}{2}$ $= -\frac{\cos 2\left(\frac{\alpha}{2}\right)}{4}$ $= -\frac{\cos \alpha}{4}$ $= -\frac{1}{4} p$	✓ multiply by $\frac{2}{2}$ ✓ double angle ✓ co function ✓ answer (4) OR/OF ✓ expansion ✓ special angles ✓ double angle ✓ answer (4)
		[12]

3. Twee identiteite om te bewys, een 'n verskil van sinusse

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V6 · 13 punte

QUESTION/VRAAG 6

6.1	$\begin{aligned} \text{LHS} &= 2 \cos^2(45^\circ + x) \\ &= 2 \cos^2(45^\circ + x) + 1 - 1 \\ &= \cos[2(45^\circ + x)] + 1 \\ &= \cos(90^\circ + 2x) + 1 \\ &= (-\sin 2x) + 1 \\ &= 1 - \sin 2x \\ &= \text{RHS} \end{aligned}$ OR/OF $\begin{aligned} \text{LHS} &= 2 \cos^2(45^\circ + x) \\ &= 2(\cos(45^\circ + x))^2 \\ &= 2(\cos 45^\circ \cos x - \sin 45^\circ \sin x)^2 \\ &= 2\left(\frac{\sqrt{2}}{2} \cos x - \frac{\sqrt{2}}{2} \sin x\right)^2 \\ &= 2\left(\frac{1}{2} \cos^2 x - \sin x \cos x + \frac{1}{2} \sin^2 x\right) \\ &= \cos^2 x - 2 \sin x \cos x + \sin^2 x \\ &= 1 - \sin 2x \\ &= \text{RHS} \end{aligned}$	✓ + 1 - 1 ✓ double angle ✓ simplification ✓ reduction (4) ✓ compound $\angle$ expansion ✓ subst. special $\angle$ values ✓ simplification ✓ $\sin^2 x + \cos^2 x = 1$ (4)
6.2.1	$\begin{aligned} \text{LHS} &= \sin(A - B) - \sin(A + B) \\ &= \sin A \cos B - \cos A \sin B - (\sin A \cos B + \cos A \sin B) \\ &= \sin A \cos B - \cos A \sin B - \sin A \cos B - \cos A \sin B \\ &= -2 \cos A \sin B \\ &= \text{RHS} \end{aligned}$	✓ $\sin A \cos B - \cos A \sin B$ ✓ $-\sin A \cos B - \cos A \sin B$ (2)
6.2.2	$\begin{aligned} \sin 4x - \sin 10x &= \sin(7x - 3x) - \sin(7x + 3x) \\ &= -2 \cos 7x \sin 3x \end{aligned}$	✓ $4x = 7x - 3x$ & $10x = 7x + 3x$ ✓ answer (2)
6.2.3	$\begin{aligned} \sin 4x - \sin 10x &= \sin 3x \\ -2 \cos 7x \sin 3x &= \sin 3x \\ 2 \cos 7x \sin 3x + \sin 3x &= 0 \\ \sin 3x(2 \cos 7x + 1) &= 0 \end{aligned}$ $\begin{array}{lll} \sin 3x = 0 & \text{or} & \cos 7x = -\frac{1}{2} \\ 3x = 0^\circ & & 7x = 120^\circ \quad \text{or} \quad 7x = 240^\circ \\ x = 0^\circ & & x = 17, 14^\circ \quad \quad x = 34, 29^\circ \\ & & \text{N/A} \end{array}$	✓ substitution ✓ factorisation ✓ both equations ✓ answer ✓ answer (5)
[13]		

4. Lei $\cos(\alpha + \beta)$ af, gebruik dit dan om te vereenvoudig

Amptelike DBE-nasienriglyn · November 2021 · V6 · 15 punte

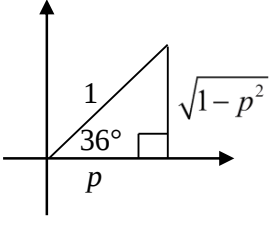
QUESTION/VRAAG 6

6.1.1	$\cos(\alpha + \beta)$ $= \cos(\alpha - (-\beta))$ $= \cos \alpha \cos(-\beta) + \sin \alpha \sin(-\beta)$ $= \cos \alpha \cos \beta + \sin \alpha (-\sin \beta)$ $= \cos \alpha \cos \beta - \sin \alpha \sin \beta$	✓ $\cos(\alpha - (-\beta))$ ✓ expansion ✓ reduction (3)
6.1.2	$2 \cos 6x \cos 4x - \cos 10x + 2 \sin^2 x$ $= 2 \cos 6x \cos 4x - \cos(6x + 4x) + 2 \sin^2 x$ $= 2 \cos 6x \cos 4x - (\cos 6x \cos 4x - \sin 6x \sin 4x) + 2 \sin^2 x$ $= \cos 6x \cos 4x + \sin 6x \sin 4x + 2 \sin^2 x$ $= \cos 2x + 2 \sin^2 x$ $= 1 - 2 \sin^2 x + 2 \sin^2 x$ $= 1$	✓ $\cos 10x = \cos(6x + 4x)$ ✓ expansion of $\cos(6x + 4x)$ ✓ $\cos 2x$ ✓ $1 - 2 \sin^2 x$ ✓ answer (5)
6.2	$\tan x = 2 \sin 2x$ $\frac{\sin x}{\cos x} = 2(2 \sin x \cos x)$ $\sin x = 4 \sin x \cos^2 x$ $4 \sin x \cos^2 x - \sin x = 0$ $\sin x(4 \cos^2 x - 1) = 0$ $\sin x = 0$ or $\cos^2 x = \frac{1}{4}$ $\cos x = -\frac{1}{2}$ $x = 180^\circ + k.360^\circ; k \in \mathbb{Z}$ or $x = 120^\circ + k.360^\circ; k \in \mathbb{Z}$ $x = 240^\circ + k.360^\circ; k \in \mathbb{Z}$ OR/OF $\tan x = 2 \sin 2x$ $\frac{\sin x}{\cos x} = 4 \sin x \cos x$ $\sin x = 4 \sin x \cos^2 x$ $4 \sin x \cos^2 x - \sin x = 0$ $4 \sin x(1 - \sin^2 x) - \sin x = 0$ $3 \sin x - 4 \sin^3 x = 0$ $\sin x(3 - 4 \sin^2 x) = 0$ $\sin x = 0$ or $\sin^2 x = \frac{3}{4}$ $\sin x = \frac{\sqrt{3}}{2}$ or $\sin x = -\frac{\sqrt{3}}{2}$ $x = 180^\circ + k.360^\circ, k \in \mathbb{Z}$ or $x = 120^\circ + k.360^\circ, k \in \mathbb{Z}$ $x = 240^\circ + k.360^\circ, k \in \mathbb{Z}$	✓ quotient identity ✓ double angle identity ✓ factors ✓ both equations ✓ $x = 180^\circ$ ✓ $x = 120^\circ$ & 240° OR/OF $x = \pm 120^\circ$ ✓ $k.360^\circ; k \in \mathbb{Z}$ (7) ✓ quotient identity ✓ identity ✓ factors ✓ both equations ✓ $x = 180^\circ$ ✓ $x = 120^\circ$ & 240° OR/OF $x = \pm 120^\circ$ ✓ $k.360^\circ; k \in \mathbb{Z}$ (7)
		[15]

5. Reduseer tot 'n enkele verhouding, bewys dan 'n identiteit

Amptelike DBE-nasienriglyn · November 2021 · V5 · 17 punte

QUESTION/VRAAG 5

5.1	$\frac{\sin 140^\circ \cdot \sin(360^\circ - x)}{\cos 50^\circ \cdot \tan(-x)}$ $= \frac{\sin 40^\circ (-\sin x)}{\sin 40^\circ (-\tan x)}$ $= \frac{-\sin x}{-\tan x}$ $= \frac{\sin x}{\cos x}$ $= \cos x$	✓ $\sin 40^\circ$ ✓ $-\sin x$ ✓ co-ratio ✓ $-\tan x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ answer
5.2	$\text{LHS} = \frac{-2\sin^2 x + \cos x + 1}{1 - \cos(540^\circ - x)}$ $\text{LHS} = \frac{-2(1 - \cos^2 x) + \cos x + 1}{1 - (-\cos x)}$ $\text{LHS} = \frac{-2 + 2\cos^2 x + \cos x + 1}{1 + \cos x}$ $\text{LHS} = \frac{2\cos^2 x + \cos x - 1}{1 + \cos x}$ $\text{LHS} = \frac{(2\cos x - 1)(\cos x + 1)}{1 + \cos x}$ $\text{LHS} = 2\cos x - 1$ $\therefore \text{LHS} = \text{RHS}$	RHS = $2\cos x - 1$ ✓ identity i. t. o. $\cos x$ ✓ $\cos(540^\circ - x) = -\cos x$ ✓ standard form ✓ factors
5.3.1	$\sin 36^\circ = \sqrt{1 - p^2}$ $\tan 36^\circ = \frac{\sqrt{1 - p^2}}{p}$ OR/OF $\cos^2 36^\circ = 1 - \sin^2 36^\circ$ $\cos 36^\circ = \sqrt{1 - (1 - p^2)}$ $= p$ $\tan 36^\circ = \frac{\sin 36^\circ}{\cos 36^\circ}$ $= \frac{\sqrt{1 - p^2}}{p}$	 ✓ method ✓ value of p ✓ answer ✓ method ✓ $\cos 36^\circ = p$ ✓ answer

5.3.2	$\cos 108^\circ$ $= -\cos 72^\circ$ $= -\cos (2 \times 36^\circ)$ $= -(2 \cos^2 36^\circ - 1)$ $= -2p^2 + 1$ OR/OF $\cos 108^\circ$ $= -\cos 72^\circ$ $= -\cos (2 \times 36^\circ)$ $= -(1 - 2 \sin^2 36^\circ)$ $= -1 + 2(\sqrt{1 - p^2})^2$ $= -1 + 2(1 - p^2)$ $= -2p^2 + 1$ OR/OF $\cos 108^\circ$ $= -\cos 72^\circ$ $= -\cos (2 \times 36^\circ)$ $= -(\cos^2 36^\circ - \sin^2 36^\circ)$ $= -\left(p^2 - (\sqrt{1 - p^2})^2\right)$ $= -(p^2 - (1 - p^2))$ $= -2p^2 + 1$ OR/OF $\cos 108^\circ$ $= \cos(2 \times 54^\circ)$ $= 2 \cos^2 54^\circ - 1$ $= 2(1 - p^2) - 1$ $= 1 - 2p^2$ OR/OF $\cos 108^\circ = \cos(72^\circ + 36^\circ)$ $= \cos 72^\circ \cos 36^\circ - \sin 72^\circ \sin 36^\circ$ $= (2 \cos^2 36^\circ - 1) \cos 36^\circ - (2 \sin 36^\circ \cos 36^\circ) \sin 36^\circ$ $= 2 \cos^3 36^\circ - \cos 36^\circ - 2 \cos 36^\circ \sin^2 36^\circ$ $= 2p^3 - p - 2p(\sqrt{1 - p^2})^2$ $= 2p^3 - p - 2p + 2p^3$ $= 4p^3 - 3p$	✓ reduction ✓ double angle ✓ expansion ✓ answer i. t. o. p (4) ✓ reduction ✓ double angle ✓ expansion ✓ answer i. t. o. p (4) ✓ reduction ✓ double angle ✓ expansion ✓ answer i. t. o. p (4) ✓ double angle ✓✓ expansion ✓ answer i. t. o. p (4) ✓ expansion ✓ both double angle identities ✓ value of $\sin 36^\circ$ ✓ answer i. t. o. p (4)
		[17]

6. Vereenvoudig, dan alles in terme van $\cos 35 = m$

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V5 · 18 punte

QUESTION/VRAAG 5

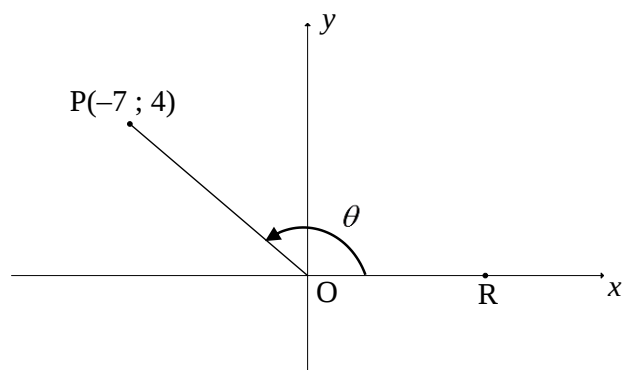
5.1	$\begin{aligned} & \tan(-x) \cos x \sin(x - 180^\circ) - 1 \\ &= -\tan x \cos x \sin(-(180^\circ - x)) - 1 \\ &= \frac{-\sin x}{\cos x} \cdot \cos x \cdot (-\sin x) - 1 \\ &= \sin^2 x - 1 \\ &= -\cos^2 x \end{aligned}$	$\checkmark -\tan x$ $\checkmark -\sin x \quad \checkmark \frac{-\sin x}{\cos x}$ $\checkmark \sin^2 x - 1$ $\checkmark \text{ answer}$ (5)
5.2.1	$\begin{aligned} & \cos 215^\circ \\ &= -\cos 35^\circ \\ &= -m \end{aligned}$	$\checkmark \text{ reduction}$ $\checkmark \text{ answer}$ (2)
5.2.2	$\begin{aligned} & \sin 20^\circ \\ &= \cos 70^\circ \\ &= \cos 2(35^\circ) \\ &= 2\cos^2 35^\circ - 1 \\ &= 2m^2 - 1 \\ \text{OR} \\ &= \sin(55^\circ - 35^\circ) \\ &= \sin 55^\circ \cos 35^\circ - \cos 55^\circ \sin 35^\circ \\ &= m \cdot m - \sqrt{1-m^2} \cdot \sqrt{1-m^2} \\ &= m^2 - (1-m^2) \\ &= 2m^2 - 1 \end{aligned}$	$\checkmark \text{ co-function}$ $\checkmark \text{ double angle expansion}$ $\checkmark \text{ answer in terms of } m$ (3) $\checkmark \text{ compound angle expansion}$ $\checkmark \cos 55^\circ = \sqrt{1-m^2} \text{ or } \sin 35^\circ = \sqrt{1-m^2}$ $\checkmark \text{ answer in terms of } m$ (3)
5.3	$\begin{aligned} & \cos 4x \cos x + \sin 4x \sin x = -0,7 \\ & \cos(4x - x) = -0,7 \\ & \text{ref } \angle = 45,57...^\circ \\ & 3x = 180^\circ - 45,57...^\circ + k \cdot 360^\circ \text{ or } 3x = 180^\circ + 45,57...^\circ + k \cdot 360^\circ \\ & 3x = 134,43^\circ + k \cdot 360^\circ \quad \text{or} \quad 3x = 225,57^\circ + k \cdot 360^\circ \\ & x = 44,81^\circ + k \cdot 120^\circ; k \in \mathbb{Z} \quad x = 75,19^\circ + k \cdot 120^\circ; k \in \mathbb{Z} \end{aligned}$	$\checkmark \text{ compound angle}$ $\checkmark 3x = 134,43^\circ \text{ or } 225,57^\circ$ $\checkmark x = 44,81^\circ \text{ or } 75,19^\circ$ $\checkmark + k \cdot 120^\circ; k \in \mathbb{Z}$ (4)

5.4	$\text{RHS} = \cos^2 x - \sin^2 x$ $\text{LHS} = \frac{\sin 4x \cdot \cos 2x - 2 \cos 4x \cdot \sin x \cdot \cos x}{\tan 2x}$ $= \frac{\sin 4x \cdot \cos 2x - \cos 4x \cdot \sin 2x}{\frac{\sin 2x}{\cos 2x}}$ $= \sin(4x - 2x) \left(\frac{\cos 2x}{\sin 2x} \right)$ $= \cos 2x$ $= \cos^2 x - \sin^2 x$ $\text{LHS} = \text{RHS}$	✓ $\sin 2x$ ✓ $\frac{\sin 2x}{\cos 2x}$ ✓ $\sin(4x - 2x)$ ✓ $\cos 2x$ (4)
		[18]

7. 'n Punt in die tweede kwadrant, en die verhoudings wat dit vasstel

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V5 · 18 punte

QUESTION/VRAAG 5



5.1.1	$OP = \sqrt{(-7)^2 + (4)^2}$ $= \sqrt{65}$ Answer only 2/2	✓ substitution ✓ answer (2)
5.1.2(a)	$\tan \theta = \frac{4}{-7}$	✓ answer (1)
5.1.2(b)	$\cos(\theta - 180^\circ) = -\cos \theta$ $= \frac{7}{\sqrt{65}}$	✓ reduction ✓ answer (2)
5.2	$\sin x \cos x + \sin x = 3\cos^2 x + 3\cos x$ $\sin x \cos x + \sin x - 3\cos^2 x - 3\cos x = 0$ $\sin x(\cos x + 1) - 3\cos x(\cos x + 1) = 0$ $(\cos x + 1)(\sin x - 3\cos x) = 0$ $\cos x = -1 \quad \text{or} \quad \sin x = 3\cos x$ $\tan x = 3$ $x = 180^\circ + k.360^\circ \quad \text{or} \quad x = 71,57^\circ + k.180^\circ ; k \in Z$ OR/OF $\sin x \cos x + \sin x = 3\cos^2 x + 3\cos x$ $\sin x \cos x + \sin x - 3\cos^2 x - 3\cos x = 0$ $\sin x(\cos x + 1) - 3\cos x(\cos x + 1) = 0$ $(\cos x + 1)(\sin x - 3\cos x) = 0$ $\cos x = -1 \quad \text{or} \quad \sin x = 3\cos x$ $\tan x = 3$ $x = 180^\circ + k.360^\circ \quad \text{or} \quad x = 71,57^\circ + k.360^\circ \quad \text{or}$ $x = 251,57^\circ + k.360^\circ ; k \in Z$	✓ RHS = 0 ✓ grouping ✓ factors ✓ both equations ✓ $x = 180^\circ$ ✓ $x = 71,57^\circ$ ✓ $+ k.180^\circ ; k \in Z$ (7) ✓ RHS = 0 ✓ grouping ✓ factors ✓ both equations ✓ $x = 180^\circ$ ✓ $x = 71,57^\circ$ and $251,57^\circ$ ✓ $+ k.360^\circ ; k \in Z$ (7)

5.3.1	$\begin{aligned} \text{LHS} &= \frac{\sin 3x}{1 - \cos 3x} \times \frac{1 + \cos 3x}{1 + \cos 3x} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{(1 - \cos 3x)(1 + \cos 3x)} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{1 - \cos^2 3x} \\ &= \frac{(\sin 3x)(1 + \cos 3x)}{\sin^2 3x} \\ &= \frac{1 + \cos 3x}{\sin 3x} \\ &= \text{RHS} \end{aligned}$ OR/OF $\begin{aligned} \text{LHS} &= \frac{\sin 3x}{1 - \cos 3x} \times \frac{\sin 3x}{\sin 3x} \\ &= \frac{\sin^2 3x}{\sin 3x(1 - \cos 3x)} \\ &= \frac{1 - \cos^2 3x}{\sin 3x(1 - \cos 3x)} \\ &= \frac{(1 - \cos 3x)(1 + \cos 3x)}{\sin 3x(1 - \cos 3x)} \\ &= \frac{1 + \cos 3x}{\sin 3x} \\ &= \text{RHS} \end{aligned}$	✓ multiply by “1” ✓ $1 - \cos^2 3x$ ✓ square identity (3) ✓ multiply by “1” ✓ square identity ✓ factors (3)
5.3.2	undefined when $\sin 3x = 0$ and $1 - \cos 3x = 0$ $3x = 0^\circ$ or $3x = 180^\circ$ and $3x = 0^\circ$ or $3x = 360^\circ$ $x = 0^\circ$ or $x = 60^\circ$	✓ $\sin 3x = 0$ and $1 - \cos 3x = 0$ ✓ 0° ✓ 60° (3)
[18]		

8. Lei $\cos(x + y)$ af uit die gegewe identiteit, pas dit dan toe

Amtelike DBE-nasienriglyn · November 2024 · V6 · 18 punte

QUESTION/VRAAG 6

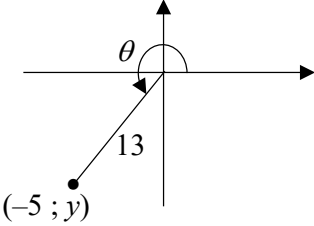
6.1.1	$\cos(x+y) = \cos(x-(-y))$ $= \cos x \cos(-y) + \sin x \sin(-y)$ $= \cos x \cos y - \sin x \sin y$	$\checkmark (x+y) = (x-(-y))$ $\checkmark$ correct expansion (2)
6.1.2	$\text{LHS} = \frac{\cos(90^\circ - x)\cos y + \sin(-y)\cos(180^\circ + x)}{\cos x \cos(360^\circ + y) + \sin(360^\circ - x)\sin y}$ $= \frac{(\sin x)\cos y + (-\sin y)(-\cos x)}{\cos x(\cos y) + (-\sin x)\sin y}$ $= \frac{\sin x \cos y + \cos x \sin y}{\cos x \cos y - \sin x \sin y}$ $= \frac{\sin(x+y)}{\cos(x+y)}$ $= \tan(x+y)$ $= \text{RHS}$	$\checkmark \cos(90^\circ - x) = \sin x$ $\checkmark \sin(-y) = -\sin y$ $\checkmark \cos(180^\circ + x) = -\cos x$ $\checkmark \cos(360^\circ + y) = \cos y$ $\checkmark \sin(360^\circ - x) = -\sin x$ $\checkmark$ compound angle formulae (6)
6.2	$\sqrt{6\sin^2 x - 11\cos(90^\circ + x) + 7} = 2$ $6\sin^2 x - 11\cos(90^\circ + x) + 7 = 4$ $6\sin^2 x - 11(-\sin x) + 7 = 4$ $6\sin^2 x + 11\sin x + 3 = 0$ $(3\sin x + 1)(2\sin x + 3) = 0$ $\sin x = -\frac{1}{3} \quad \text{OR/OR} \quad \sin x = -\frac{3}{2}$ $\text{ref } \angle = 19,47^\circ \quad \text{no solution}$ $x = 199,47^\circ \text{ or } x = 340,53^\circ$	$\checkmark$ squaring both sides $\checkmark \cos(90^\circ + x) = -\sin x$ $\checkmark$ factors $\checkmark$ both equations $\checkmark\checkmark$ answers (6)
6.3.1	$g(x) = \frac{4-8\sin^2 x}{3}$ $= \frac{4(1-2\sin^2 x)}{3}$ $= \frac{4\cos 2x}{3}$ Maximum value of $\cos 2x$ is 1 $\therefore \text{maximum value of } g(x) = \frac{4}{3}$	$\checkmark$ factors $\checkmark \frac{4\cos 2x}{3}$ $\checkmark$ answer (3)

	OR/OF $4 - 8\sin^2 x$ is a maximum when $\sin^2 x$ is a minimum Minimum value of $\sin^2 x$ is 0 $\therefore$ max. value of $g(x) = \frac{4-8(0)}{3}$ $g(x) = \frac{4}{3}$ OR/OF $\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}$ $\sin x = 0$ $\therefore$ max. value of $g(x) = \frac{4-8(0)}{3}$ $g(x) = \frac{4}{3}$	OR/OF ✓ min of $\sin^2 x = 0$ ✓ $g(x) = \frac{4-8(0)}{3}$ ✓ answer (3) OR/OF ✓ $\sin x = \frac{-(0)}{2\left(-\frac{8}{3}\right)}$ ✓ $\sin x = 0$ ✓ answer (3)
6.3.2	$x = 180^\circ$	✓ 180° (1)
[18]		

9. $\cos \theta = 5/13$ met die kwadrant gegee, dan 'n vereenvoudiging

Amtelike DBE-nasienriglyn · Mei/Junie 2025 · V5 · 19 punte

QUESTION/VRAAG 5

5.1.1	$y^2 = \sqrt{13^2 - (-5)^2}$ [Pythagoras] $y = -12$ $\sin^2 \theta$ $= \left(-\frac{12}{13}\right)^2$ $= \frac{144}{169}$ OR/OR $\sin^2 \theta = 1 - \cos^2 \theta$ $\sin^2 \theta = 1 - \left(-\frac{5}{13}\right)^2$ $\sin^2 \theta = \frac{144}{169}$	 $\checkmark y = -12$ $\checkmark$ substitution $\checkmark$ answer (3)
5.1.2	$\tan(360^\circ - \theta)$ $= -\tan \theta$ $= -\left(\frac{-12}{-5}\right)$ $= -\frac{12}{5}$	$\checkmark -\tan \theta$ $\checkmark$ answer (2)
5.1.3	$\cos(\theta - 135^\circ)$ $= \cos \theta \cos 135^\circ + \sin \theta \sin 135^\circ$ $= \cos \theta (-\cos 45^\circ) + \sin \theta (\sin 45^\circ)$ $= \left(-\frac{5}{13}\right)\left(-\frac{\sqrt{2}}{2}\right) + \left(-\frac{12}{13}\right)\left(\frac{\sqrt{2}}{2}\right)$ OR $\left(-\frac{5}{13}\right)\left(-\frac{1}{\sqrt{2}}\right) + \left(-\frac{12}{13}\right)\left(\frac{1}{\sqrt{2}}\right)$ $= -\frac{7\sqrt{2}}{26} \qquad \qquad \qquad = -\frac{7}{13\sqrt{2}}$	$\checkmark$ cpd. $\angle$ expansion $\checkmark$ reduction $\checkmark$ substitution $\checkmark$ answer (4)

5.2	$\frac{2 \cos(180^\circ - x) \sin(-x)}{1 - 2 \cos^2(90^\circ - x)}$ $= \frac{2(-\cos x)(-\sin x)}{1 - 2 \sin^2 x}$ $= \frac{2 \sin x \cos x}{\cos 2x}$ $= \frac{\sin 2x}{\cos 2x}$ $= \tan 2x$	✓ $\cos(180^\circ - x) = -\cos x$ ✓ $\sin(-x) = -\sin x$ ✓ $\cos^2(90^\circ - x) = \sin^2 x$ ✓ $1 - 2 \sin^2 x = \cos 2x$ ✓ $2 \sin x \cos x = \sin 2x$ ✓ answer (6)
5.3	$(\tan 92^\circ)(\tan 94^\circ)(\tan 96^\circ) \dots (\tan 176^\circ)(\tan 178^\circ)$ $= \left(\frac{\sin 92^\circ}{\cos 92^\circ} \right) \left(\frac{\sin 94^\circ}{\cos 94^\circ} \right) \left(\frac{\sin 96^\circ}{\cos 96^\circ} \right) \dots \left(\frac{\sin 176^\circ}{\cos 176^\circ} \right) \left(\frac{\sin 178^\circ}{\cos 178^\circ} \right)$ $= \left(\frac{\cos 2^\circ}{-\sin 2^\circ} \right) \left(\frac{\cos 4^\circ}{-\sin 4^\circ} \right) \left(\frac{\cos 6^\circ}{-\sin 6^\circ} \right) \dots \left(\frac{\sin 4^\circ}{-\cos 4^\circ} \right) \left(\frac{\sin 2^\circ}{-\cos 2^\circ} \right)$ $= 1$ OR $(\tan 92^\circ)(\tan 94^\circ)(\tan 96^\circ) \dots (\tan 176^\circ)(\tan 178^\circ)$ $= (\tan 92^\circ)(\tan 94^\circ)(\tan 96^\circ) \dots (-\tan 4^\circ)(-\tan 2^\circ)$ $= \left(\frac{\sin 92^\circ}{\cos 92^\circ} \right) \left(\frac{\sin 94^\circ}{\cos 94^\circ} \right) \left(\frac{\sin 96^\circ}{\cos 96^\circ} \right) \dots \left(-\frac{\sin 4^\circ}{\cos 4^\circ} \right) \left(-\frac{\sin 2^\circ}{\cos 2^\circ} \right)$ $= \left(\frac{\cos 2^\circ}{-\sin 2^\circ} \right) \left(\frac{\cos 4^\circ}{-\sin 4^\circ} \right) \left(\frac{\cos 6^\circ}{-\sin 6^\circ} \right) \dots \left(-\frac{\sin 4^\circ}{\cos 4^\circ} \right) \left(-\frac{\sin 2^\circ}{\cos 2^\circ} \right)$ $= 1$	✓ quotient identity ✓ co-ratios ✓ reduction ✓ answer (4) ✓ reduction ✓ quotient identity ✓ co-ratios ✓ answer (4)
		[19]

10. Alles in terme van $\sin 40^\circ = p$, dan 'n identiteit om te bewys

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V5 · 26 punte

QUESTION/VRAAG 5

5.1.1	$\sin 220^\circ$ $= -\sin 40^\circ$ $= -p$	✓ $-\sin 40^\circ$ ✓ answer (2)
5.1.2	$\cos^2 50^\circ$ $= \sin^2 40^\circ$ $= p^2$	✓ $\sin^2 40$ ✓ answer (2)
5.1.3	$\cos(-80^\circ)$ $= \cos 80^\circ$ $= 1 - 2 \sin^2 40^\circ$ $= 1 - 2p^2$ OR $\cos(-80^\circ)$ $= \cos 80^\circ$ $= \cos(30^\circ + 50^\circ)$ $= \cos 30^\circ \cos 50^\circ - \sin 30^\circ \sin 50^\circ$ $= \frac{\sqrt{3}p}{2} - \frac{\sqrt{1-p^2}}{2}$	✓ $\cos 80^\circ$ ✓ double angle ✓ answer (3) ✓ $\cos 80^\circ$ ✓ expansion ✓ answer (3)
5.2.1	$\text{LHS} = \tan x(1 - \cos^2 x) + \cos^2 x$ $= \frac{\sin x}{\cos x}(\sin^2 x) + \cos^2 x$ $= \frac{\sin^3 x + \cos^3 x}{\cos x}$ $= \frac{(\sin x + \cos x)(\sin^2 x - \sin x \cos x + \cos^2 x)}{\cos x}$ $= \frac{(\sin x + \cos x)(1 - \sin x \cos x)}{\cos x}$ $= \text{RHS}$ OR	✓ $\frac{\sin x}{\cos x}$ ✓ $\sin^2 x$ ✓ simplification ✓ factorisation of cubes ✓ $\sin^2 x + \cos^2 x = 1$ (5)

	$\begin{aligned} \text{RHS} &= \frac{(\sin x + \cos x)(1 - \sin x \cos x)}{\cos x} \\ &= \frac{\sin x - \sin^2 x \cos x + \cos x - \sin x \cos^2 x}{\cos x} \\ &= \tan x - \sin^2 x + 1 - \sin x \cos x \\ &= \tan x + \cos^2 x - \sin x \cos x \\ &= \tan x \left(1 - \frac{\sin x \cos x}{\tan x} \right) + \cos^2 x \\ &= \tan x \left(1 - \frac{\sin x \cos x}{\frac{\sin x}{\cos x}} \right) + \cos^2 x \\ &= \tan x (1 - \cos^2 x) + \cos^2 x \\ &= \text{LHS} \end{aligned}$	✓ multiplication ✓ $\div$ by $\cos x$ ✓ $-\sin^2 x + 1 = \cos^2 x$ ✓ factorisation ✓ $\tan x = \frac{\sin x}{\cos x}$ (5)
5.2.2	$\cos x = 0$ or where $\tan x$ is undefined $x = 90^\circ + k.360^\circ$ or $x = 270^\circ + k.360^\circ$ $x = 90^\circ$ or $x = -90^\circ$	✓ $\cos x = 0$ or $\tan x$ undefined ✓ $x = 90^\circ$ ✓ $x = -90^\circ$ (3)
5.3.1	$\begin{aligned} &\frac{\sin 150^\circ + \cos^2 x - 1}{2} \\ &= \frac{\sin 30^\circ + \cos^2 x - 1}{2} \\ &= \frac{\frac{1}{2} - (1 - \cos^2 x)}{2} \\ &= \left(\frac{1}{2} - \sin^2 x \right) \times \frac{1}{2} \\ &= \frac{1 - 2\sin^2 x}{4} \\ &= \frac{\cos 2x}{4} \end{aligned}$	✓ $\sin 30^\circ$ ✓ $\sin 30^\circ = \frac{1}{2}$ ✓ factor ✓ $1 - \cos^2 x = \sin^2 x$ ✓ simplification ✓ answer in terms of $\cos 2x$ (6)
5.3.2	$\begin{aligned} \frac{\sin 150^\circ + \cos^2 x - 1}{2} &= \frac{1}{25} \\ \frac{\cos 2x}{4} &= \frac{1}{25} \\ \cos 2x &= \frac{4}{25} \\ \text{ref} \angle &= 80, 79 \dots^\circ \\ 2x &= 80, 79 \dots^\circ + k.360^\circ \quad \text{or} \quad 2x = 279, 20 \dots^\circ + k.360^\circ \\ x &= 40, 40^\circ + k.180^\circ \quad \text{or} \quad x = 139, 60^\circ + k.180^\circ ; k \in \mathbb{Z} \end{aligned}$	✓ answer 5.3.1 = $\frac{1}{25}$ ✓ $2x = 80, 79^\circ$ ✓ $2x = 279, 20 \dots^\circ$ ✓ $x = 40, 40^\circ$ and $x = 139, 60^\circ$ ✓ $+ k.180^\circ; \quad k \in \mathbb{Z}$ (5)

	OR $\frac{\sin 150^\circ + \cos^2 x - 1}{2} = \frac{1}{25}$ $\sin 150^\circ + \cos^2 x - 1 = \frac{2}{25}$ $\sin 30^\circ + \cos^2 x - 1 = \frac{2}{25}$ $\cos^2 x = \frac{29}{50}$ $\cos x = \pm \sqrt{\frac{29}{50}}$ $x = 40,40^\circ + k.360^\circ \quad \text{or} \quad x = 319,60^\circ + k.360^\circ ; k \in \mathbb{Z}$ or $x = 139,60^\circ + k.360^\circ \quad \text{or} \quad x = 220,40^\circ + k.360^\circ ; k \in \mathbb{Z}$	$\checkmark \cos^2 x = \frac{29}{50}$ $\checkmark x = 40,40^\circ \quad \checkmark x = 139,60^\circ$ $\checkmark x = 220,40^\circ \text{ and } x = 319,60^\circ$ $\checkmark + k.360^\circ ; \quad k \in \mathbb{Z}$ (5)
		[26]

11. $13 \sin x + 3 = 0$, en die hele ketting wat daaruit volg

Amtelike DBE-nasienriglyn · November 2022 · V5 · 30 punte

QUESTION/VRAAG 5

5.1.1	$\sin(360^\circ + x)$ $= \sin x$	$\checkmark + \checkmark \sin x$ (2)
5.1.2	$x\text{-coordinate} = \sqrt{(\sqrt{13})^2 - (-3)^2}$ $= -2$ $\tan x = \frac{-3}{-2}$ $= \frac{3}{2}$ OR/OF $x\text{-coordinate} = \sqrt{(\sqrt{13})^2 - (3)^2}$ $= 2$ $\tan x = \frac{3}{2}$	$\checkmark\checkmark$ substitution $\checkmark$ method (3) $\checkmark\checkmark$ substitution $\checkmark$ method (3)
5.1.3	$\cos(180^\circ + x)$ $= -\cos x$	$\checkmark - \checkmark \cos x$ (2)
5.2	$\frac{\cos(90^\circ + \theta)}{\sin(\theta - 180^\circ) + 3\sin(-\theta)}$ $= \frac{-\sin \theta}{\sin(-(180^\circ - \theta)) - 3\sin \theta}$ $= \frac{-\sin \theta}{-\sin \theta - 3\sin \theta}$ $= \frac{-\sin \theta}{-4\sin \theta}$ $= \frac{1}{4}$	$\checkmark - \sin \theta$ $\checkmark - 3\sin \theta$ $\checkmark - \sin \theta$ $\checkmark$ simplification $\checkmark$ answer (5)

5.3	$(\cos x + 2 \sin x)(3 \sin 2x - 1) = 0$ $\cos x + 2 \sin x = 0$ or $3 \sin 2x - 1 = 0$ $\tan x = -\frac{1}{2}$ $\sin 2x = \frac{1}{3}$ $\text{ref } \angle = 26,565...^\circ$ $\text{ref } \angle = 19,471...^\circ$ $x = 153,43^\circ + k.180^\circ; k \in \mathbb{Z}$ $x = 9,74^\circ + k.180^\circ; k \in \mathbb{Z}$ OR/OF or $x = 153,43^\circ + k.360^\circ; k \in \mathbb{Z}$ $x = 80,26^\circ + k.180^\circ;$ $k \in \mathbb{Z}$ or $x = 333,43^\circ + k.360^\circ; k \in \mathbb{Z}$	✓ both equations ✓ $\tan x = -\frac{1}{2}$ ✓ $\sin 2x = \frac{1}{3}$ ✓ $x = 153,43^\circ$ OR $x = 153,43^\circ \text{ \& } 333,43^\circ$ ✓ $x = 9,74^\circ \text{ \& } 80,26^\circ$ ✓ $+ k.180^\circ; k \in \mathbb{Z}$
5.4.1	$\text{LHS} = \cos(x+y) \cdot \cos(x-y)$ $= [\cos x \cdot \cos y - \sin x \cdot \sin y][\cos x \cdot \cos y + \sin x \cdot \sin y]$ $= \cos^2 x \cdot \cos^2 y - \sin^2 x \cdot \sin^2 y$ $= (1 - \sin^2 x)(1 - \sin^2 y) - \sin^2 x \cdot \sin^2 y$ $= 1 + \sin^2 x \cdot \sin^2 y - \sin^2 x - \sin^2 y - \sin^2 x \cdot \sin^2 y$ $= 1 - \sin^2 x - \sin^2 y = \text{RHS}$	✓ expansion ✓ simplification ✓ square identity ✓ product
5.4.2	$1 - \sin^2 45^\circ - \sin^2 15^\circ$ $= \cos(45^\circ + 15^\circ) \cdot \cos(45^\circ - 15^\circ)$ $= \cos 60^\circ \cdot \cos 30^\circ$ $= \left(\frac{1}{2}\right) \left(\frac{\sqrt{3}}{2}\right)$ $= \frac{\sqrt{3}}{4}$ OR/OF	✓ identifying x and y ✓ substitution ✓ answer

(6)

(4)

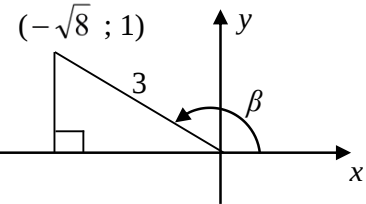
(3)

5.5.1	$16\sin x \cdot \cos^3 x - 8\sin x \cdot \cos x$ $= 8\sin x \cdot \cos x (2\cos^2 x - 1)$ $= 4\sin 2x (\cos 2x)$ $= 2\sin 4x$ OR/OF $16\sin x \cdot \cos^3 x - 8\sin x \cdot \cos x$ $= 16\cos^2 x \left(\frac{1}{2}\sin 2x \right) - 8\left(\frac{1}{2}\sin 2x \right)$ $= 8(2\cos^2 x - 1) \left(\frac{1}{2}\sin 2x \right)$ $= 4\sin 2x \cdot \cos 2x$ $= 2\sin 4x$	✓ factorisation ✓ $4\sin 2x$ ✓ $\cos 2x$ ✓ double angle (4) ✓ factorisation ✓ $4\sin 2x$ ✓ $\cos 2x$ ✓ double angle (4)
5.5.2	$16\sin x \cdot \cos^3 x - 8\sin x \cdot \cos x = 2\sin 4x$ Minimum at $x = 67,5^\circ$	✓ answer (1)
		[30]

12. sin beta gegee met sy kwadrant - die langste vraag in die boek

Amtelike DBE-nasienriglyn · November 2023 · V5 · 31 punte

QUESTION/VRAAG 5

5.1.1	$\sin \beta = \frac{1}{3} \quad \beta \in (90^\circ; 270^\circ)$  $x = -\sqrt{8} = -2\sqrt{2}$ $\cos \beta$ $= \frac{-2\sqrt{2}}{3}$ OR $\sin \beta = \frac{1}{3} \quad \beta \in (90^\circ; 270^\circ)$ $\cos^2 \beta = 1 - \sin^2 \beta$ $\cos^2 \beta = 1 - \left(\frac{1}{3}\right)^2$ $\cos^2 \beta = \frac{8}{9}$ $\cos \beta = \frac{-\sqrt{8}}{3}$ $= \frac{-2\sqrt{2}}{3}$	$\checkmark \quad x^2 + y^2 = r^2$ $\checkmark \quad x = -2\sqrt{2}$ $\checkmark \quad \text{answer}$ (3)
5.1.2	$\sin 2\beta$ $= 2 \sin \beta \cos \beta$ $= 2 \left(\frac{1}{3}\right) \left(\frac{-\sqrt{8}}{3}\right)$ $= \frac{-2\sqrt{8}}{9} \quad \text{OR} \quad 2 \left(\frac{-2\sqrt{2}}{9}\right)$ $= \frac{-4\sqrt{2}}{9}$	$\checkmark \quad \text{double angle}$ $\checkmark \quad \text{substitution}$ $\checkmark \quad \text{answer}$ (3)
5.1.3	$\cos (450^\circ - \beta)$ $= \cos (90^\circ - \beta)$ $= \sin \beta$ $= \frac{1}{3}$ OR	$\checkmark \quad \cos (90^\circ - \beta)$ $\checkmark \quad \text{co-ratio}$ $\checkmark \quad \text{answer}$ (3)

[illegible]

5.2.2	$\sin x + 1 = 0$ $\sin x = -1$ ref. $\angle = 90^\circ$ $x = 270^\circ$	$\checkmark \sin x + 1 = 0$ $\checkmark x = 270^\circ$ (2)
5.2.3	$y = \frac{\cos^4 x + \sin^2 x \cdot \cos^2 x}{1 + \sin x}$ $y = 1 - \sin x$ $\therefore \text{Minimum} = 0$	$\checkmark \checkmark \text{Minimum} = 0$ (2)
5.3.1	$\sin(A - B)$ $= \cos[90^\circ - (A - B)]$ $= \cos[(90^\circ - A) - (-B)]$ $= \cos(90^\circ - A)\cos(-B) + \sin(90^\circ - A)\sin(-B)$ $= \sin A \cos B + \cos A(-\sin B)$ $= \sin A \cos B - \cos A \sin B$ OR $\sin(A - B)$ $= \cos[90^\circ - (A - B)]$ $= \cos[(90^\circ + B) - A]$ $= \cos(90^\circ + B)\cos A + \sin(90^\circ + B)\sin A$ $= -\sin B \cos A + \cos B \sin A$ $= \sin A \cos B - \cos A \sin B$	$\checkmark$ co-ratio $\checkmark$ compound angle $\checkmark$ reduction (3) $\checkmark$ co-ratio $\checkmark$ compound angle $\checkmark$ reduction (3)
5.3.2	$\sin 48^\circ \cos x - \cos 48^\circ \sin x = \cos 2x$ $\sin(48^\circ - x) = \cos 2x$ $\sin(48^\circ - x) = \sin(90^\circ - 2x)$ $48^\circ - x = 90^\circ - 2x + k \cdot 360^\circ \quad \text{or}$ $48^\circ - x = 180^\circ - (90^\circ - 2x) + k \cdot 360^\circ$ $x = 42^\circ + k \cdot 360^\circ \qquad -3x = 42^\circ + k \cdot 360^\circ$ $\qquad \qquad \qquad x = -14^\circ - k \cdot 120^\circ ; k \in \mathbb{Z}$ OR $\sin 48^\circ \cos x - \cos 48^\circ \sin x = \cos 2x$ $\sin(48^\circ - x) = \cos 2x$ $\cos(90^\circ - 48^\circ + x) = \cos 2x$ $\cos(42^\circ + x) = \cos 2x$ $42^\circ + x = 2x + k \cdot 360^\circ \quad \text{or} \quad 42^\circ + x = 360^\circ - 2x + k \cdot 360^\circ$ $-x = -42^\circ + k \cdot 360^\circ \qquad 3x = 318^\circ + k \cdot 360^\circ$ $x = 42^\circ - k \cdot 360^\circ \qquad x = 106^\circ + k \cdot 120^\circ \quad ; k \in \mathbb{Z}$	$\checkmark$ compound angle $\checkmark$ co-ratio $\checkmark$ both equations $\checkmark$ general solution $\checkmark$ general solution; $k \in \mathbb{Z}$ (5) $\checkmark$ compound angle $\checkmark$ co-ratio $\checkmark$ both equations $\checkmark$ general solution $\checkmark$ general solution; $k \in \mathbb{Z}$ (5)

5.4	$\frac{\sin 3x + \sin x}{\cos 2x + 1}$ $= \frac{\sin(2x + x) + \sin(2x - x)}{\cos 2x + 1}$ $= \frac{\sin 2x \cos x + \cos 2x \sin x + \sin 2x \cos x - \cos 2x \sin x}{2 \cos^2 x - 1 + 1}$ $= \frac{2 \sin 2x \cos x}{2 \cos^2 x}$ $= \frac{2(2 \sin x \cos x) \cos x}{2 \cos^2 x}$ $= \frac{4 \sin x \cos^2 x}{2 \cos^2 x}$ $= 2 \sin x$ OR $\frac{\sin 3x + \sin x}{\cos 2x + 1}$ $= \frac{\sin(2x + x) + \sin x}{2 \cos^2 x - 1 + 1}$ $= \frac{\sin 2x \cos x + \cos 2x \sin x + \sin x}{2 \cos^2 x}$ $= \frac{2 \sin x \cos x \cos x + \cos 2x \sin x + \sin x}{2 \cos^2 x}$ $= \frac{\sin x(2 \cos^2 x + \cos 2x + 1)}{2 \cos^2 x}$ $= \frac{\sin x(2 \cos^2 x + 2 \cos^2 x - 1 + 1)}{2 \cos^2 x}$ $= 2 \sin x$	✓ $3x = (2x + x)$ ✓ expansion ✓ double angle of $\cos 2x$ ✓ simplification ✓ $\sin 2x = 2 \sin x \cos x$ ✓ answer (6) ✓ $3x = (2x + x)$ ✓ double angle of $\cos 2x$ ✓ expansion ✓ $\sin 2x = 2 \sin x \cos x$ ✓ common factor ✓ answer (6)
		[31]

13. Teken 'n kosinus op 'n sinus wat reeds geskets is

Amtelike DBE-nasienriglyn · November 2021 · V7 · 8 punte

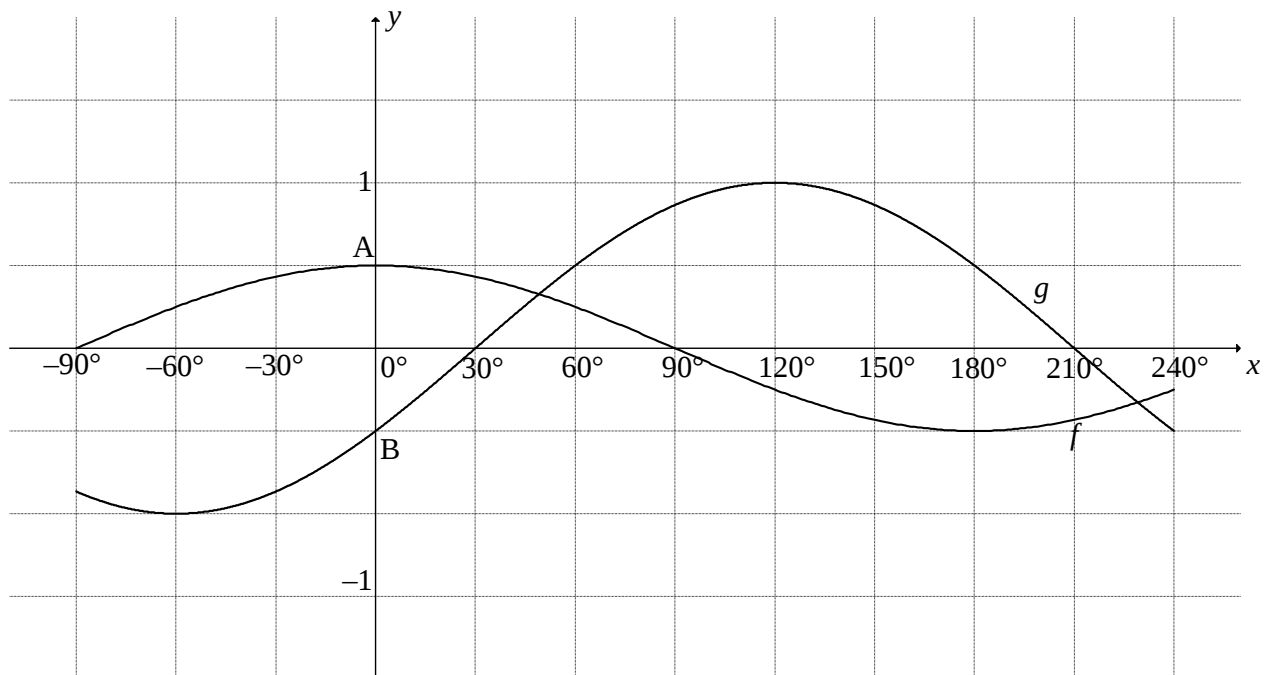
QUESTION/VRAAG 7

7.1		✓ both turning points ✓ both x intercepts (-30° & 150°) ✓ shape
7.2	Period = 120°	✓✓ answer
7.3	$x = -30^\circ$	✓ answer
7.4	Range of/waardeversameling van g: $y \in [-1; 1]$ Range of/Waardeversameling van $\frac{1}{2}g$: $y \in \left[-\frac{1}{2}; \frac{1}{2}\right]$ Range of/Waardeversameling van $\frac{1}{2}g + 1$: $y \in \left[\frac{1}{2}; \frac{3}{2}\right]$ OR/OF Range of/Waardeversameling van $\frac{1}{2}g + 1$: $\frac{1}{2} \leq y \leq \frac{3}{2}$	✓ critical values ✓ correct notation
[8]		

14. 'n Kosinus en 'n verskuifde sinus op een stel asse

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V7 · 10 punte

QUESTION/VRAAG 7

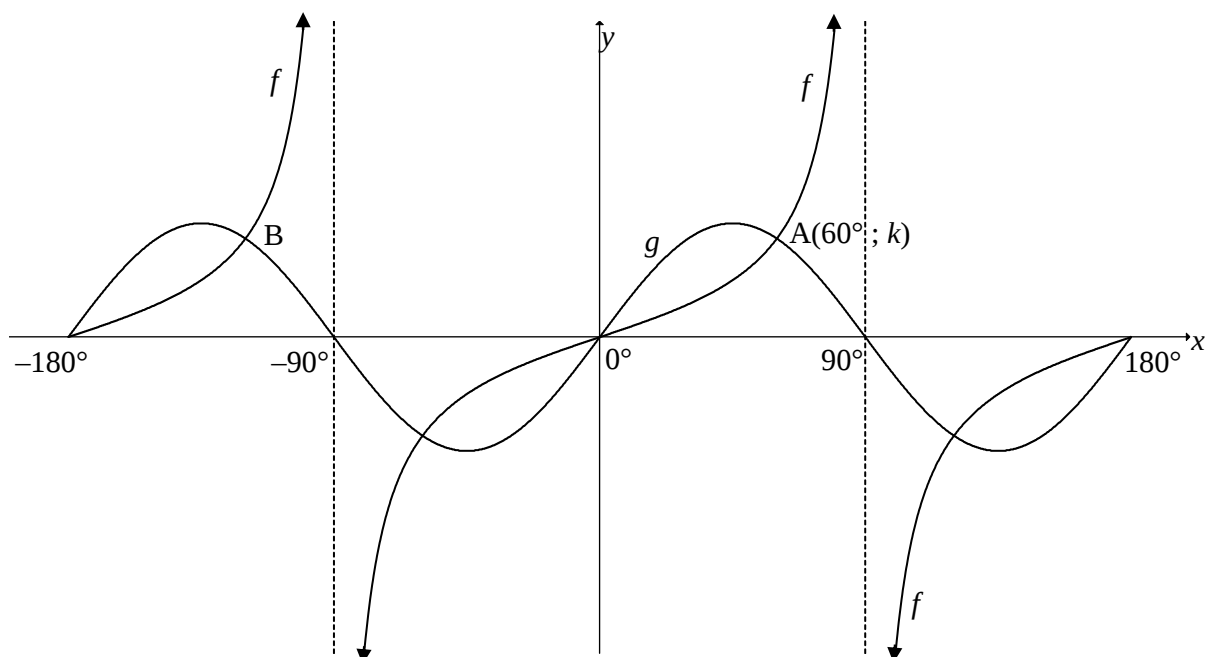


7.1	$A\left(0; \frac{1}{2}\right) \quad B\left(0; -\frac{1}{2}\right)$ $AB = \frac{1}{2} - \left(-\frac{1}{2}\right)$ $= 1 \text{ unit}$ Answer only 2/2	✓ y-values ✓ answer (2)
7.2	Range of $f: y \in \left[-\frac{1}{2}; \frac{1}{2}\right]$ Range of $3f(x) + 2: y \in \left[\frac{1}{2}; 3\frac{1}{2}\right]$ OR/OF $\frac{1}{2} \leq y \leq 3\frac{1}{2}$	✓ critical values ✓ answer (2)
7.3	$x = 90^\circ$	✓✓ $x = 90^\circ$ (2)
7.4.1	$x \in (30^\circ; 90^\circ) \cup (210^\circ; 240^\circ]$ OR/OF $30^\circ < x < 90^\circ \text{ or } 210^\circ < x \leq 240^\circ$	✓ $x \in (30^\circ; 90^\circ)$ ✓ $(210^\circ; 240^\circ]$ (2) ✓ $30^\circ < x < 90^\circ$ ✓ $210^\circ < x \leq 240^\circ$ (2)
7.4.2	$x \in (-55^\circ; 125^\circ)$ OR/OF $-55^\circ < x < 125^\circ$	✓ critical values ✓ answer (2) ✓ critical values ✓ answer (2)

15. $\tan x$ teenoor $2 \sin 2x$, en waar die twee kruis

Amptelike DBE-nasienriglyn · November 2022 · V6 · 10 punte

QUESTION/VRAAG 6



6.1	180°	✓ answer (1)
6.2.1	$k = \sqrt{3} = 1,73$	✓ answer (1)
6.2.2	$B(-120^\circ; \sqrt{3})$	✓ $x = -120^\circ$ (1)
6.3	Range of g : $y \in [-2; 2]$ Range of $2g(x)$: $y \in [-4; 4]$ OR/OF Range of g : $-2 \leq y \leq 2$ Range of $2g(x)$: $-4 \leq y \leq 4$	✓ $y \in [-2; 2]$ ✓ answer (2) ✓ $-2 \leq y \leq 2$ ✓ answer (2)
6.4	$x \in [-65^\circ; -5^\circ]$ OR/OF $-65^\circ \leq x \leq -5^\circ$	✓✓ $x \in [-65^\circ; -5^\circ]$ (2) ✓✓ $-65^\circ \leq x \leq -5^\circ$ (2)
6.5	$\sin x \cdot \cos x = p$ $4 \sin x \cdot \cos x = 4p$ $2 \sin 2x = 4p$ $4p = \pm 2$ $\therefore p = -\frac{1}{2} \text{ or } \frac{1}{2}$	✓ $2 \sin 2x = 4p$ ✓ $4p = \pm 2$ ✓ answers (3)

16. Vind a uit waar $\cos(x + a)$ en $\sin 2x$ mekaar ontmoet

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V6 · 10 punte

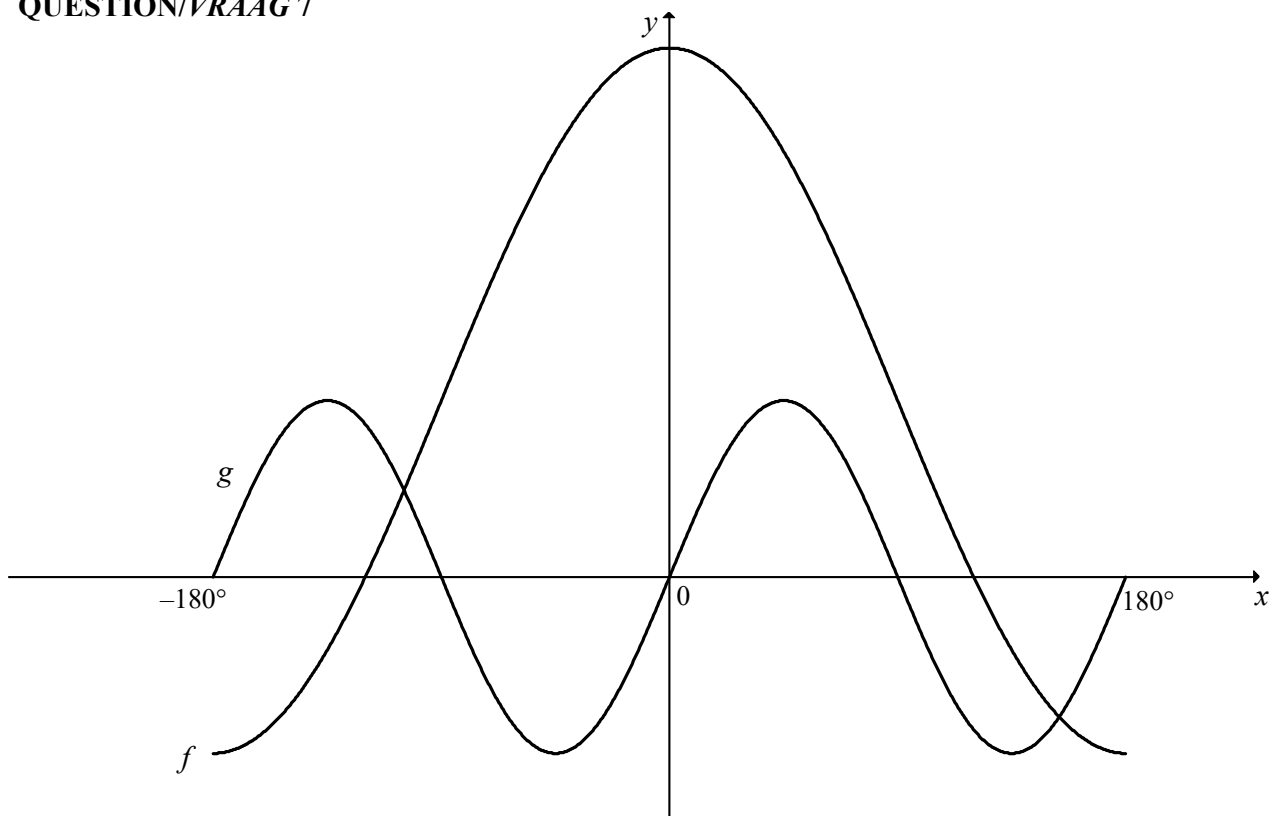
QUESTION/VRAAG 6

6.1	Period = 360°	✓ 360° (1)
6.2	Amplitude = 1	✓ 1 (1)
6.3	$a = -45^\circ$	✓ $a = -45^\circ$ (1)
6.4	$\sin 2x = k$ $k = \sin(2 \times 165^\circ)$ OR $k = \sin(2 \times (-75^\circ))$ $k = \sin 330^\circ$ $k = \sin(-150^\circ)$ $k = -\sin 30^\circ$ $k = -\frac{1}{2}$ OR $k = \cos(165^\circ - 45^\circ)$ OR $k = \cos(-75^\circ - 45^\circ)$ $k = \cos 120^\circ$ $k = \cos(-120^\circ)$ $k = -\cos 60^\circ$ $k = -\frac{1}{2}$	✓ $-\sin 30^\circ$ ✓ $-\frac{1}{2}$ (2) ✓ $-\cos 60^\circ$ ✓ $-\frac{1}{2}$ (2)
6.5	Points of intersection are translated 60° to the left $x = -15^\circ$	✓ $x = -15^\circ$ (1)
6.6	$\sqrt{2} \sin 2x = \sin x + \cos x$ $\sin 2x = \frac{1}{\sqrt{2}} \sin x + \frac{1}{\sqrt{2}} \cos x$ $\sin 2x = \sin 45^\circ \sin x + \cos 45^\circ \cos x$ $\sin 2x = \cos(45^\circ - x)$ OR $\sin 2x = \cos(x - 45^\circ)$ $\therefore 2$ roots in the interval $x \in [-90^\circ; 90^\circ]$	✓ division by $\sqrt{2}$ ✓ special angles ✓ $\cos(45^\circ - x)$ or $\cos(x - 45^\circ)$ ✓ answer (4)
		[10]

17. Waardeversameling, periode, en waar $2 \cos x + 1 \sin 2x$ ontmoet

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V7 · 10 punte

QUESTION/VRAAG 7



7.1	Range of f : $y \in [-1; 3]$ OR/OF $-1 \leq y \leq 3$	$\checkmark y \in [-1; 3]$ (1) $\checkmark -1 \leq y \leq 3$ (1)
7.2	Period of g : 180°	$\checkmark 180^\circ$ (1)
7.3	f increasing: $x \in (-180^\circ; 0^\circ)$ OR/OF $-180^\circ < x < 0^\circ$	$\checkmark x \in (-180^\circ; 0^\circ)$ (1) $\checkmark -180^\circ < x < 0^\circ$ (1)
7.4.1	$g(x) \cdot f'(x) < 0$ $x \in (-90^\circ; 0^\circ) \cup (0^\circ; 90^\circ)$ OR/OF $-90^\circ < x < 0^\circ$ or $0^\circ < x < 90^\circ$	$\checkmark x \in (-90^\circ; 0^\circ) \checkmark x \in (0^\circ; 90^\circ)$ (2) $\checkmark -90^\circ < x < 0^\circ \checkmark 0^\circ < x < 90^\circ$ (2)

7.4.2	$\cos x \leq -\frac{1}{2}$ $2 \cos x + 1 \leq 0$ $x \in [-180^\circ; -120^\circ] \cup [120^\circ; 180^\circ]$ OR/OF $2 \cos x + 1 \leq 0$ $-180^\circ \leq x \leq -120^\circ$ or $120^\circ \leq x \leq 180^\circ$	$\checkmark 2 \cos x + 1 \leq 0$ $\checkmark x \in [-180^\circ; -120^\circ] \checkmark x \in [120^\circ; 180^\circ]$ (3) $\checkmark 2 \cos x + 1 \leq 0$ $\checkmark -180^\circ \leq x \leq -120^\circ \checkmark 120^\circ \leq x \leq 180^\circ$ (3)
7.5	$g(x) = \sin 2x$ $h(x) = \sin 2(x - 45^\circ)$ $= \sin(2x - 90^\circ)$ $= -\sin(90^\circ - 2x)$ $= -\cos 2x$	$\checkmark \sin(2x - 90^\circ)$ $\checkmark$ equation of h (2)
[10]		

18. Die asimptoot van tan x, en om die grafiek daaromheen te lees

Amtelike DBE-nasienriglyn · November 2024 · V7 · 11 punte

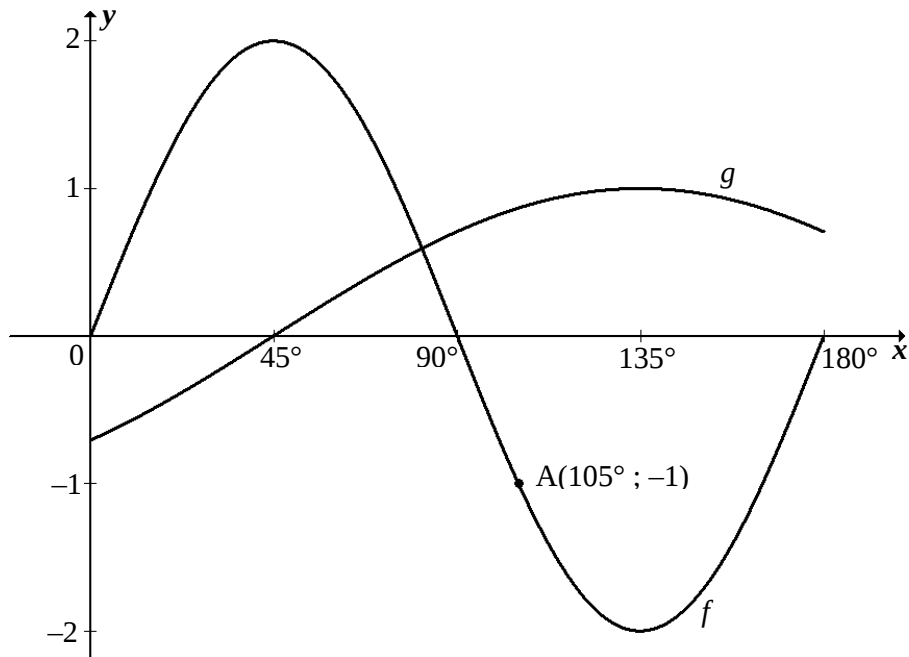
QUESTION/VRAAG 7

7.1	$x = 90^\circ$	✓ $x = 90^\circ$ (1)
7.2	$x = -180^\circ$ or $x \in (-90^\circ ; 0^\circ]$ OR/OF $x = -180^\circ$ or $-90^\circ < x \leq 0^\circ$	✓✓ answer (2) ✓✓ answer (2)
7.3.1	180°	✓ answer (1)
7.3.2		✓ turning points on x-axis: $x = -90^\circ ; 90^\circ$ ✓ shape ✓ turning point on y-axis at $(0 ; 2)$ (3)
7.4	$2 \cos^3 x - \sin x = 0$ $2 \cos^3 x = \sin x$ $2 \cos^2 x = \frac{\sin x}{\cos x}$ $2 \cos^2 x = \tan x$ $2 \cos^2 x - 1 = \tan x - 1$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$ OR/OF $2 \cos^3 x - \sin x = 0$ $\cos x (2 \cos^2 x - \tan x) = 0$ $\cos x = 0$ or $2 \cos^2 x = \tan x$ not valid $2 \cos^2 x - 1 + 1 = \tan x$ $\cos 2x + 1 = \tan x$ $x = 45^\circ + k \cdot 180^\circ ; k \in \mathbb{Z}$	✓ $2 \cos^2 x = \tan x$ ✓ $2 \cos^2 x - 1 = \tan x - 1$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4) OR/OF ✓ $2 \cos^2 x = \tan x$ ✓ $2 \cos^2 x - 1 + 1 = \tan x$ ✓ $\cos 2x + 1 = \tan x$ ✓ answer (4)
[11]		

19. Periode, amplitude, en 'n punt wat op f lê

Amptelike DBE-nasienriglyn · November 2023 · V6 · 12 punte

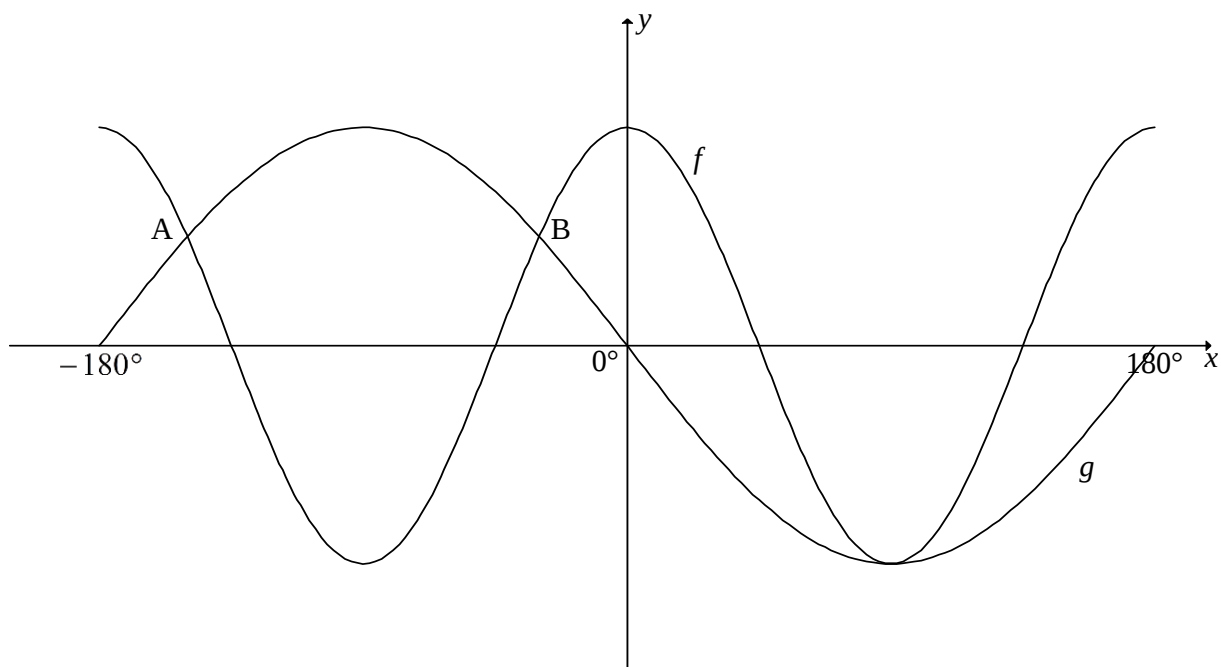
QUESTION/VRAAG 6



6.1	Period = 180°	✓ 180° (1)
6.2	$y \in \left[-\frac{\sqrt{2}}{2}; 1\right]$ OR $y \in [-0,71; 1]$ OR $-\frac{\sqrt{2}}{2} \leq y \leq 1$	✓ $-\frac{\sqrt{2}}{2}$ ✓ $y \in \left[-\frac{\sqrt{2}}{2}; 1\right]$ (2)
6.3.1	$x \in (45^\circ; 90^\circ)$ OR $45^\circ < x < 90^\circ$	✓✓ $x \in (45^\circ; 90^\circ)$ (2)
6.3.2	$f(x) + 1 \leq 0$ $f(x) \leq -1$ $x \in [105^\circ; 165^\circ]$ OR $105^\circ \leq x \leq 165^\circ$	✓✓ $x \in [105^\circ; 165^\circ]$ (2)
6.4	$p(x) = -2\sin 2x$ $-2\sin 2x = -1$ OR $2\sin 2x = 1$ $k = 15^\circ$ or $k = 75^\circ$	✓ reading off $f(x) = 1$ or $-f(x) = -1$ ✓ 15° ✓ 75° (3)
6.5	$g(x) = -\cos(x + 45^\circ)$ $h(x) = -\cos(x + 90^\circ)$ $h(x) = \sin x$	✓ $-\cos(x + 90^\circ)$ ✓ answer (2)
		[12]

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V6 · 13 punte

6.1	$1 - 2\sin^2 x = -\sin x$ $2\sin^2 x - \sin x - 1 = 0$ $(2\sin x + 1)(\sin x - 1) = 0$ $\sin x = -\frac{1}{2}$ or $\sin x = 1$ ref $\angle = 30^\circ$ ref $\angle = 90^\circ$ $x = 210^\circ + k.360^\circ$ $x = 90^\circ + k.360^\circ$ or $x = 330^\circ + k.360^\circ$ $x = -150^\circ$ or $x = -30^\circ$ or $x = 90^\circ$ OR $\cos 2x = -\sin x$ $\cos 2x = -\cos(90^\circ - x)$ $2x = 180^\circ - (90^\circ - x) + k.360^\circ$ or $2x = 180^\circ + (90^\circ - x) + k.360^\circ$ $2x = 90^\circ + x + k.360^\circ$ or $2x = 270^\circ - x + k.360^\circ$ $x = 90^\circ + k.360^\circ$ $x = 90^\circ + k.120^\circ$ $x = -150^\circ$ or $x = -30^\circ$ or $x = 90^\circ$ OR $\cos 2x = -\sin x$ $\cos 2x = \cos(90^\circ + x)$ $2x = 90^\circ + x + k.360^\circ$ or $2x = 360^\circ - (90^\circ + x) + k.360^\circ$ $x = 90^\circ + k.360^\circ$ or $3x = 270^\circ + k.360^\circ$ $x = 90^\circ + k.120^\circ$ $x = -150^\circ$ or $x = -30^\circ$ or $x = 90^\circ$ OR $\cos 2x = -\sin x$ $\sin(90^\circ - 2x) = -\sin x$ $90^\circ - 2x = 180^\circ + x + k.360^\circ$ or $90^\circ - 2x = 360^\circ - x + k.360^\circ$ $x = -30^\circ + k.120^\circ$ $x = -270^\circ + k.360^\circ$ $x = -150^\circ$ or $x = -30^\circ$ or $x = 90^\circ$	✓ identity ✓ factors ✓ $\sin x = -\frac{1}{2}$ ✓ $\sin x = 1$ ✓ -150° and -30° ✓ 90° (A) (6) ✓ co-functions ✓ $2x$ in quadrant 2 ✓ $2x$ in quadrant 3 ✓ both general solutions ✓ -150° and -30° ✓ 90° (A) (6) ✓ co-functions ✓ $2x$ in quadrant 1 ✓ $2x$ in quadrant 4 ✓ both general solutions ✓ -150° and -30° ✓ 90° (A) (6) ✓ co-functions ✓ $90^\circ - 2x$ in quadrant 3 ✓ $90^\circ - 2x$ in quadrant 4 ✓ both general solutions ✓ -150° and -30° ✓ 90° (A) (6)
-----	--	--

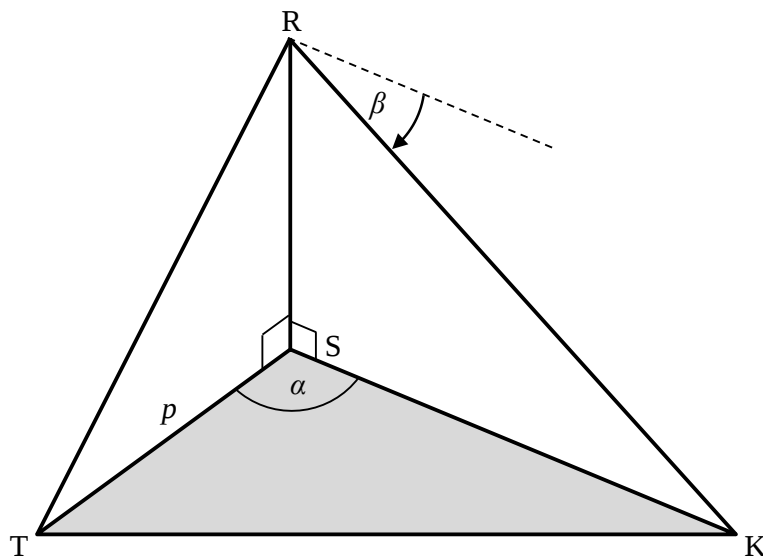


6.2.1	$A(-150^\circ; 0,5)$ $B(-30^\circ; 0,5)$ $AB = -30^\circ - (-150^\circ)$ $AB = 120^\circ$ Answer only: Full marks	$\checkmark AB = -30^\circ - (-150^\circ)$ $\checkmark$ answer (2)
6.2.2	$x \in (0^\circ; 90^\circ)$ or $x \in (90^\circ; 180^\circ)$ OR $0^\circ < x < 90^\circ$ or $90^\circ < x < 180^\circ$	$\checkmark x \in (0^\circ; 90^\circ)$ $\checkmark x \in (90^\circ; 180^\circ)$ (2) $\checkmark 0^\circ < x < 90^\circ$ $\checkmark 90^\circ < x < 180^\circ$ (2)
6.2.3	$\cos 2x = k - 3$ $k - 3 < -1$ or $k - 3 > 1$ $k < 2$ or $k > 4$ Answer only: Full marks OR $k < 2$ or $k > 4$ Answer only: Full marks	$\checkmark k - 3 < -1$ or $k - 3 > 1$ $\checkmark k < 2$ $\checkmark k > 4$ (3) $\checkmark$ graph of $y = \cos 2x + 3$ $\checkmark k < 2$ $\checkmark k > 4$ (3)
[13]		

21. 'n Vertikale toring, 'n dieptehoek, en 'n oppervlakte q

Amptelike DBE-nasienriglyn · November 2023 · V7 · 7 punte

QUESTION / VRAAG 7



7.1	$\text{Area } \Delta STK = \frac{1}{2} p(SK) \sin \alpha$ $q = \frac{1}{2} p(SK) \sin \alpha$ $SK = \frac{q}{\frac{1}{2} p \sin \alpha}$ $= \frac{2q}{p \sin \alpha}$	✓ substitution into the correct formula ✓ answer (2)
7.2	$\hat{RKS} = \beta$ $\frac{RS}{SK} = \tan \beta$ $RS = \frac{2q \tan \beta}{p \sin \alpha}$ OR $\frac{RS}{\sin \beta} = \frac{SK}{\sin(90^\circ - \beta)}$ $RS \cos \beta = SK \sin \beta$ $RS = SK \tan \beta$ $RS = \frac{2q \tan \beta}{p \sin \alpha}$	✓ $\hat{RKS} = \beta$ ✓ correct trig ratio (2) ✓ $\hat{RKS} = \beta$ ✓ $\tan \beta = \frac{\sin \beta}{\cos \beta}$ (2)
7.3	$70 = \frac{2(2500) \tan 42^\circ}{80 \sin \alpha}$ $\sin \alpha = \frac{25}{28} \tan 42^\circ \quad \text{OR} \quad \sin \alpha = 0,80\dots$ $\alpha = 53,51^\circ$	✓ correct substitution of values into RS ✓ value of $\sin \alpha$ ✓ answer (3)
		[7]

22. 'n Oprit in 'n gebou: sy hoogte, sy hoek en sy lengte

Amptelike DBE-nasienriglyn · Mei/Junie 2022 · V8 · 8 punte

QUESTION/VRAAG 8

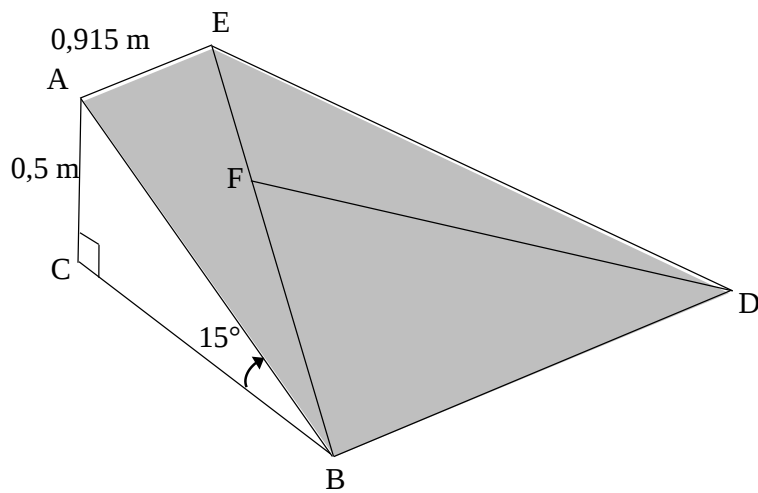


FIGURE I

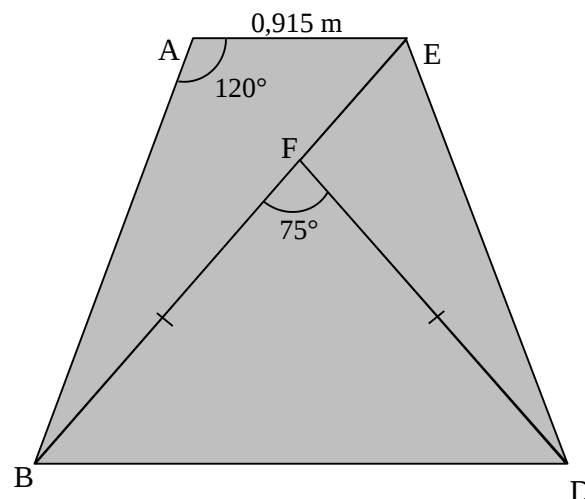


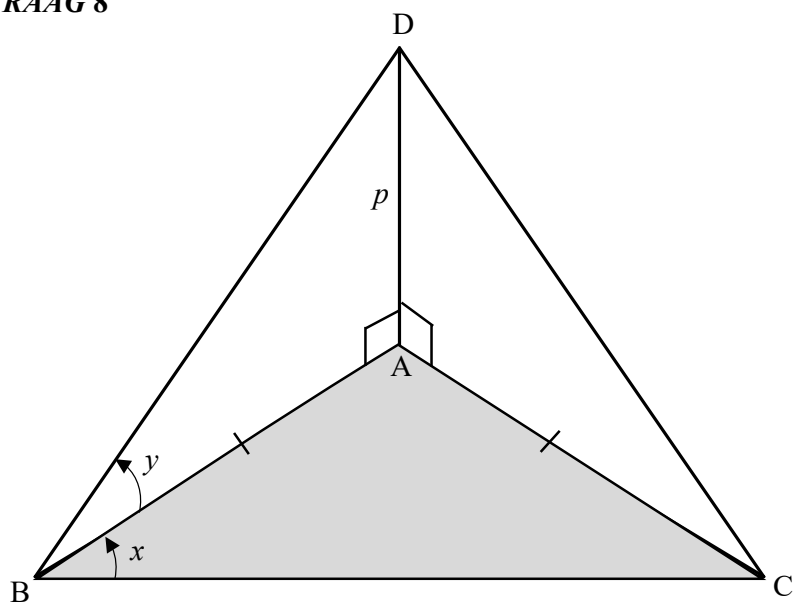
FIGURE II (top view)

8.1	$\frac{0,5}{AB} = \sin 15^\circ$ $AB = \frac{0,5}{\sin 15^\circ}$ $AB = 1,93 \text{ m}$ Answer only 2/2	✓ trig ratio ✓ answer (2)
8.2	$BE^2 = AB^2 + AE^2 - 2(AB)(AE)\cos\hat{BAE}$ $BE^2 = (1,93)^2 + (0,915)^2 - 2(1,93)(0,915)(\cos 120^\circ)$ $BE = 2,52 \text{ m}$	✓ correct use of cosine rule ✓ substitution ✓ answer (3)
8.3	$BF = FD = \frac{5}{7}(2,52) = 1,80 \text{ m}$ $\text{Area } \triangle BFD = \frac{1}{2}(BF)(FD)\sin\hat{BFD}$ $= \frac{1}{2}(1,8)(1,8)(\sin 75^\circ)$ $= 1,56 \text{ m}^2$	✓ BF ✓ correct substitution into the area rule ✓ answer (3)
[8]		

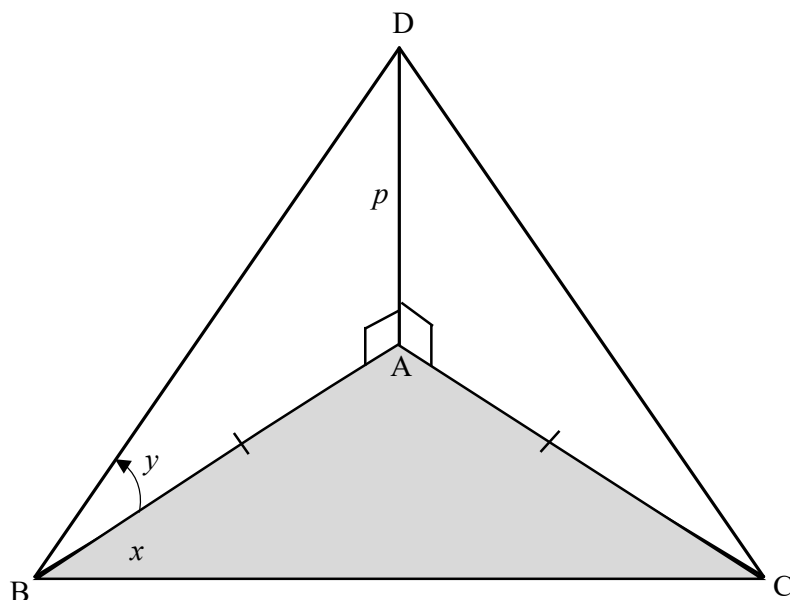
23. 'n Punt reg bo 'n driehoek, met $2AD = BC$

Amptelike DBE-nasienriglyn · Mei/Junie 2025 · V8 · 8 punte

QUESTION/VRAAG 8



8.1	$\tan y = \frac{p}{AB}$ $AB = \frac{p}{\tan y}$	✓ correct trig ratio ✓ answer (2)
8.2	In $\triangle BAC$: $\frac{\sin \hat{BAC}}{BC} = \frac{\sin \hat{ACB}}{AB}$ $\frac{\sin(180^\circ - 2x)}{2p} = \frac{\sin x}{\left(\frac{p}{\tan y}\right)}$ $\frac{\sin 2x}{2p} = \sin x \times \left(\frac{\tan y}{p}\right)$ $\frac{2 \sin x \cos x}{2p} = \sin x \times \left(\frac{\tan y}{p}\right)$ $2 \cos x = \left(\frac{\tan y}{p}\right)(2p)$ $\cos x = \tan y$	✓ correct use of sine-rule ✓ substitute BC & AB ✓ $\sin(180^\circ - 2x) = \sin 2x$ ✓ $\sin 2x = 2 \sin x \cos x$ (4)

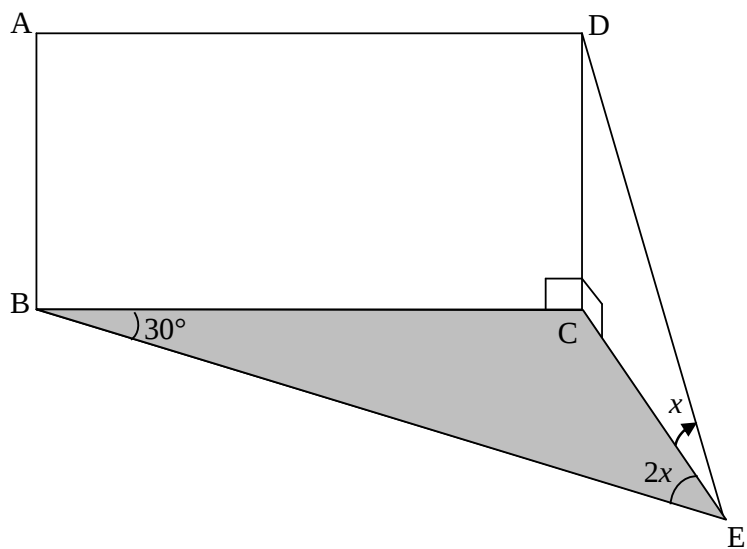


8.2	OR/OF In $\triangle BAC$: $BC^2 = AB^2 + AC^2 - 2(AB)(AC)\cos \hat{BAC}$ $(2p)^2 = \left(\frac{p}{\tan y}\right)^2 + \left(\frac{p}{\tan y}\right)^2 - 2\left(\frac{p}{\tan y}\right)\left(\frac{p}{\tan y}\right)\cos(180^\circ - 2x)$ $4p^2 = \frac{2p^2}{\tan^2 y} - \frac{2p^2(-\cos 2x)}{\tan^2 y}$ $4p^2 \tan^2 y = 2p^2(1 + \cos 2x)$ $\tan^2 y = \frac{1 + 2\cos^2 x - 1}{2}$ $\tan^2 y = \cos^2 x$ $\tan y = \cos x$	✓ correct use of cos-rule ✓ substitute AB & BC ✓ $\cos(180^\circ - 2x) = -\cos 2x$ ✓ $\cos 2x = 2\cos^2 x - 1$ (4)
8.3	$\cos x = \tan y$ $\tan y = \cos 60^\circ$ $\tan y = 0,5$ $y = 26,57^\circ$	✓ substitution of 60° ✓ answer (2)
[8]		

24. Twee planke wat teen regte hoeke ontmoet

Amptelike DBE-nasienriglyn · Mei/Junie 2021 · V7 · 9 punte

QUESTION/VRAAG 7



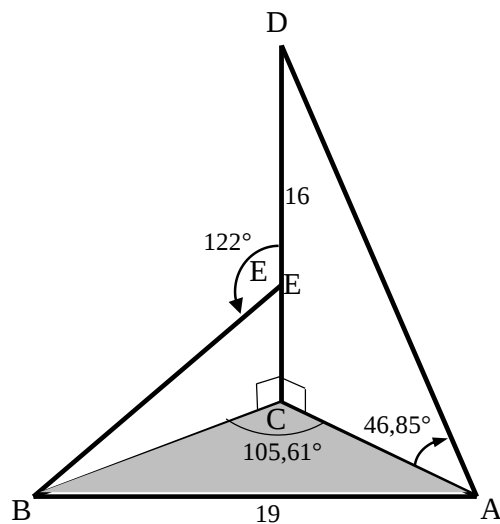
7.1	In $\triangle BCE$: $\frac{CE}{\sin \hat{B}} = \frac{BC}{\sin \hat{BEC}}$ $\frac{CE}{\sin 30^\circ} = \frac{BC}{\sin 2x}$ $CE = \frac{BC \sin 30^\circ}{\sin 2x}$ In $\triangle CDE$: $\frac{DC}{CE} = \tan \hat{DEC}$ $DC = \frac{BC \cdot \sin 30^\circ}{\sin 2x} (\tan x)$ $DC = \frac{BC}{4 \sin x \cos x} \left(\frac{\sin x}{\cos x} \right)$ $DC = \frac{BC}{4 \cos^2 x}$	✓ correct use of sine rule ✓ $CE = \frac{BC \sin 30^\circ}{\sin 2x}$ ✓ correct trig ratio ✓ Subst CE ✓ $2 \sin x \cos x$ ✓ $\frac{\sin x}{\cos x}$ (6)
-----	--	---

7.2	$DC = \frac{BC}{4 \cos^2 30^\circ}$ $= \frac{BC}{4 \left(\frac{\sqrt{3}}{2} \right)^2}$ $= \frac{BC}{3}$ $\therefore BC = 3DC$ But $AB = DC$ [opp sides of rectangle/teenoorst. sye v reghoek] $\therefore BC = 3AB$ Area of rectangle = $(AB)(BC)$ $= (AB)(3AB)$ $= 3AB^2$	✓ $DC = \frac{BC}{3}$ ✓ $BC = 3AB$ ✓ substitution into area formula (3)
[9]		

25. Twee waarnemers 19 m uitmekaar, en 'n gebou 16 m hoog

Amptelike DBE-nasienriglyn · November 2024 · V8 · 9 punte

QUESTION/VRAAG 8



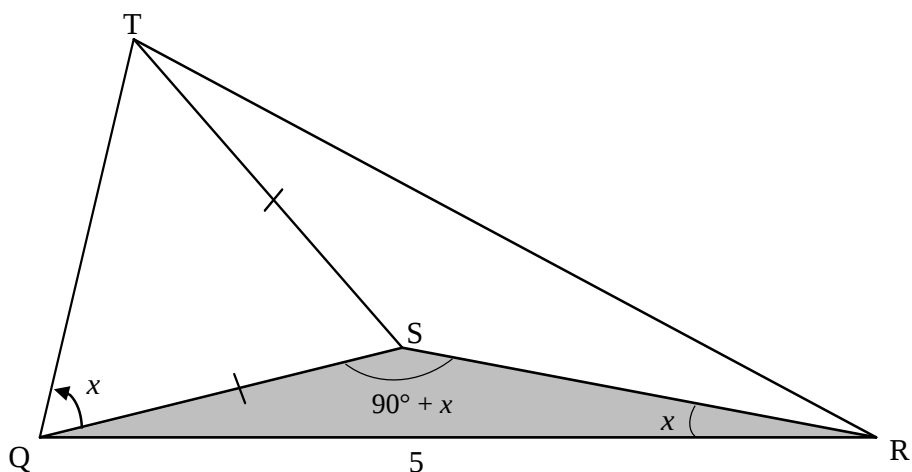
8.1	$\tan \hat{D}AC = \frac{DC}{AC}$ $AC = \frac{16}{\tan 46,85^\circ}$ $AC = 15 \text{ m}$	✓ correct subs into trig ratio ✓ answer (2)
8.2	$(AB)^2 = (BC)^2 + (AC)^2 - 2(BC)(AC)\cos \hat{B}CA$ $(19)^2 = x^2 + (15)^2 - 2x(15)\cos 105,61^\circ$ $x^2 + 8,07x - 136 = 0$ $x = \frac{-8,07 \pm \sqrt{(8,07)^2 - 4(1)(-136)}}{2(1)}$ $x = 8,30 \text{ m or } x \neq -16,38 \text{ m}$ $\hat{B}EC = 58^\circ \qquad \text{OR/OR} \qquad \hat{E}BC = 32^\circ$ $\tan \hat{B}EC = \frac{BC}{EC} \qquad \qquad \qquad \tan \hat{E}BC = \frac{EC}{BC}$ $EC = \frac{8,3}{\tan 58^\circ} \qquad \qquad \qquad EC = 8,3 \tan 32^\circ$ $EC = 5,19 \text{ m} \qquad \qquad \qquad EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m} \qquad \qquad \qquad DE = 10,81 \text{ m}$	✓ correct subst. into cosine rule ✓ quadratic equation in std form ✓ correct subst. into quadratic formula ✓ length of BC ✓ size of $\hat{B}EC$ OR/OR $\hat{E}BC$ ✓ length of EC ✓ answer (7)

OR/OF $\frac{\sin 105,61^\circ}{19} = \frac{\sin \hat{CBA}}{15}$ $\hat{CBA} = 49,5^\circ$ $\hat{BAC} = 24,89^\circ$ $\frac{BC}{\sin 24,89^\circ} = \frac{19}{\sin 105,61^\circ}$ $BC = 8,3 \text{ m}$ $\hat{BEC} = 58^\circ$ $\tan \hat{BEC} = \frac{BC}{EC}$ $EC = \frac{8,3}{\tan 58^\circ}$ $EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m}$	OR/OF $\hat{EBC} = 32^\circ$ $\tan \hat{EBC} = \frac{EC}{BC}$ $EC = 8,3 \tan 32^\circ$ $EC = 5,19 \text{ m}$ $DE = 10,81 \text{ m}$	OR/OF ✓ correct subst. into sine rule ✓ $\hat{BAC}$ ✓ correct subst. into sine formula ✓ length of BC ✓ size of $\hat{BEC}$ OR/OF $\hat{EBC}$ ✓ length of EC ✓ answer (7)
[9]		

26. 'n Haak aan 'n gallery se plafon, uit drie punte gesien

Amptelike DBE-nasienriglyn · November 2021 · V8 · 10 punte

QUESTION/VRAAG 8



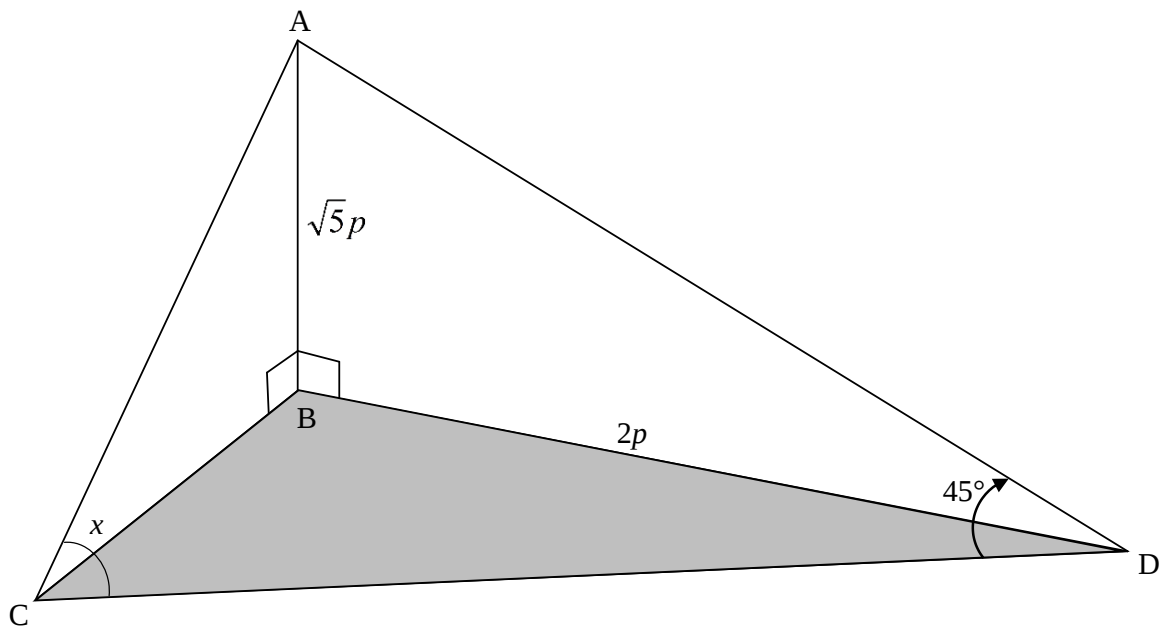
8.1	In ΔSQR: $\frac{QS}{\sin x} = \frac{QR}{\sin(90^\circ + x)}$ $\frac{QS}{\sin x} = \frac{5}{\cos x}$ $QS = \frac{5 \sin x}{\cos x}$ $QS = 5 \tan x$	✓ correct use of sine rule ✓ $\sin(90^\circ + x) = \cos x$ ✓ $QS = \frac{5 \sin x}{\cos x}$ (3)
8.2	$\frac{QT}{\sin(180^\circ - 2x)} = \frac{TS}{\sin x}$ $\frac{QT}{\sin 2x} = \frac{5 \tan x}{\sin x}$ $QT = \frac{5 \tan x \sin 2x}{\sin x}$ $QT = \frac{5 \left(\frac{\sin x}{\cos x} \right) (2 \sin x \cos x)}{\sin x}$ $QT = \frac{5 \sin x (2 \sin x)}{\sin x}$ $QT = 10 \sin x$	✓ correct use of sine rule ✓ $TS = QS = 5 \tan x$ ✓ $QT = \frac{5 \tan x \sin 2x}{\sin x}$ ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ $\sin 2x = 2 \sin x \cos x$ (5)

	OR/OF $QT^2 = QS^2 + TS^2 - 2QS.TS\cos\hat{QST}$ $QT^2 = (5 \tan x)^2 + (5 \tan x)^2 - 2(5 \tan x).(5 \tan x)\cos(180^\circ - 2x)$ $QT^2 = 50 \tan^2 x - 50 \tan^2 x(-\cos 2x)$ $QT^2 = 50 \tan^2 x(1 + \cos 2x)$ $QT^2 = 50 \tan^2 x(1 + 2 \cos^2 x - 1)$ $QT^2 = 50 \tan^2 x(2 \cos^2 x)$ $QT^2 = 100 \frac{\sin^2 x}{\cos^2 x} (\cos^2 x)$ $QT^2 = 100 \sin^2 x$ $QT = 10 \sin x$ OR/OF $TS^2 = QS^2 + TQ^2 - 2QS.TQ.\cos x$ $(5 \tan x)^2 = (5 \tan x)^2 + TQ^2 - 2(5 \tan x).TQ.\cos x$ $0 = TQ^2 - 2(5 \tan x).TQ.\cos x$ $0 = TQ[TQ - 10 \tan x.\cos x]$ $TQ = 10 \tan x.\cos x \quad (TQ \neq 0)$ $= 10 \frac{\sin x}{\cos x} . \cos x$ $= 10 \sin x$	✓ correct use of cos rule ✓ $TS = QS = 5 \tan x$ ✓ $\cos 2x = 2 \cos^2 x - 1$ & reduction ✓ $\tan x = \frac{\sin x}{\cos x}$ ✓ $QT^2 = 100 \sin^2 x$ (5) ✓ correct use of cos rule ✓ $TS = QS = 5 \tan x$ ✓ quadratic equation into TQ ✓ $TQ = 10 \tan x . \cos x$ ✓ $\tan x = \frac{\sin x}{\cos x}$ (5)
8.3	Area of $\Delta TQR = \frac{1}{2}.TQ.QR \sin \hat{Q}R$ $= \frac{1}{2}(10 \sin 25^\circ)(5)(\sin 70^\circ)$ $= 9.93 \text{ unit}^2$	✓ correct substitution into the area rule ✓ answer (2)
[10]		

27. 'n Vlagpaal en die twee kables wat dit anker

Amptelike DBE-nasienriglyn · November 2022 · V7 · 10 punte

QUESTION/VRAAG 7



7.1	$AD^2 = AB^2 + BD^2$ $AD^2 = (\sqrt{5}p)^2 + (2p)^2$ $AD^2 = 9p^2$ $AD = 3p$	✓ substitution in Pythagoras ✓ answer (2)
7.2	$\frac{CD}{\sin(135^\circ - x)} = \frac{3p}{\sin x}$ $CD = \frac{3p \sin(135^\circ - x)}{\sin x}$ $CD = \frac{3p(\sin 135^\circ \cos x - \cos 135^\circ \sin x)}{\sin x}$ $CD = \frac{3p(\sin 45^\circ \cos x + \cos 45^\circ \sin x)}{\sin x}$ $CD = \frac{3p\left(\frac{\sqrt{2}}{2} \cos x + \frac{\sqrt{2}}{2} \sin x\right)}{\sin x}$ $CD = \frac{3p\left(\frac{\sqrt{2}}{2}\right)(\cos x + \sin x)}{\sin x}$ $CD = \frac{3p(\sin x + \cos x)}{\sqrt{2} \sin x}$	✓ correct use of sine rule ✓ $135^\circ - x$ ✓ compound angle ✓ special values ✓ factorisation (5)

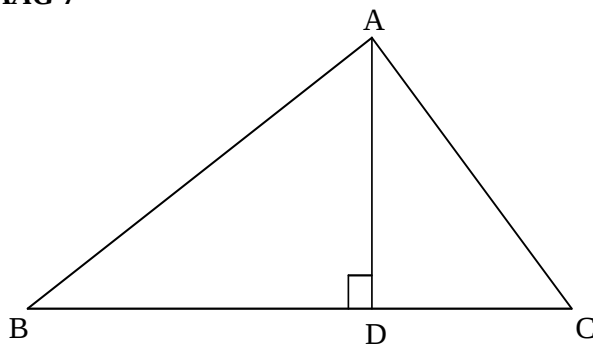
7.3	$\text{Area } \triangle ADC = \frac{1}{2}(AD)(CD)\sin\hat{A}DC$ $= \frac{1}{2}(3p)\left(\frac{3p(\sin x + \cos x)}{\sqrt{2}\sin x}\right)(\sin 45^\circ)$ $= \frac{1}{2}(30)\left(\frac{30(\sin 110^\circ + \cos 110^\circ)}{\sqrt{2}\sin 110^\circ}\right)\sin 45^\circ$ $= 143,11m^2$	✓ correct use of area rule ✓ substitution in area rule ✓ answer (3)
[10]		

28. Lei die oppervlakte reël af, sit dit dan aan die werk

Amptelike DBE-nasienriglyn · Mei/Junie 2024 · V7 · 11 punte

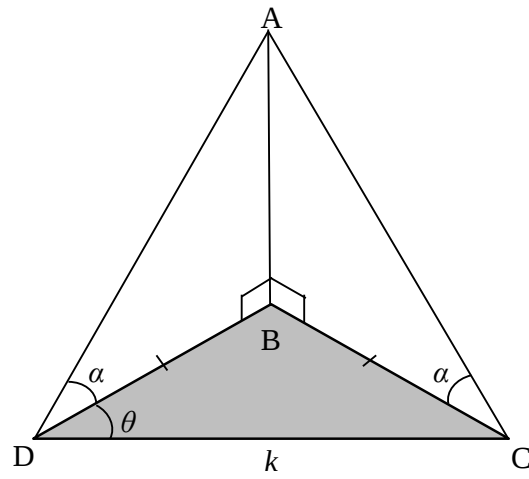
QUESTION/VRAAG 7

7.1



7.1.1	$\sin \hat{B} = \frac{AD}{AB}$ $AD = AB \sin \hat{B}$	✓ $\sin \hat{B} = \frac{AD}{AB}$ ✓ answer (2)
7.1.2	$\text{Area of } \triangle ABC = \frac{1}{2}(BC)(AD)$ $\therefore \text{Area of } \triangle ABC = \frac{1}{2}(BC)(AB)\sin \hat{B}$	✓ $\frac{1}{2}(BC)(AD)$ (1)

7.2



7.2.1

In $\triangle ADB$

$$\sin \alpha = \frac{AB}{AD}$$

$$AD = \frac{AB}{\sin \alpha}$$

In $\triangle ABC$

$$\sin \alpha = \frac{AB}{AC}$$

$$AC = \frac{AB}{\sin \alpha}$$

$$AD = AC$$

OR

In $\triangle ADB$ and $\triangle ACB$

$$\checkmark \sin \alpha = \frac{AB}{AD}$$

$$\checkmark \sin \alpha = \frac{AB}{AC}$$

(2)

	$AB = AB$ [common side] $\hat{A}BD = \hat{A}BC = 90^\circ$ [given] $BD = BC$ [given] $\triangle ADB \equiv \triangle ACB$ [S $\angle$ S] $\therefore AD = AC$ OR In $\triangle ADB$ and $\triangle ACB$ $\hat{A}DB = \hat{A}CB = \alpha$ [given] $\hat{A}BD = \hat{A}BC = 90^\circ$ [given] $AB = AB$ OR $BD = BC$ [common side OR given] $\therefore \triangle ADB \equiv \triangle ACB$ [$\angle\angle$ S] $\therefore AD = AC$ OR $AD^2 = AB^2 + DB^2$ [Pythagoras] $AC^2 = AB^2 + BC^2$ [Pythagoras] But $DB = BC$ [given] $\therefore AD^2 = AC^2$ $\therefore AD = AC$	$\checkmark \triangle ADB \equiv \triangle ACB \checkmark R$ (2) $\checkmark \triangle ADB \equiv \triangle ACB \checkmark R$ (2) $\checkmark$ both Pythagoras statements $\checkmark DB = BC$ (2)
7.2.2	$\frac{BD}{\sin \theta} = \frac{k}{\sin(180^\circ - 2\theta)}$ $BD = \frac{k \sin \theta}{\sin 2\theta}$ $BD = \frac{k \sin \theta}{2 \sin \theta \cos \theta}$ $BD = \frac{k}{2 \cos \theta}$ OR $BC^2 = k^2 + BD^2 - 2k(BD)\cos \theta$ $BD^2 = k^2 + BD^2 - 2k(BD)\cos \theta$ $k^2 - 2k(BD)\cos \theta = 0$ $2k(BD)\cos \theta = k^2$ $\therefore BD = \frac{k}{2 \cos \theta}$	$\checkmark$ substitution of $(180^\circ - 2\theta)$ into sine rule $\checkmark$ reduction $\checkmark$ double angle (3) $\checkmark$ substitution into cosine-rule $\checkmark$ substitution BC with BD into cosine-rule $\checkmark$ simplification in terms of BD (3)

7.2.3	Area of $\triangle BCD = \frac{1}{2}(DC)(BD)(\sin \hat{CDB})$ $= \frac{1}{2}k \left(\frac{k}{2 \cos \theta} \right) \sin \theta$ $= \frac{1}{4}k^2 \tan \theta$ OR Area of $\triangle BCD = \frac{1}{2}(BD)(BC)(\sin(180^\circ - 2\theta))$ $= \frac{1}{2} \left(\frac{k}{2 \cos \theta} \right) \left(\frac{k}{2 \cos \theta} \right) (\sin 2\theta)$ $= \frac{2k^2 \sin \theta \cos \theta}{8 \cos \theta \cos \theta}$ $= \frac{1}{4}k^2 \tan \theta$	✓ substitution into area rule ✓ $\frac{\sin \theta}{\cos \theta} = \tan \theta$ ✓ $\frac{1}{4}k^2 \tan \theta$ (3) ✓ substitution into area rule ✓ $\frac{\sin \theta}{\cos \theta} = \tan \theta$ ✓ $\frac{1}{4}k^2 \tan \theta$ (3)
		[11]