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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 12

WISKUNDE V2

NOVEMBER 2012

MEMORANDUM

PUNTE: 150

Hierdie memorandum bestaan uit 29 bladsye.

NOTA:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk slegs die EERSTE poging.
- Indien 'n kandidaat 'n poging van 'n vraag gekanselleer het en nie die vraag weer gedoen het nie, merk die gekanselleerde weergawe.
- Volgehoue akkuraatheid is van toepassing in ALLE aspekte van die memorandum tensy anders aangedui.

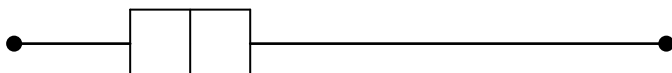
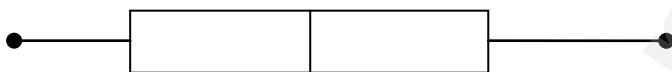
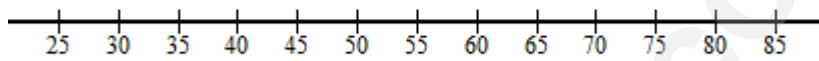
VRAAG 1

1.1	Ongeveer 121cm (Aanvaar 120 – 122)	✓ antwoord (1)
1.2	Soos die ouderdom toeneem sal die lengte toeneem OF Elke jaar die lengte sal toeneem met ongeveer 6,2 cm OF Reguit lyn (linieêr) met positiewe gradient OF Toename in lengte: toename in ouderdom is 'n konstante OF Sterk positiewe korrelasie	✓ beskrywing (1)
1.3	Geskatte toename in gemiddelde lengte = $\frac{169 - 88}{15 - 2}$ = 6,23 Interval vir noemer (87 – 89 ; 167 – 170) (Aanvaar enige antwoord tussen 6 – 6,4 cm)	✓ lees van grafiek af ✓ noemer ✓ antwoord (3)
1.4	Kinders hou op groei as hulle volwassenheid bereik. OF Indien die neiging voortduur sal die seuns onmoontlike lengtes bereik OF Die neiging sal 'n konstante waarde nader. OF Mense kan nie onbeperk groei nie.	✓ opmerking (1) [6]

VRAAG 2

2.1	Gemiddelde aantal lopies $\bar{x} = \frac{\sum x}{n} = \frac{128}{8} = 16$	✓ 128 ✓ 16 (2)
2.2	Standaard afwyking = 7,55 NOTA: Penalisering van 1 punt vir nie-korrekte afronding	✓✓ 7,55 (2)
2.3	Standaard afwyking = 9,71 Standaard afwyking vermeerder. OF 2 en 35 is ver van die gemiddelde, naamlik 16. Die standaard afwyking hang af van hoe ver die data punte vanaf die gemiddelde is, en daarom word dit verwag dat die standaard afwyking sal toeneem	✓ 9,71 ✓ vermeerder (2) ✓ 2 en 35 ver van gemiddelde ✓ vermeerder (2)
2.4	Totale aantal lopies benodig is $20 \times 16 = 320$ Totale aantal lopies aangeteken tydens die laaste vyf wedstryde $= 320 - 59 - 128 = 133$ Gemiddelde aantal lopies vir die laaste wedstryd is $\frac{133}{5} = 26,6$ OF $\frac{128 + 59 + x}{16} = 20$ $187 + x = 320$ $\therefore x = 133$ $\therefore \frac{133}{5} = 26,6$ OF $\frac{128 + 59 + 5x}{16} = 20$ $5x = 133$ $\therefore x = 26,6$	✓ 320 ✓ 133 ✓ 26,6 (3) ✓ 320 ✓ 133 ✓ 26,6 (3) ✓ 320 ✓ 133 ✓ 26,6 (3) [9]

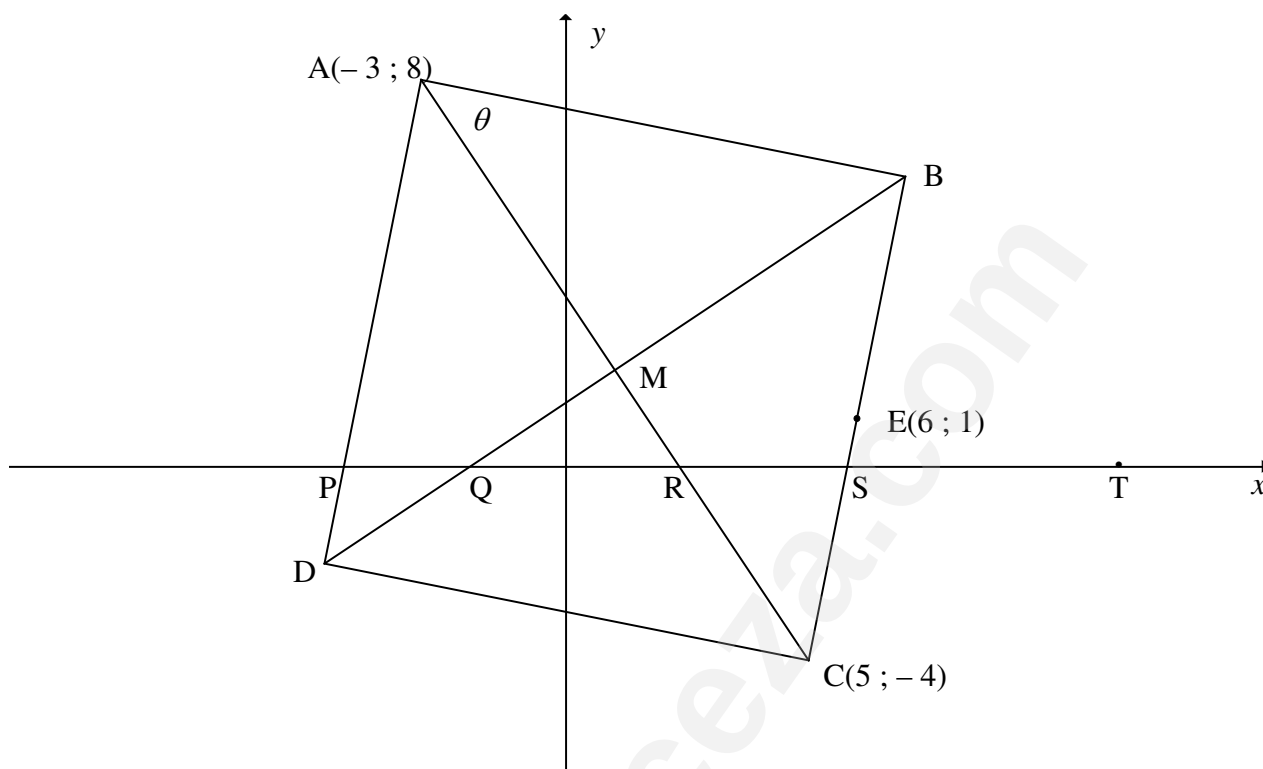
VRAAG 3

3.1	Omvang (Variasiewydte) = $85 - 30 = 55$	✓ 55 (1)
3.2	Skei  Wisk  	✓ maks 85 ✓ $Q_3 = 70$ ✓ $Q_1 = 40$ ✓ Mediaan = 55 (4)
3.3	Vanuit die inligting oor Wiskunde, die waarde van die derde kwartiel is 70%. Dus sal 75% van die leerder se punte onder 70% wees. Verwagte aantal leerders minder as 70% is $\frac{75}{100} \times 60 = \frac{3}{4} \times 60 = 45 \text{ leerders}$	✓ 75% van leerders ✓ 45 leerders (2)
3.4	Nee, Joe se stelling is nie geldig nie. 50% van die leerders het tussen 30% en 45% presteer in Skeinat. 50% van die leerders het tussen 30% en 55% presteer in Wiskunde. Daarom is die aantal leerders dieselfde OF Nee, Joe se stelling is nie geldig nie. Selfde aantal leerders (tussen min en mediaan)	✓ nie geldig nie/no ✓ mediaan represents 50% of leerders (2) [9]

VRAAG 4

4.1	Modale interval(klas) is $50 \leq x < 60$ OF $50 < x \leq 60$ OF 50 tot 60	✓ korrekte interval (1)
4.2	Mediaan posisie is 15 leerders (gegroepeerde data). Geskatte gewig is omtrent 53 kg. (Aanvaar 52 kg - 54 kg)	✓ 53 kg (1)
4.3	$30 - 23 = 7$ leerders het meer as 60 kg versamel.	✓ ✓ 7 leerders (2) [4]

VRAAG 5



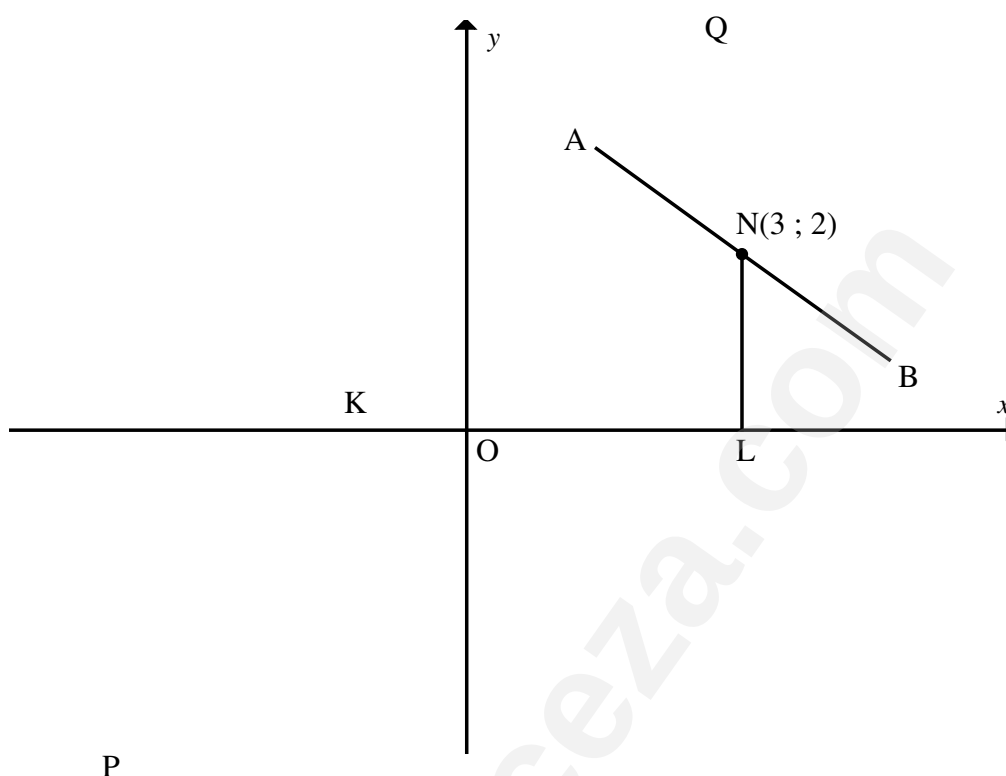
5.1	Hoeklyne halveer mekaar by M: $x_M = \frac{-3+5}{2} = 1$; $y_M = \frac{8+(-4)}{2} = 2$ M(1 ; 2)	✓ $x_M = 1$ ✓ $y_M = 2$ (2)
5.2	$m_{BC} = \frac{1+4}{6-5}$ $m_{BC} = 5$ OR $m_{BC} = \frac{-4-1}{5-6}$ $m_{BC} = 5$	✓ vervanging in gradient formule ✓ 5 (2) ✓ $m_{BC} = \frac{-4-1}{5-6}$ ✓ 5 (2)
5.3	$y - y_1 = m(x - x_1)$ $y - 8 = m(x + 3)$ $m_{AD} = m_{BC} = 5$ $y - 8 = 5(x + 3)$ $y = 5x + 23$ Ewewydige lyne	✓ vervanging (-3 ; 8) ✓ gradiente gelyk ✓ vergelyking (3)

	OF $m_{AD} = m_{BC}$ $m_{AD} = 5$ $y = 5x + c$ $8 = 5(-3) + c$ $c = 23$ $y = 5x + 23$ Ewewydige lyne	✓ gradiente gelyk ✓ vervanging (-3 ; 8) ✓ vergelyking (3)
5.4	ABCD is 'n ruit, daarom AB = BC $\theta = \hat{BCA} = \hat{ARS} - \hat{RSC}$ $= \hat{ARS} - \hat{BST}$ $\tan \hat{ARS} = m_{AC} = \frac{8+4}{-3-5}$ $\tan \hat{ARS} = -\frac{3}{2}$ $\hat{ARS} = 180^\circ - 56,3099\dots$ $\hat{ARS} = 123,69^\circ$ $\tan \hat{BST} = m_{BC} = 5$ $\hat{BST} = 78,69^\circ$ $\hat{ARS} = \hat{BCA} + \hat{BST}$ $\hat{BCA} = 123,69^\circ - 78,69^\circ$ $\hat{BCA} = 45^\circ$ OF $\tan \hat{ARS} = m_{AC} = \frac{8+4}{-3-5} = -\frac{3}{2}$ $\hat{ARS} = 123,69^\circ$ $\tan \hat{APR} = m_{AD} = 5$ $\hat{APR} = 78,69^\circ$ $\hat{PAR} = \hat{ARS} - \hat{APR}$ $= 123,69^\circ - 78,69^\circ$ $= 45^\circ$ $\theta = \hat{PAR}$ $= 45^\circ$ Buitehoek van 'n driehoek Hoeklyne van 'n ruit halveer teenoorstaande hoeke NOTA: Indien 'n leerder aanvaar dat E die middelpunt van BC is dan max 3/6 OF AB is loodreg op BC dan max 1/6	✓ $\theta = \hat{BCA}$ ✓ $\tan \hat{ARS} = -\frac{3}{2}$ ✓ $123,69^\circ$ ✓ $\tan \hat{BST} = m_{BC} = 5$ ✓ $78,69^\circ$ ✓ $\theta = 45^\circ$ (6) ✓ $\tan \hat{ARS} = -\frac{3}{2}$ ✓ $123,69^\circ$ ✓ $\tan \hat{APR} = m_{AD} = 5$ ✓ $78,69^\circ$ ✓ $\hat{PAR} = 45^\circ$ ✓ $\theta = 45^\circ$ (6)

	OF $\tan \hat{ARS} = m_{AC} = \frac{8+4}{-3-5} = -\frac{3}{2}$ $\hat{ARS} = 123,69^\circ$ $\tan \hat{APR} = 5$ $\hat{APR} = 78,69^\circ$ $\theta = \hat{PAR}$ Hoeklyne van 'n ruit halveer teenoorstaande hoeke $\theta = \hat{ARS} - \hat{APR}$ $\theta = 123,69^\circ - 78,69^\circ$ Buite hoek van driehoek $\theta = 45^\circ$ OF $\tan \hat{ARS} = m_{AC} = \frac{8+4}{-3-5} = -\frac{3}{2}$ $\hat{ARS} = 123,69^\circ$ $\tan \hat{BST} = 5$ $\hat{BST} = 78,69^\circ$ $\theta = \hat{RCS}$ BA=BC $\hat{RCS} + \hat{BST} = \hat{RCS} + \hat{RSC}$ $= \hat{ARS}$ $\theta = \hat{ARS} - \hat{BST}$ $= 123,69^\circ - 78,69^\circ$ $= 45^\circ$ OF ABCD is 'n ruit, daarom AB = BC $\therefore \hat{ACB} = \hat{BAC}$ $\tan \theta = \tan \hat{ACB}$ $= \tan(\hat{ARS} - \hat{BST})$ $= \frac{\tan \hat{ARS} - \tan \hat{BST}}{1 + \tan \hat{ARS} \cdot \tan \hat{BST}}$ $= \frac{\left(\frac{12}{-8}\right) - \left(\frac{-5}{-1}\right)}{1 + \left(\frac{12}{-8}\right)\left(\frac{5}{-1}\right)}$ $= 1$ $\theta = 45^\circ$	$\checkmark \tan \hat{ARS} = -\frac{3}{2}$ $\checkmark 123,69^\circ$ $\checkmark \tan \hat{APR} = m_{AD} = 5$ $\checkmark 78,69^\circ$ $\checkmark \theta = \hat{PAR}$ $\checkmark \theta = 45^\circ$ (6) $\checkmark \tan \hat{ARS} = -\frac{3}{2}$ $\checkmark 123,69^\circ$ $\checkmark \tan \hat{BST} = 5$ $\checkmark 78,69^\circ$ $\checkmark \theta = \hat{RCS}$ $\checkmark \theta = 45^\circ$ (6) $\checkmark \hat{ACB} = \hat{BAC}$ $\checkmark \tan \theta = \tan \hat{ACB}$ $\checkmark \text{formule}$ $\checkmark \text{vervanging}$ $\checkmark \tan \theta = 1$ $\checkmark \theta = 45^\circ$ (6)
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	OF Uit 5.1, M se koördinate is (1 ; 2) Verbind ME $m_{ME} = \frac{2-1}{1-6} = -\frac{1}{5}$ Uit 5.2 $m_{BC} = 5$ $\therefore m_{ME} \times m_{BC} = -1$ $\therefore \hat{MEC} = 90^\circ$ $ME = \sqrt{(1-6)^2 + (2-1)^2} = \sqrt{26}$ $EC = \sqrt{(5-6)^2 + (-4-1)^2} = \sqrt{26}$ $\therefore$ MEC is 'n reghoekige driehoek. $\hat{ECM} = 45^\circ$ ABCD is 'n ruit, dus AB = BC $\therefore \theta = \hat{BCM} = 45^\circ$ OF $AM = \sqrt{(-3-1)^2 + (8-2)^2} = 2\sqrt{13}$ Berekeninge om die koördinate van B te bepaal $m_{AC} = \frac{8+4}{-3-5} = -\frac{3}{2}$ $m_{BD} \times m_{AC} = -1$ $m_{BD} = \frac{2}{3}$ Hoeklyne halveer reghoekig Vergelyking van BD is $y = \frac{2}{3}x + \frac{4}{3}$ Vergelyking van BC is $y = 5x - 29$ BD en BC ontmoet in B. Los gelyktydig op om B(7 ; 6) te kry. $\therefore BM = \sqrt{(7-1)^2 + (6-2)^2} = \sqrt{52} = 2\sqrt{13}$ $\therefore BM = AM$ Omdat $\hat{AMB} = 90^\circ$ $\tan \theta = \frac{BM}{AM}$ $\therefore \tan \theta = 1$ $\theta = 45^\circ$	✓ gradient van ME ✓ gradient van BC ✓ $\hat{MEC} = 90^\circ$ ✓ $ME = \sqrt{26}$ ✓ $EC = \sqrt{26}$ ✓ $\hat{ECM} = 45^\circ$ (6) ✓ $AM = 2\sqrt{13}$ ✓ $y = \frac{2}{3}x + \frac{4}{3}$ ✓ $y = 5x - 29$ ✓ B(7 ; 6) ✓ $BM = 2\sqrt{13}$ ✓ 45° (6) [13]
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VRAAG 6



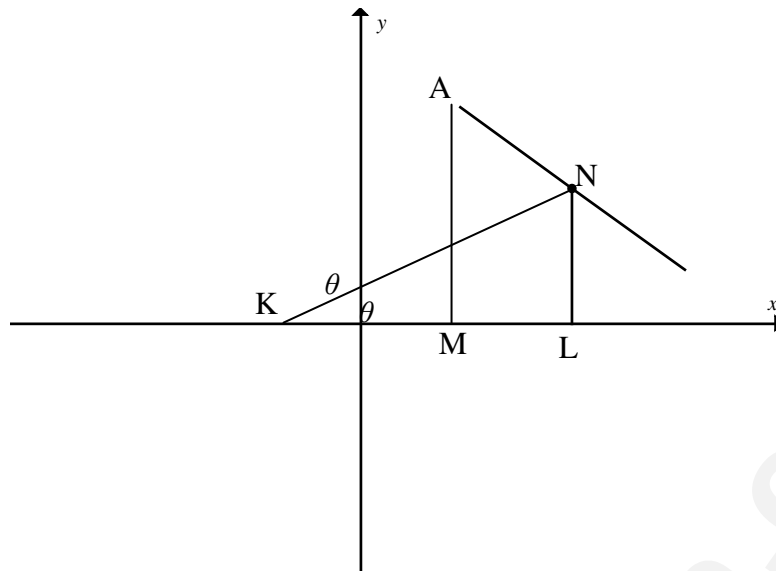
6.1	Die radius (NL) van 'n sirkel is loodreg op die raaklyn (OL) by die kontakpunt	✓ radius $\perp$ raaklyn (1)
6.2	L(3 ; 0)	✓ (3 ; 0) (1)
6.3	Middelpunt N (3 ; 2) en $r = NL = 2$ Vergelyking van die sirkel N: $(x - a)^2 + (y - b)^2 = r^2$ $(x - 3)^2 + (y - 2)^2 = 4$	✓ $r = 2$ ✓ $(x - 3)^2 + (y - 2)^2$ ✓ 4 (3)
6.4	koördinate van K. K is die x-afsnit van die raaklyn. $y = \frac{4}{3}x + \frac{4}{3}$ $0 = \frac{4}{3}x + \frac{4}{3}$ $0 = 4x + 4$ $4x = -4$ $x = -1$ $K(-1; 0)$ $KL = 3 - (-1)$ of $KL = 3 + 1$ $KL = 4$	✓ vervanging $y = 0$ in vergelyking van raaklyn ✓ $x = -1$ ✓ $KL = 4$ (3)

OF $y = \frac{4}{3}x + \frac{4}{3}$ $0 = \frac{4}{3}x + \frac{4}{3}$ $0 = 4x + 4$ $4x = -4$ $x = -1$ $K(-1;0)$ $KL = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $KL = \sqrt{(3+1)^2 + (0-0)^2}$ $KL = \sqrt{16}$ $KL = 4$ OF Vir AK, $m = \frac{4}{3}$, $c = \frac{4}{3}$ $\frac{\frac{4}{3}}{OK} = \tan \hat{AKO} = \frac{4}{3}$ $OK = 1$ $\therefore KL = 4$ OF $y = \frac{4}{3}x + \frac{4}{3}$ $0 = \frac{4}{3}x + \frac{4}{3}$ $0 = 4x + 4$ $4x = -4$ $x = -1$ $K(-1;0)$ $KN^2 = NL^2 + KL^2$ $(-1-3)^2 + (0-2)^2 = 4 + KL^2$ $20 = 4 + KL^2$ $16 = KL^2$ $KL = 4$ Pythagoras se stelling	✓ vervanging $y = 0$ in vergelyking van raaklyn ✓ $x = -1$ ✓ $KL = 4$ (3) ✓ $\frac{\frac{4}{3}}{OK} = \frac{4}{3}$ ✓ $OK = 1$ ✓ $KL = 4$ (3) ✓ $x = -1$ ✓ $KN^2 = NL^2 + KL^2$ ✓ $KL = 4$ (3)
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6.5	$m_{AB} \times m_{AK} = -1$ raaklyn $\perp$ radius $m_{AK} = \frac{4}{3}$ $\therefore m_{AB} = -\frac{3}{4}$ $y - y_1 = m(x - x_1)$ $y - 2 = -\frac{3}{4}(x - 3)$ $y = -\frac{3}{4}x + \frac{9}{4} + \frac{8}{4}$ $y = -\frac{3}{4}x + \frac{17}{4}$ OF $m_{AB} \times m_{AK} = -1$ raaklyn $\perp$ radius $m_{AK} = \frac{4}{3}$ $\therefore m_{AB} = -\frac{3}{4}$ $y = -\frac{3}{4}x + c$ $2 = \left(-\frac{3}{4}\right)(3) + c$ $c = \frac{8}{4} + \frac{9}{4}$ $c = \frac{17}{4}$ $y = -\frac{3}{4}x + \frac{17}{4}$	$\checkmark m_{AK} = \frac{4}{3}$ $\checkmark m_{AB} = -\frac{3}{4}$ $\checkmark$ vervanging van punt (3;2) in vergelyking $\checkmark$ vergelyking (4) $\checkmark m_{AK} = \frac{4}{3}$ $\checkmark m_{AB} = -\frac{3}{4}$ $\checkmark$ vervanging van punt (3;2) in vergelyking $\checkmark$ vergelyking (4)
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6.6	Punt A is op PQ en AB. Dus $\frac{4}{3}x + \frac{4}{3} = -\frac{3}{4}x + \frac{17}{4}$ $16x + 16 = -9x + 51$ $25x = 35$ $x = \frac{7}{5}$ $y = -\frac{3}{4}\left(\frac{7}{5}\right) + \frac{17}{4}$ $y = \frac{16}{5}$ $A\left(\frac{7}{5}; \frac{16}{5}\right)$ OF Punt A is op PQ en die sirkel. Dus $(x-3)^2 + \left(\frac{4}{3}x + \frac{4}{3} - 2\right)^2 = 4$ $(x-3)^2 + \left(\frac{4}{3}x - \frac{2}{3}\right)^2 = 4$ $25x^2 - 70x + 49 = 0$ $(5x-7)^2 = 0$ $x = \frac{7}{5}$ $y = -\frac{3}{4}\left(\frac{7}{5}\right) + \frac{17}{4}$ $y = \frac{16}{5}$ OF	✓ vergelyking ✓ $25x = 35$ ✓ vervanging van x (3) ✓ vergelyking ✓ $(5x-7)^2 = 0$ (3) ✓ substitusie van x
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Punt A lê op die sirkel en op lyn AB $(x-3)^2 + (y-2)^2 = 4 \quad \text{----- (1)}$ $y = -\frac{3}{4}x + \frac{17}{4} \quad \text{----- (2)}$ Subs (2) in (1): $x^2 - 6x + 9 + \left(-\frac{3}{4}x + \frac{17}{4} - 2\right)^2 = 4$ $x^2 - 6x + 9 + \left(-\frac{3}{4}x + \frac{9}{4}\right)^2 = 4$ $25x^2 - 150x + 161 = 0$ $(5x - 23)(5x - 7) = 0$ $x = \frac{7}{5}$ $y = -\frac{3}{4}\left(\frac{7}{5}\right) + \frac{17}{4}$ $y = \frac{16}{5}$ OF Gebruik rotasie: Stel $\theta = \hat{AKN} = \hat{LKN}$ Skuif die diagram met 1 eenheid regs. Dan is L' geroteer deur 2θ die punt A'. $\tan \theta = \frac{AN}{KA} = \frac{2}{4} = \frac{1}{2}$ $\therefore \sin 2\theta = 2 \sin \theta \cos \theta = 2\left(\frac{1}{\sqrt{5}}\right)\left(\frac{2}{\sqrt{5}}\right) = \frac{4}{5}$ $\cos 2\theta = \cos^2 \theta - \sin^2 \theta = \left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2 = \frac{3}{5}$ $\therefore x_{A'} = x_{L'} \cos 2\theta - y_{L'} \sin 2\theta = 4\left(\frac{3}{5}\right) - (0)\left(\frac{4}{5}\right) = \frac{12}{5}$ $y_{A'} = x_{L'} \sin 2\theta + y_{L'} \cos 2\theta = 4\left(\frac{4}{5}\right) - (0)\left(\frac{3}{5}\right) = \frac{16}{5}$ $A'\left(\frac{12}{5}; \frac{16}{5}\right)$ Om terug te keer na A, skuif 1 eenheid links. $\therefore A\left(\frac{7}{5}; \frac{16}{5}\right)$ OF	✓ vergelyking ✓ $(5x - 23)(5x - 7) = 0$ ✓ vervanging van x (3) ✓ waardes van $\sin 2\theta$ en $\cos 2\theta$ ✓ vervanging in die rotasie-formules ✓ $A'\left(\frac{12}{5}; \frac{16}{5}\right)$ (3)
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Stel $\widehat{NKL} = \theta$. Dan sal $\tan \theta = \frac{NL}{KN} = \frac{2}{4} = \frac{1}{2}$.

Dus: $\sin \theta = \frac{1}{\sqrt{5}}$ en $\cos \theta = \frac{2}{\sqrt{5}}$

Laat $AM \perp x-as$ met M op $x-as$

$\triangle NAK \equiv \triangle NLK$

$\widehat{AKN} = \widehat{NKL} = \theta$

$\therefore \widehat{AKL} = 2\theta$

$y_A = AM = AK \sin 2\theta = KL \sin 2\theta = 4 \sin 2\theta$

$\sin 2\theta = 2 \sin \theta \cos \theta = 2 \left(\frac{1}{\sqrt{5}} \right) \left(\frac{2}{\sqrt{5}} \right) = \frac{4}{5}$

$y_A = 4 \left(\frac{4}{5} \right) = \frac{16}{5}$

$x_A = OL - NA \sin \widehat{MAN}$

$= 3 - 2 \sin(90^\circ - \widehat{MAK})$

$= 3 - 2 \sin 2\theta$

$= 3 - \frac{8}{5}$

$= \frac{7}{5}$

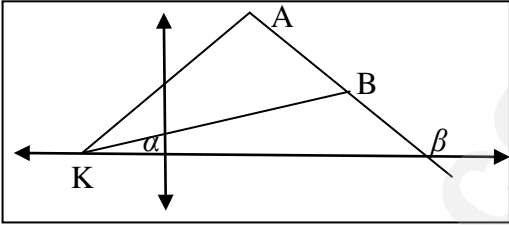
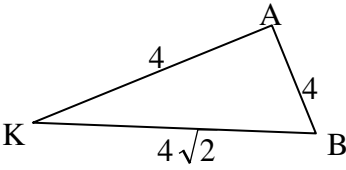
✓ $\tan \theta = \frac{1}{2}$

✓ $\sin 2\theta = \frac{4}{5}$

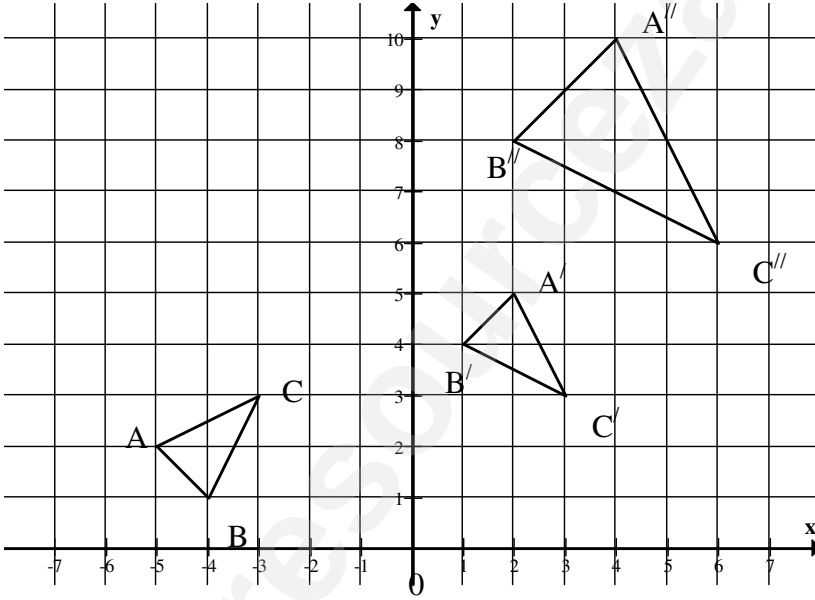
✓ los op vir x en y

(3)

6.7	$KA = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{\left(\frac{7}{5} + 1\right)^2 + \left(\frac{16}{5} - 0\right)^2}$ $= 4$ OF $KN = \sqrt{4^2 + 2^2} = \sqrt{20}$ $KA^2 = KN^2 - AN^2$ $= 20 - 4$ $= 16$ $KA = 4$ OF KA = KL Raaklyne van dieselfde punt af is gelyk KA = 4	✓ afstandformule ✓ vervanging ✓ 4 (3)
6.8	AN = NL Radii is gelyk KA = KL ∴ KLNA is a kite twee paar aangrensdende sye is gelyk.	✓ AN = NL ✓ KA = KL (2)
6.9	$AB = AN + NB = 2 + 2 = 4$ $AK = 4 = AB$ $\hat{KAB} = 90^\circ$ raaklyn $\perp$ radius ∴ $\triangle AKB$ is 'n reghoekige gelykbenige driehoek $\hat{AKB} + \hat{ABK} = 90^\circ$ $2\hat{ABK} = 90^\circ$ $\therefore \hat{ABK} = 45^\circ$ OF	✓ AB = 4 ✓ AK = AB ✓ $\hat{KAB} = 90^\circ$ (3)

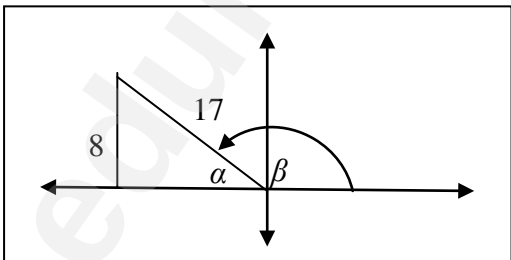
	N is die middelpunt van AB Veronderstel B is $(x_B; y_B)$ $\frac{x_B + \frac{7}{5}}{2} = 3 \qquad \frac{y_B + \frac{16}{5}}{2} = 2$ $\therefore x_B = \frac{23}{5} \qquad \therefore y_B = \frac{4}{5}$ $\therefore B\left(\frac{23}{5}; \frac{4}{5}\right)$ $\tan \beta = m_{AB} = -\frac{3}{4}$ $\beta = 180^\circ - 36,87^\circ$ $\beta = 143,13^\circ$  $\tan \alpha = m_{KB} = \frac{\frac{4}{5} - 0}{\frac{23}{5} + 1} = \frac{1}{7}$ $\alpha = 8,13^\circ$ $\hat{ABK} = \alpha + (180^\circ - \beta)$ $= 8,13^\circ + 36,87^\circ$ $= 45^\circ$ OF N is die middelpunt van AB Veronderstel B is $(x_B; y_B)$ $\frac{x_B + \frac{7}{5}}{2} = 3 \qquad \frac{y_B + \frac{16}{5}}{2} = 2$ $\therefore x_B = \frac{23}{5} \qquad \therefore y_B = \frac{4}{5}$ $\therefore B\left(\frac{23}{5}; \frac{4}{5}\right)$ $KB = \sqrt{\left(\frac{23}{5} + 1\right)^2 + \left(\frac{4}{5}\right)^2} = 4\sqrt{2}$ $4^2 = 4^2 + (\sqrt{32})^2 - 2(4)(\sqrt{32}) \cos \theta$ $\cos \theta = \frac{\sqrt{2}}{2}$ $\therefore \theta = 45^\circ$ 	✓ $143,13^\circ$ ✓ $8,13^\circ$ ✓ $\hat{ABK} = \alpha + (180^\circ - \beta)$ (3) ✓ $4\sqrt{2}$ ✓ vervanging in cos-formule ✓ $\cos \theta = \frac{\sqrt{2}}{2}$ (3)
6.10	$N'(3; -2)$	✓ $N'(3; -2)$ (1) [24]

VRAAG 7**NOTA:** CA nie van toepassing in hierdie VRAAG

7.1	Rotasie om oorsprong deur 90° in 'n kloksgewyse rigting. OF Rotasie om oorsprong deur 270° in 'n anti-kloksgewyse rigting. OF Rotasie om oorsprong deur -90°.	✓ rotasie van 90° ✓ kloksgewyse rigting (2) ✓ rotasie of 270° ✓ anti-kloksgewyse rigting (2) ✓✓ stelling (2)
7.2	$(x; y) \rightarrow (y; -x)$	✓ ✓ (beide) $(x; y) \rightarrow (y; -x)$ (2)
7.3		✓ een punt korrek ✓ alle punte korrek en driehoek geteken (2)
7.4	$(x; y) \rightarrow (2x; 2y)$	✓ $(2x; 2y)$ (1)
7.5.1	$A(-5; 2) \rightarrow (-5; -2) \rightarrow D(5; -2)$	✓ 5 ✓ -2 (2)
7.5.2	$(x; y) \rightarrow (x; -y) \rightarrow (-x; -y)$	✓ $(x; -y)$ ✓ $(-x; -y)$ (2)
7.5.3	Rotasie deur 180° om die oorsprong in beide rigtings. OF Refleksie in die oorsprong.	✓ rotasie ✓ 180° (2) ✓ refleksie ✓ oorsprong (2)

[13]

VRAAG 8**Geen sakrekenaar toegelaat in hierdie VRAAG**

8.1.1	$OT = k$, $PT = 8$ en $OP = 17$ $k^2 + 8^2 = 17^2$ $k^2 = 289 - 64$ $k^2 = 225$ $k = \pm 15$ $k > 0$ $k = 15$ OF $k^2 = 17^2 - 8^2$ $k^2 = (17 - 8)(17 + 8)$ $= 25 \times 9$ $= 225$ $k = \pm 15$ $k > 0$ $k = 15$	✓ vervanging in Pythagoras ✓ $k = 15$ (2) ✓ vervanging in Pythagoras ✓ $k = 15$ (2)
8.1.2	$\cos \alpha = \frac{15}{17}$	✓ $\frac{15}{17}$ (1)
8.1.3	$\alpha + \beta = 180^\circ$ $\beta = 180^\circ - \alpha$ $\therefore \cos \beta = \cos(180^\circ - \alpha)$ $= -\cos \alpha$ $= -\frac{15}{17}$ OF  $\therefore \cos \beta = \cos(180^\circ - \alpha)$ $= -\cos \alpha$ $= -\frac{15}{17}$	✓ $\cos(180^\circ - \alpha)$ or $-\cos \alpha$ ✓ $-\frac{15}{17}$ (2) ✓ $\cos(180^\circ - \alpha)$ or $-\cos \alpha$ ✓ $-\frac{15}{17}$ (2)

8.1.4	$\sin(\beta - \alpha)$ $= \sin \beta \cos \alpha - \cos \beta \sin \alpha$ $= \left(\frac{8}{17}\right)\left(\frac{15}{17}\right) - \left(-\frac{15}{17}\right)\left(\frac{8}{17}\right)$ $= \frac{120}{289} + \frac{120}{289}$ $= \frac{240}{289}$ OF $\beta - \alpha = (180^\circ - \alpha) - \alpha$ $= 180^\circ - 2\alpha$ $\sin(\beta - \alpha) = \sin(180^\circ - 2\alpha)$ $= \sin 2\alpha$ $= 2 \sin \alpha \cos \alpha$ $= 2 \left(\frac{8}{17}\right)\left(\frac{15}{17}\right)$ $= \frac{240}{289}$	✓ uitbreiding ✓ $\sin \beta = \frac{8}{17}$ ✓ $\sin \alpha = \frac{8}{17}$ ✓ $\frac{240}{289}$ (4) ✓ vervanging β ✓ $2 \sin \alpha \cos \alpha$ ✓ $\sin \alpha = \frac{8}{17}$ ✓ $\frac{240}{289}$ (4)
8.2.1	$LK = \frac{1 - \cos 2x - \sin x}{\sin 2x - \cos x}$ $= \frac{1 - (1 - 2 \sin^2 x) - \sin x}{2 \sin x \cos x - \cos x}$ $= \frac{2 \sin^2 x - \sin x}{2 \sin x \cos x - \cos x}$ $= \frac{\sin x(2 \sin x - 1)}{\cos x(2 \sin x - 1)}$ $= \frac{\sin x}{\cos x}$ $= \tan x$ $= RK$ OF	✓ $1 - 2 \sin^2 x$ ✓ $2 \sin x \cos x$ ✓ of $\sin x(2 \sin x - 1)$ of $\cos x(2 \sin x - 1)$ ✓ $\frac{\sin x}{\cos x}$ (4)

	$LK = \frac{1 - \cos 2x - \sin x}{\sin 2x - \cos x}$ $= \frac{1 - (2\cos^2 x - 1) - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{2 - 2\cos^2 x - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{2(1 - \cos^2 x) - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{2\sin^2 x - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{\sin x(2\sin x - 1)}{\cos x(2\sin x - 1)}$ $= \frac{\sin x}{\cos x}$ $= \tan x$ $= RK$ OF $LK = \frac{1 - \cos 2x - \sin x}{\sin 2x - \cos x}$ $= \frac{1 - (\cos^2 x - \sin^2 x) - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{1 - \cos^2 x + \sin^2 x - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{2\sin^2 x - \sin x}{2\sin x \cos x - \cos x}$ $= \frac{\sin x(2\sin x - 1)}{\cos x(2\sin x - 1)}$ $= \frac{\sin x}{\cos x}$ $= \tan x$ $= RK$	$\checkmark 2\cos^2 x - 1$ $\checkmark 2\sin x \cos x$ $\checkmark \sin x(2\sin x - 1)$ of $\cos x(2\sin x - 1)$ $\checkmark \frac{\sin x}{\cos x}$ (4) $\checkmark \cos^2 x - \sin^2 x$ $\checkmark 2\sin x \cos x$ $\checkmark \text{ of } \sin x(2\sin x - 1)$ of $\cos x(2\sin x - 1)$ $\checkmark \frac{\sin x}{\cos x}$ (4)
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8.2.2	$\sin 2x - \cos x = 0$ $2 \sin x \cos x - \cos x = 0$ $\cos x(2 \sin x - 1) = 0$ $\cos x = 0$ $x = 90^\circ + 360^\circ k \quad \text{of} \quad x = 270^\circ + 360^\circ k \quad k \in \mathbb{Z}$ of $\sin x = \frac{1}{2}$ $x = 30^\circ + 360^\circ k \quad \text{of} \quad x = 150^\circ + 360^\circ k$ $x = 90^\circ \text{ of } x = 270^\circ \text{ of } x = 30^\circ \text{ of } x = 150^\circ$ OF $\sin 2x = \cos x$ $\sin 2x = \sin(90^\circ - x)$ $2x = 90^\circ - x + 360^\circ k; k \in \mathbb{Z} \quad \text{of} \quad 2x = 180^\circ - (90^\circ - x) + 360^\circ k$ $3x = 90^\circ + 360^\circ k \quad 2x = 90^\circ + x + 360^\circ k$ $x = 30^\circ + 120^\circ k \quad x = 90^\circ + 360^\circ k$ $x = 30^\circ \text{ of } x = 150^\circ \text{ of } x = 270^\circ \text{ of } x = 90^\circ$	$\checkmark 2 \sin x \cos x$ $\checkmark \begin{cases} \cos x = 0 \\ \text{en} \\ \sin x = \frac{1}{2} \end{cases}$ $\checkmark \text{ vir twee korrekte antwoorde}$ $\checkmark \text{ vir vier korrekte antwoorde}$ (4) $\checkmark \sin(90^\circ - x)$ $\checkmark$ $x = 30^\circ + 120^\circ k$ en $x = 90^\circ + 360^\circ k$ $\checkmark \text{ vir twee korrekte antwoorde}$ $\checkmark \text{ vir vier korrekte antwoorde}$ (4) [17]
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VRAAG 9

9.1	$\frac{\sin^2 \theta}{\sin(180^\circ - \theta) \cdot \cos(90^\circ + \theta) + \tan 45^\circ}$ $= \frac{\sin^2 \theta}{(\sin \theta)(-\sin \theta) + 1}$ $= \frac{\sin^2 \theta}{-\sin^2 \theta + 1}$ $= \frac{\sin^2 \theta}{\cos^2 \theta}$ $= \tan^2 \theta$	$\checkmark \sin \theta$ $\checkmark -\sin \theta$ $\checkmark 1$ $\checkmark \cos^2 \theta$ $\checkmark \tan^2 \theta$ (5)
9.2	$\frac{\sin 104^\circ (2 \cos^2 15^\circ - 1)}{\tan 38^\circ \sin^2 412^\circ}$ $= \frac{\sin 76^\circ \cdot \cos 30^\circ}{\tan 38^\circ \cdot (\sin 52^\circ)^2}$ $= \frac{2 \sin 38^\circ \cos 38^\circ \left(\frac{\sqrt{3}}{2} \right)}{\left(\frac{\sin 38^\circ}{\cos 38^\circ} \right) (\cos 38^\circ)^2}$ $= \frac{\sqrt{3} \sin 38^\circ \cos 38^\circ}{\sin 38^\circ \cos 38^\circ}$ $= \sqrt{3}$ NOTA: • Indien $\cos 30^\circ$ nie getoon word nie: -1 • Slegs antwoord: 0/8 OF $\frac{\sin 104^\circ (2 \cos^2 15^\circ - 1)}{\tan 38^\circ \sin^2 412^\circ}$ $= \frac{\sin 2(52^\circ) \cdot (2 \cos^2 15^\circ - 1)}{\frac{\sin 38^\circ}{\cos 38^\circ} \cdot (\sin 52^\circ)^2}$ $= \frac{2 \sin 52^\circ \cos 52^\circ \cdot \cos 30^\circ}{\left(\frac{\cos 52^\circ}{\sin 52^\circ} \right) (\sin 52^\circ)^2}$ $= 2 \cos 30^\circ$ $= 2 \cdot \frac{\sqrt{3}}{2}$ $= \sqrt{3}$	$\checkmark \sin 76^\circ$ $\checkmark \cos 30^\circ$ $\checkmark \frac{\sin 38^\circ}{\cos 38^\circ}$ $\checkmark \sin 52^\circ$ $\checkmark 2 \sin 38^\circ \cos 38^\circ$ $\checkmark \frac{\sqrt{3}}{2}$ $\checkmark$ $\sin 52^\circ = \cos 38^\circ$ $\checkmark \sqrt{3}$ (8) $\checkmark \sin 2(52^\circ)$ $\checkmark \frac{\sin 38^\circ}{\cos 38^\circ}$ $\checkmark \sin 52^\circ$ $\checkmark 2 \sin 52^\circ \cos 52^\circ$ $\checkmark \cos 30^\circ$ $\checkmark$ $\cos 52^\circ = \sin 38^\circ$ en $\sin 52^\circ = \cos 38^\circ$ $\checkmark \frac{\sqrt{3}}{2}$ $\checkmark \sqrt{3}$ (8)

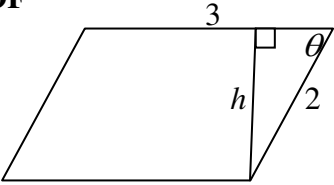
OF $\frac{\sin 104^\circ (2 \cos^2 15^\circ - 1)}{\tan 38^\circ \sin^2 412^\circ}$ $= \frac{\cos 14^\circ \cdot \cos 30^\circ}{\left(\frac{\sin 38^\circ}{\cos 38^\circ}\right) (\sin 52^\circ)^2}$ $= \frac{\cos 14^\circ \left(\frac{\sqrt{3}}{2}\right)}{\left(\frac{\sin 38^\circ}{\cos 38^\circ}\right) (\cos^2 38^\circ)}$ $= \frac{\sqrt{3} \cos 14^\circ}{2 \sin 38^\circ \cos 38^\circ}$ $= \frac{\sqrt{3} \cos 14^\circ}{\sin 76^\circ}$ $= \frac{\sqrt{3} \cos 14^\circ}{\cos 14^\circ}$ $= \sqrt{3}$	$\checkmark \cos 30^\circ$ $\checkmark \frac{\sin 38^\circ}{\cos 38^\circ}$ $\checkmark \sin 52^\circ$ $\checkmark \cos 38^\circ$ $\checkmark \frac{\sqrt{3}}{2}$ $\checkmark \checkmark \sin 76^\circ$ $\checkmark \sqrt{3}$	(8)
OF $\frac{\sin 104^\circ (2 \cos^2 15^\circ - 1)}{\tan 38^\circ \sin^2 412^\circ}$ $= \frac{\sin 104^\circ \cdot \cos 30^\circ}{\frac{\sin 38^\circ}{\cos 38^\circ} \cdot (\sin 52^\circ)^2}$ $= \frac{\sin 104^\circ \cdot \frac{\sqrt{3}}{2}}{\left(\frac{\cos 52^\circ}{\sin 52^\circ}\right) (\sin 52^\circ)^2}$ $= \frac{\sin 104^\circ \cdot \frac{\sqrt{3}}{2}}{\cos 52^\circ (\sin 52^\circ)}$ $= \frac{\sin 104^\circ \cdot \frac{\sqrt{3}}{2}}{\frac{1}{2} \sin 104^\circ}$ $= \sqrt{3}$	$\checkmark \cos 30^\circ$ $\checkmark \frac{\sin 38^\circ}{\cos 38^\circ}$ $\checkmark \sin 52^\circ$ $\checkmark \frac{\sqrt{3}}{2}$ $\checkmark$ $\cos 52^\circ = \sin 38^\circ$ en $\sin 52^\circ = \cos 38^\circ$ $\checkmark$ $\cos 52^\circ \cdot \sin 52^\circ$ $\checkmark \frac{1}{2} \sin 104^\circ$ $\checkmark \sqrt{3}$	(8)

[13]

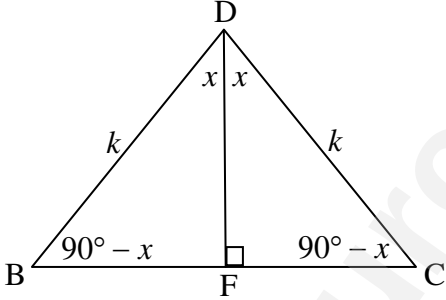
VRAAG 10

10.1	$f(0) - g(0) = 0,5 - (-2) = 2,5$	✓ 2,5 (1)
10.2	$\sin(x + 30^\circ) = -2 \cos x$ $\sin x \cdot \cos 30^\circ + \cos x \cdot \sin 30^\circ = -2 \cos x$ $\left(\frac{\sqrt{3}}{2}\right) \sin x + \left(\frac{1}{2}\right) \cos x = -2 \cos x$ $\sqrt{3} \sin x + \cos x = -4 \cos x$ $\sqrt{3} \sin x = -5 \cos x$ $\tan x = -\frac{5}{\sqrt{3}}$ $x = 109,11^\circ + 180^\circ \cdot k ; k \in \mathbb{Z}$ $x_p = -70,89^\circ$ en $x_q = 109,11^\circ$ OF $\sin(x + 30^\circ) = -2 \cos x$ $\cos(90^\circ - x - 30^\circ) = -2 \cos x$ $\cos(60^\circ - x) = -2 \cos x$ $\cos 60^\circ \cos x + \sin 60^\circ \sin x = -2 \cos x$ $\frac{1}{2} \cos x + \frac{\sqrt{3}}{2} \sin x = -2 \cos x$ $\cos x + \sqrt{3} \sin x = -4 \cos x$ $\sqrt{3} \sin x = -5 \cos x$ $\tan x = -\frac{5}{\sqrt{3}}$ $x = 109,11^\circ + 180^\circ \cdot k ; k \in \mathbb{Z}$ $x_p = -70,89^\circ$ and $x_q = 109,11^\circ$	✓ vergelyking ✓ uitbreiding $\sin(x + 30^\circ)$ ✓ vervanging van spesiale hoeke ✓ vereenvoudiging ✓ $\tan x = -\frac{5}{\sqrt{3}}$ ✓ $x_p = -70,89^\circ$ ✓ $x_q = 109,11^\circ$ (7) ✓ vergelyking ✓ uitbreiding van $\cos(60^\circ - x)$ ✓ vervanging van spesiale hoeke ✓ vereenvoudiging ✓ $\tan x = -\frac{5}{\sqrt{3}}$ ✓ $x_p = -70,89^\circ$ ✓ $x_q = 109,11^\circ$ (7)
10.3	$-70,89^\circ \leq x \leq 109,11^\circ$ OF $[-70,89^\circ ; 109,11^\circ]$ OF $x_p \leq x \leq x_q$	✓ hoeke ✓ korrekte interval (2)
10.4	$h(x) = 2 \sin(x + 60^\circ + 30^\circ) = 2 \sin(x + 90^\circ) = 2 \cos x$ h is die refleksie van g in die x -as. OF f word na links geskuif deur 60° en dan verdubbel. $\therefore h$ is die refleksie van g in die x -as.	✓✓ refleksie in die x -as of lyn $y = 0$ (2) ✓✓ refleksie in die x -as of lyn y $= 0$ (2) [12]

VRAAG 11

11.1	Area parallelogram ABCD = $2 \times \text{Area } \triangle ABC$ $= 2 \left[\left(\frac{1}{2} \right) (3)(2) \sin \theta \right]$ $= 6 \sin \theta$ OF  $\frac{h}{2} = \sin \theta$ $h = 2 \sin \theta$ $\therefore \text{Area } ABCD = b.h = 3.2 \sin \theta = 6 \sin \theta$ OF Area van parallelogram ABCD = area of $\triangle ABC$ + area of $\triangle ADC$ $= \left(\frac{1}{2} \right) (3)(2) \sin \theta + \left(\frac{1}{2} \right) (3)(2) \sin \theta$ $= 6 \sin \theta$ OF Area = $\frac{1}{2} (\text{sum of // sides}) \times h$ $= \frac{1}{2} (3 + 3) \times 2 \sin \theta$ $= 6 \sin \theta$	✓✓ 2area $\triangle ABC$ ✓ vervanging in area reel (3) ✓ $\frac{h}{2} = \sin \theta$ ✓ $h = 2 \sin \theta$ ✓ $b.h$ (3) ✓ som van areas ✓✓ gelyke sye en gelyke hoeke (3) ✓ formule ✓ $h = 2 \sin \theta$ ✓ vervanging (3)
11.2	Area van parallelogram ABCD = $3\sqrt{3}$ $6 \sin \theta = 3\sqrt{3}$ $\sin \theta = \frac{\sqrt{3}}{2}$ $\theta = 60^\circ$ OF $6 \sin 60^\circ = 3\sqrt{3}$ $\therefore \theta = 60^\circ$	✓ $6 \sin \theta = 3\sqrt{3}$ ✓ $\sin \theta = \frac{\sqrt{3}}{2}$ ✓ 60° (3) ✓✓ $6 \sin \theta = 3\sqrt{3}$ ✓ 60° (3)
11.3	Maksimum area van parallelogram verkry as $\sin \theta = 1$, dit is waar $\theta = 90^\circ$	✓ $\sin \theta = 1$ ✓ $\theta = 90^\circ$ (2) [8]

VRAAG 12

12.1	$\frac{CB}{\sin D} = \frac{CD}{\sin B}$ $\frac{CB}{\sin 2x} = \frac{k}{\sin(90^\circ - x)}$ $CB = \frac{k \cdot \sin 2x}{\sin(90^\circ - x)}$ $CB = \frac{k \cdot 2 \sin x \cos x}{\cos x}$ $= 2k \sin x$ OF $\hat{DCB} = 180^\circ - (90^\circ - x + 2x) = 90^\circ - x$ $\therefore DC = DB = k$  Trek $DF \perp BC$ $\frac{CF}{CD} = \sin x$ $CF = k \sin x$ $CB = 2CF$ $CB = 2k \sin x$ OF $\hat{DCB} = 180^\circ - (90^\circ - x + 2x) = 90^\circ - x$ $\therefore DC = DB = k$ $CB^2 = CD^2 + BD^2 - 2 \cdot CD \cdot BD \cdot \cos 2x$ $CB^2 = k^2 + k^2 - 2k^2 \cos 2x$ $= 2k^2(1 - \cos 2x)$ $= 2k^2(1 - (1 - 2\sin^2 x))$ $= 2k^2(2\sin^2 x)$ $= 4k^2 \sin^2 x$ $= (2k \sin x)^2$ $CB = 2k \sin x$	✓ Gebruik die sin reel in driehoek CBD ✓ $\frac{CB}{\sin 2x} = \frac{k}{\sin(90^\circ - x)}$ ✓ $\frac{k \cdot \sin 2x}{\sin(90^\circ - x)}$ ✓ $2 \sin x \cdot \cos x$ ✓ $\cos x$ (5) ✓ $\hat{DCB} = \hat{DBC} = 90^\circ - x$ ✓ $DC = DB = k$ ✓ $\hat{CDF} = x$ ✓ $CF = k \sin x$ ✓ $CB = 2 CF$ (5) ✓ $\hat{DCB} = \hat{DBC} = 90^\circ - x$ ✓ $DC = DB = k$ ✓ gebruik cos reel in driehoek CDB ✓ faktore ✓ vereenvoudiging (5)
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12.2	$\cos x = \frac{BC}{HC}$ $HC = \frac{BC}{\cos x}$ $= \frac{2k \sin x}{\cos x}$ $= 2k \tan x$ OF $\frac{HC}{\sin 90^\circ} = \frac{BC}{\sin(90^\circ - x)}$ $HC = \frac{BC}{\sin(90^\circ - x)}$ $= \frac{2k \sin x}{\cos x}$ $= 2k \tan x$	$\checkmark \cos x = \frac{BC}{HC}$ $\checkmark HC = \frac{BC}{\cos x}$ $\checkmark \text{vervanging van BC}$ (3) $\checkmark HC = \frac{BC}{\sin(90^\circ - x)}$ $\checkmark \text{vervanging van BC}$ $\checkmark \sin(90^\circ - x) = \cos x$ (3)
12.3	$HC = 2k \tan x = 2(40) \cdot \tan(23^\circ) = 33,9579\dots$ In $\triangle HCD$: $CD^2 = HC^2 + HD^2 - 2HC \cdot HD \cdot \cos \theta$ $\cos \theta = \frac{HC^2 + HD^2 - CD^2}{2HC \cdot HD}$ $= \frac{(33,9579\dots)^2 + 31,8^2 - 40^2}{2(33,9579\dots)(31,8)}$ $\cos \theta = 0,2613\dots$ $\therefore \theta = 74,85^\circ$	$\checkmark \text{waarde van HC}$ $\checkmark \text{vervanging in cos formule}$ $\checkmark \cos \theta = 0,2613\dots$ $\checkmark 74,85^\circ$ (4) $[12]$

VRAAG 13

13.1

Hoek waardeur minuut wyser beweeg is:

$$\frac{37}{60} \times 360^\circ$$

$$= 222^\circ$$

P is geroteer deur 138° in 'n **anti-kloksgewyse** rigting:

$$a = 2 \cos 138^\circ - 4 \sin 138^\circ \quad b = 4 \cos 138^\circ + 2 \sin 138^\circ$$

$$= -4,16 \quad \text{en} \quad = -1,63$$

OF

Hoek waardeur minuut wyser beweeg is:

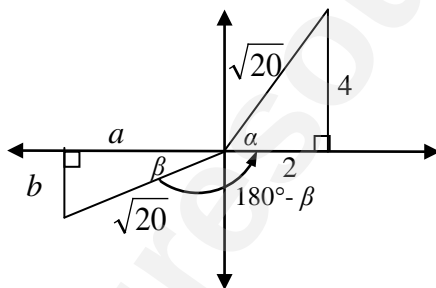
$$\frac{37}{60} \times 360^\circ$$

$$= 222^\circ$$

P is geroteer deur 222° in 'n **kloksgewyse** rigting:

$$a = 2 \cos 222^\circ + 4 \sin 222^\circ \quad b = 4 \cos 222^\circ - 2 \sin 222^\circ$$

$$= -4,16 \quad \text{en} \quad = -1,63$$

OF

$$\tan \alpha = 2$$

$$\alpha = 63,43^\circ$$

$$\alpha + 180^\circ - \beta = 222^\circ$$

$$\beta = 63,43^\circ + 180^\circ - 222^\circ$$

$$= 21,43^\circ$$

$$\therefore a = -\sqrt{20} \cos 21,43^\circ = -4,16$$

$$b = -\sqrt{20} \sin 21,43^\circ = -1,63$$

$$\checkmark \checkmark \frac{37}{60} \times 360^\circ$$

$$\checkmark 222^\circ$$

✓ vervanging van 138°
in formule vir x en y

$$\checkmark -4,16$$

$$\checkmark -1,63$$

(6)

$$\checkmark \checkmark \frac{37}{60} \times 360^\circ$$

$$\checkmark 222^\circ$$

✓ vervanging van
 222° in formule vir x
en y

$$\checkmark -4,16$$

$$\checkmark -1,63$$

(6)

$$\checkmark \tan \alpha = 2$$

$$\checkmark \alpha = 63,43^\circ$$

$$\checkmark \alpha + 180^\circ - \beta = 222^\circ$$

$$\checkmark \beta = 21,43^\circ$$

$$\checkmark -4,16$$

$$\checkmark -1,63$$

(6)

13.2	Die minuut-wyser beweeg deur 360° in 60 minute. Die uur-wyser beweeg deur 30° in 60 minute, dus $\frac{1}{12}$ van die minuut-wyser. Daarom as die minuut-wyser deur 222° beweeg, beweeg die uur-wyser deur $\frac{222^\circ}{12} = 18,5^\circ$ OF Uur-wyser beweeg deur $\frac{360^\circ}{12} = 30^\circ$ grade in 60 minute. $\therefore$ 37 minute: $\frac{37}{60} \times 30^\circ = 18,5^\circ$	✓ 360° ✓ 30° ✓ $\frac{1}{12}$ ✓ $18,5^\circ$ (4) ✓ 360° ✓ 30° ✓ $\frac{37}{60} \times 30^\circ$ ✓ $18,5^\circ$ (4) [10]
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TOTAAL : 150