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# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NASIONALE  
SENIOR SERTIFIKAAT**

**GRAAD 12**

**TEGNIESE WISKUNDE V2**

**NASIENRIGLYNE**

**MODEL 2018**

**PUNTE: 150**

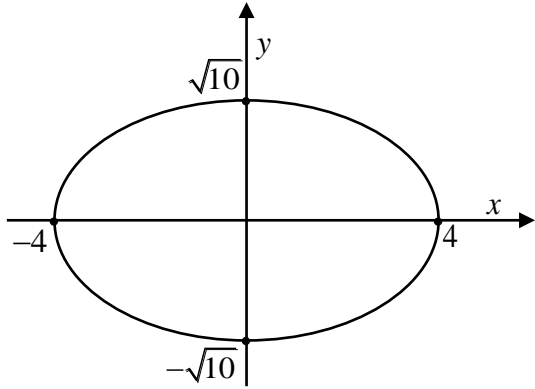
**Hierdie nasienriglyne bestaan uit 14 bladsye.**

**VRAAG 1**

1.1	$AD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(5-1)^2 + (-2-4)^2}$ $= \sqrt{52}$ $= 2\sqrt{13}$	✓Vervanging in die korrekte formule ✓Vereenvoudiging ✓ $2\sqrt{13}$ eenvoudige wortelvorm (3)
1.2	$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$ $M\left(\frac{1+5}{2}; \frac{4-2}{2}\right)$ $M(3; 1)$	✓Vervanging ✓M(3; 1) (2)
1.3	$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{1-4}{-3-1}$ $= \frac{3}{4}$ <p>AB    MC</p> $m_{MC} = \frac{3}{4}$ $y - y_1 = m(x - x_1) \quad \text{or} \quad y = mx + c$ $y - 1 = \frac{3}{4}(x - 3)$ $-3x + 4y + 5 = 0$ <p style="text-align: center;">or <math>3x + -4y - 5 = 0</math></p> $1 = \frac{3}{4}(3) + c$ $c = \frac{4-9}{4} = -\frac{5}{4}$ $y = \frac{3}{4}x - \frac{5}{4}$ $-3x + 4y + 5 = 0$	✓Vervanging in die korrekte formule ✓Gradiënt of MC ✓Vervanging in die korrekte formule ✓Vereenvoudiging ✓Antwoord in die korrekte vorm (5)
1.4	$\tan \alpha = \frac{3}{4}$ $\alpha \approx 36,87^\circ$	✓ $\tan \alpha = \frac{3}{4}$ ✓ $36,87^\circ$ (2)

1.5	$m_{AD} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-2 - 4}{5 - 1}$ $= \frac{-3}{2}$ $\tan \beta = \frac{-3}{2}$ $\beta \approx 123,69^\circ$ $\hat{B}AD = 123,69^\circ - 36,87^\circ \quad \text{ext } \angle \text{ of } \Delta$ $= 86,82^\circ$	$\checkmark \frac{-3}{2}$ $\checkmark \beta = 123,69^\circ$ $\checkmark 123,69^\circ - 36,87^\circ$ $\checkmark 86,82^\circ$ <p style="text-align: right;">(4)</p>
		<b>[16]</b>

**VRAAG 2**

2.1.1	$x^2 + y^2 = r^2$ $r^2 = (10)^2 + (-4)^2$ $\therefore r = \sqrt{116} = 2\sqrt{29}$	✓ Vervanging $\checkmark \sqrt{116} = 2\sqrt{29}$ (2)
2.1.2	$m_{OH} = m_{OF} = \frac{0 - (-4)}{0 - 10}$ $= -\frac{4}{10}$ $= -\frac{2}{5}$	✓ Vervanging $\checkmark -\frac{2}{5}$ (2)
2.1.3	$m_{GH} = \frac{5}{2} \quad (m_{GH} \times m_{OH} = -1)$ <p>Met simetrie H(-10;4)</p> $y - y_1 = m(x - x_1) \quad \text{or} \quad y = mx + c$ $y - 4 = \frac{5}{2}(x + 10) \quad 4 = \frac{5}{2}(-10) + c$ $y = \frac{5}{2}x + 29 \quad c = 29$ $y = \frac{5}{2}x + 29$	✓ $m_{GH}$ ✓ H(-10;4) ✓ Vervanging van H ✓ Vergelyking (4)
2.2		✓ Beide x-afsnitte ✓ Beide y-afsnitte ✓ Vorm (3)
		<b>[11]</b>

**VRAAG 3**

3.1.1	$OP^2 = (12)^2 + (-5)^2$ $\therefore OP = 13 \text{ eenhede}$	$\checkmark OP = 13 \text{ units}$ (1)
3.1.2	$5 \cot \theta - 13 \cos \theta$ $= 5 \left( \frac{12}{-5} \right) - 13 \left( \frac{12}{13} \right)$ $= -24$	$\checkmark \frac{12}{-5} \checkmark \frac{12}{13}$ $\checkmark$ Vereenvoudiging (3)
3.1.3	$\operatorname{cosec}^2 x - 1 \text{ of } \operatorname{cosec}^2 x - 1 = \cot^2 x$ $= \left( \frac{13}{-5} \right)^2 - 1 = \left( \frac{12}{-5} \right)^2$ $= \frac{144}{25} = \frac{144}{25}$	$\checkmark \left( \frac{13}{-5} \right)^2 \text{ of } \left( \frac{12}{-5} \right)^2$ $\checkmark$ Vereenvoudiging (2)
3.2	$\sec(a-b)$ $= \sec(2,659 - 1,112)$ $= \sec 1,547$ $= \frac{1}{\cos 1,547}$ $\approx 42,03$	$\checkmark$ Vervanging $\checkmark$ Resiprook $\checkmark$ Vereenvoudiging met radiale (3)
		<b>[9]</b>

**VRAAG 4**

4.1	$\frac{\sin(360^\circ - x) \cdot \cos(180^\circ - x) \cdot \tan 120^\circ}{\cos^2 x \cdot \sin \frac{5\pi}{6}}$ $= \frac{(-\sin x) \cdot (-\cos x) \cdot (-\tan 60^\circ)}{\cos^2 x \cdot \sin \frac{\pi}{6}}$ $= \frac{-\sin x \cdot \cos x \cdot -\sqrt{3}}{\cos^2 x \cdot \frac{1}{2}}$ $= \frac{2\sqrt{3} \sin x}{\cos x}$ $= 2\sqrt{3} \tan x$	$\checkmark -\sin x$ $\checkmark -\cos x$ $\checkmark -\tan 60^\circ$  $\checkmark \sin \frac{\pi}{6}$  $\checkmark -\sqrt{3} \text{ and } \frac{1}{2}$  $\checkmark \text{ Vereenvoudiging}$  $\checkmark \tan x$
4.2	$\cos^2 3x$	$\checkmark \cos^2 3x$
4.3	$LK = \frac{\sin x}{\cos x} (\sin x)$ $= \frac{\sin^2 x}{\cos x}$ $RK = \sec x - \cos x$ $= \frac{1}{\cos x} - \cos x$ $= \frac{1 - \cos^2 x}{\cos x}$ $= \frac{\sin^2 x}{\cos x}$ $= LK$	$\checkmark \frac{\sin x}{\cos x}$  $\checkmark \frac{1}{\cos x}$ $\checkmark \frac{1 - \cos^2 x}{\cos x}$ $\checkmark \sin^2 x$
4.4	$\operatorname{cosec} 2x = 2,114$ $\sin 2x = \frac{1}{2,114}$ $2x = \sin^{-1}\left(\frac{1}{2,114}\right)$ $2x = \sin^{-1}\left(\frac{1}{2,114}\right)$ $2x \approx 28,23^\circ \text{ of } 2x \approx 180^\circ - 28,23^\circ$ $x \approx 14,12^\circ \text{ of } x \approx 75,89^\circ$	$\checkmark \text{ Gebruik van resiprook}$  $\checkmark \text{ Inverse}$  $\checkmark \text{ Waarde van } x$ $\checkmark \text{ Ander waarde van } x$
		<b>[16]</b>

## VRAAG 5

5.1	$\sin 55^\circ = \frac{50}{AC}$ $AC = \frac{50}{\sin 55^\circ}$ $\approx 61 \text{ m}$	✓Definisie ✓AC onderwerp ✓61 m (3)
5.2	$AD \approx 61 \text{ m}$ $DC^2 = AC^2 + AD^2 - 2AC \cdot AD \cos 65^\circ$ $DC^2 = (61)^2 + (61)^2 - 2(61)(61) \cos 65^\circ$ $DC \approx 66 \text{ m}$	✓AD $\approx$ 61 m ✓Gebruik van kosinus-reël ✓Vervanging ✓66 m (4)
5.3	$BD = \sqrt{AD^2 - AB^2} \quad \tan 55^\circ = \frac{50}{BD}$ $= \sqrt{(61)^2 - (50)^2} \quad \text{OF} \quad BD = \frac{50}{\tan 55^\circ}$ $\approx 35 \text{ m} \quad \quad \quad = 35 \text{ m}$ $\therefore \text{oppervlakte van } \triangle BDC = \frac{1}{2}(35,01)(66) \sin \hat{BDC} = 563$ $\sin \hat{BDC} = \frac{563}{\frac{1}{2}(35,01)(66)}$ $\therefore \hat{BDC} = \sin^{-1} \left( \frac{563}{\frac{1}{2}(35,01)(66)} \right)$ $= 29,16^\circ$	✓Gebruik die stelling van Pythagoras of tan ✓BD = 35 m ✓Vervanging in die oppervlakte-formule ✓Area = 563 $\checkmark \sin \hat{BDC} = \frac{563}{\frac{1}{2}(35)(66)}$ ✓Vereenvoudiging (6)
		<b>[13]</b>



## VRAAG 6

6.1		$f(x)$ ✓ $x$ -afsnitte ✓ $y$ -afsnit ✓ Vorm  $g(x)$ ✓ $y$ -afsnit ✓ Draaipunte ✓ Vorm  (6)
6.2	2	$\sqrt{2}$  (1)
6.3	$360^\circ$	$\sqrt{360^\circ}$  (1)
6.4	$60^\circ < x < 240^\circ$	$\checkmark\checkmark$ Antwoord met korrekte notasie  (2)
		<b>[10]</b>

**VRAAG 7**

7.1	Die hoek in die teenoorstaande segment	✓ Korrekte bewering (1)
7.2.1	$\hat{R}_2 = \hat{S}_1 = 38^\circ$ tan – koord stelling	✓ Bewering ✓ rede (2)
7.2.2	$\hat{M}_1 = 2\hat{R}_2 = 76^\circ$ middelpunts $\angle = 2 \times$ omtreks $\angle$	✓ bewering ✓ Rede (2)
7.2.3.	$\hat{S}_2 = 90^\circ - 38^\circ = 52^\circ$ raaklyn $\perp$ radius	✓ Bewering ✓ Rede (2)
7.2.4	$\hat{R}_1 = 90^\circ$ $\angle$ in 'n semi – sirkel $\hat{Q}_1 = \hat{S}_1 = 38^\circ$ tan - koord stelling $\therefore \hat{Q}_2 = 180^\circ - (17^\circ + 90^\circ + 38^\circ)$ som van $\angle$ 'e van 'n $\Delta$ $= 35^\circ$	✓ Bewering ✓ Rede ✓ Rede ✓ Bewering ✓ Bewering (5)
7.2.5	$\hat{R}_2 = 38^\circ$ en $\hat{P}_1 = 17^\circ$ $\therefore \hat{R}_2 \neq \hat{P}_1$ (verwisselende hoeke is nie gelyk nie)	✓ Verwisselende hoeke is nie gelyk nie of $\hat{R}_2 \neq \hat{P}_1$ of $\hat{R}_2 = 38^\circ$ en $\hat{P}_1 = 17^\circ$ (1)
		<b>[13]</b>

**VRAAG 8**

8.1	Verdeel die ander twee sye eweredig	✓ Antwoord (1)
8.2.1	$\frac{x}{8} = \frac{4}{10}$ $10x = 32$ $x = 3,2$	✓ Prop. ✓ Vereenvoudiging ✓ Waarde van $x$ (3)
8.2.2	RTSP is 'n parallelogram (beide pare teenoorstaande sye van 'n vierhoek is ewewydig)	✓ Bewering ✓ Rede (2)
8.2.3	$\frac{y}{9} = \frac{3,2}{8}$ Ewe. stelling ; TS  MP  $y = 3,6$	✓ Bewering ✓ Rede  ✓ Waarde van $y$ (3)
8.2.4	$\frac{MR}{TS} = \frac{10}{4} = 2,5$  $\frac{RT}{SN} = \frac{9}{3,6} = 2,5$  $\frac{MT}{TN} = \frac{8}{3,2} = 2,5$ $\Delta MRT \parallel \Delta TSN$ sye van diedriehoek is eweredig	✓ Verhouding  ✓ Verhouding  ✓ Verhouding ✓ Rede (4)
		<b>[13]</b>

## VRAAG 9

9.1	$\hat{K}_1 = \hat{LHF}$ buite $\angle$ van koordevierhoek $= \hat{GFK}$ ooreenkomstige hoeke $LK \parallel GF$	✓ Bewering ✓ Rede ✓ Bewering/Rede (3)
9.2	$\hat{MFG} = \hat{K}_1 = 104^\circ$ <i>corres <math>\angle</math>s; <math>FG \perp KL</math></i> $\hat{G} + 104^\circ + 20^\circ = 180^\circ$ <i>angles of <math>\Delta</math></i> $\hat{G} = 56^\circ$ $\hat{MFG} = \hat{K}_1 = 104^\circ$ <i>corres. <math>\angle</math>s; <math>FG \parallel KL</math></i> $\hat{G} + 104^\circ + 20^\circ = 180^\circ$ <i>angles of <math>\Delta</math></i> $\hat{G} = 56^\circ$ <b>OF</b> $\hat{MLK} + 104^\circ + 20^\circ = 180^\circ$ <i>angles of <math>\Delta</math> <math>\angle</math>s; <math>FG \parallel KL</math></i> $\hat{MLK} = 56^\circ$ $\hat{MLK} = \hat{G}$ <i>corresp <math>\angle</math>s; <math>FG \parallel KL</math></i> $\hat{G} = 56^\circ$	✓ Bewering ✓ Bewering ✓ Rede  ✓ Bewering ✓ Bewering ✓ Rede (3)
9.3.1	$\frac{10}{30} = \frac{12}{MG}$ (Ewer. Stelling; $KL \parallel FG$ ) $MG = \frac{360}{10} = 36$ eenhede	✓ Bewering ✓ Rede ✓ 36 eenhede (3)
9.3.2	$\hat{MHF} = \hat{GFK} = 104^\circ$ reeds bewys in vraag 9.1. $\hat{M}$ is gemeen $\hat{G} = \hat{F}_2$ som van hoeke van 'n $\Delta$ $\Delta MFG \parallel \Delta MFG$ $\angle; \angle; \angle$	✓ Bewering ✓ Bewering en rede ✓ Rede (3)
9.3.3	$\Delta MFH \parallel \Delta MGF \parallel \Delta MLK$	✓ $\Delta MLK$ (1)
		[13]

**VRAAG 10**

10.1	$x^2 - 4dh + 4h^2 = 0$ $x^2 - (4 \times 220 \text{ mm} \times 60 \text{ mm}) + 4(60 \text{ mm})^2 = 0$ $x^2 = \sqrt{67200 \text{ mm}^2}$ $\therefore x = 259,23 \text{ mm}$	✓ Formule ✓ Vervanging  ✓ Vereenvoudiging ✓ Lengte (4)
10.2.1	$v = \pi Dn$ $= \pi(18 \text{ m})\left(\frac{225}{60 \text{ s}}\right)$ $\approx 212,06 \text{ m/s}$	✓ Korrekte formule ✓ Korrekte middellyn  ✓ Vervanging  ✓ 212,06 m/s (4)
10.2.2	$\omega = 2\pi n$ $= 2\pi\left(\frac{225}{60 \text{ s}}\right)$ $\approx 23,56 \text{ rad/s}$	✓ korrekte formule  ✓ vervanging ✓ 23,56 rad/s (3)
10.3.1	$\hat{LBA} = 180^\circ - 70^\circ = 110^\circ$ ko-binne hoeke; AK // BL	✓ Bewering ✓ Rede (2)
10.3.2	$\hat{KAD} = 360^\circ - 140^\circ = 220^\circ$ $\approx 3,84 \text{ rad}$ $s_1 = r\theta = 50(3,84)$ $\approx 192 \text{ cm}$ $s_2 = 48,8 \text{ cm}$ $\text{Lengte van band} = 110 + 192 + 110 + 48,80$ $= 460,80 \text{ cm}$	✓ Grootte van $\hat{KAD}$ ✓ Herlei na radiale ✓ Korrekte vervanging in formule ✓ Booglengte $s_1$  ✓ Lengte van DE = 110  ✓ Lengte van band (6)
		<b>[19]</b>

**VRAAG 11**

11.1.1	<p>Volume of pyramid</p> $= \frac{1}{3}(\text{area of base})(\text{height})$ $= \frac{1}{3}(4m \times 4m)(1,1m)$ $= 5,87m^3$ <p>Volume of Cube</p> $= (l)(b)(h)$ $= (4m)(4m)(4m)$ $= 64m^3$ <p>Total Volume = <math>5,87 m^3 + 64 m^3</math></p> $\approx 69,87m^3$	<p>✓ Vervanging in die korrekte formule</p> <p>✓ Hoogte</p> <p>✓ <math>5,87m^3</math></p> <p>✓ Vervanging in die korrekte formule</p> <p>✓ <math>64m^3</math></p> <p>✓ <math>69,87m^3</math></p> <p>(6)</p>
11.1.2	<p>totale buiteoppervlakte</p> <p>= buite oppervlakte van die kubus se basis + buite oppervlakte van piramied</p> $= 4 (sy \times sy) + 4 \left( \frac{1}{2} \times \text{basis} \times \text{skuins hoogte} \right)$ $= 4(4m \times 4m) + 4 \left( \frac{1}{2} \times 4m \times \sqrt{1,1 + 2^2} m \right)$ $= 64m^2 + 4(2m \times \sqrt{5,1} m)$ $= 82,07m^2$	<p>✓ Skuins hoogte</p> <p>✓ Korrekte vervanging in die oppervlakte van 'n kubus</p> <p>✓ Korrekte vervanging in die oppervlakte van 'n piramide</p> <p>✓ Vereenvoudiging</p> <p>✓ Totale oppervlakte</p> <p>(5)</p>
11.1.3	<p>Koste van verf = <math>82,07 \times R30,50</math></p> $= R2\ 503,14$	<p>✓ <math>82,07 \times R30,50</math></p> <p>✓ R2 503,14</p> <p>(2)</p>

11.2	$A_T = a \left( \frac{o_1 + o_n}{2} + o_2 + o_2 + o_3 + \dots + o_{n-1} \right)$ $= 4 \left( \frac{6,2 + 2}{2} + y + 5,1 + 4,9 \right)$ $= 4(14,1 + y)$ $= 56,4 + 4y$ $\therefore 72 = 56,4 + 4y$ $\Rightarrow y = \frac{15,6}{4}$ $= 3,9m$ <p><b>OF</b></p> $A_T = a(m_1 + m_2 + m_3 + \dots + m_n)$ $72 = 4 \left( \frac{6,2 + y}{2} + \frac{y + 5,1}{2} + \frac{5,1 + 4,9}{2} + \frac{4,9 + 2}{2} \right)$ $18 = \frac{11,3 + 2y}{2} + 8,45$ $9,55 = \frac{11,3 + 2y}{2}$ $19,1 = 11,3 + 2y$ $\therefore y = 3,9m$	✓Formule  ✓Vervanging  ✓vereenvoudiging  ✓ 3,9m  OF ✓Formule  ✓Vervanging  ✓Vereenvoudiging  ✓ 3,9m  (4)
		<b>[17]</b>

**TOTAAL: 150**