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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ SENIORSERTIFIKAAT-EKSAMEN NATIONAL SENIOR CERTIFICATE EXAMINATIONS/ NASIONALE SENIORSERTIFIKAAT-EKSAMEN

MATHEMATICS P2/ WISKUNDE V2

MARKING GUIDELINES/NASIENRIGLYNE

2019

MARKS: 150 *PUNTE: 150*

These marking guidelines consist of 20 pages. *Hierdie nasienriglyne bestaan uit 20 bladsye.*.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum. Stop marking at the second calculation error.
- Assuming answers/values in order to solve a problem is NOT acceptable.

NOTA:

- As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.
- Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas. Hou op nasien by die tweede berekeningsfout.
- Om antwoorde/waardes te aanvaar om 'n probleem op te los, word NIE toegelaat NIE.

GEOMETRY • MEETKUNDE		
S	A mark for a correct statement (A statement mark is independent of a reason)	
	'n Punt vir 'n korrekte bewering ('n Punt vir 'n bewering is onafhanklik van die rede)	
n	A mark for the correct reason (A reason mark may only be awarded if the statement is correct)	
R	'n Punt vir 'n korrekte rede ('n Punt word slegs vir die rede toegeken as die bewering korrek is)	
S/R	Award a mark if statement AND reason are both correct	
	Ken 'n punt toe as die bewering EN rede beide korrek is	

Mathematics P2/Wiskunde V2

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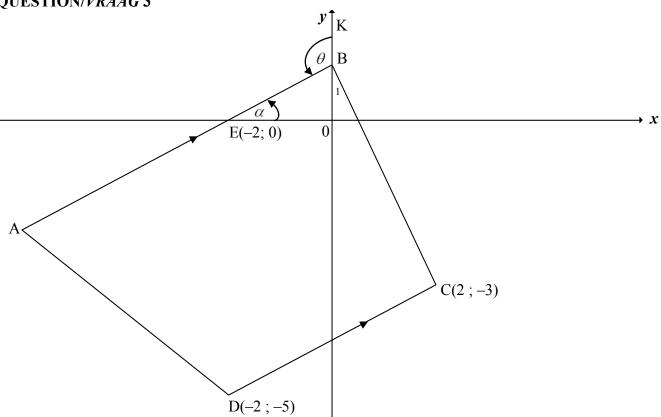
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freq	(1)
	(1)
Time taken (t) (in minutes) children frequency $2 < t \le 6$ 2 $6 < t \le 10$ 10 12 $10 < t \le 14$ 9 21 $14 < t \le 18$ 7 28 $18 < t \le 22$ 8 36 $22 < t \le 26$ 7 43 $26 < t \le 30$ 2 40 CUMULATIVE FREQUENCY GRAPH (OGIVE) CUMULATIVE FREQUENCY GRAPH (OGIVE)	/er (2)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	4 cum frea
	ect
	-
$22 < t \le 26$ $26 < t \le 30$ 2 $20 < t \le 30$ 2 $20 < t \le 30$ $20 $	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	
CUMULATIVE FREQUENCY GRAPH (OGIVE) 50 40 plott freq	
CUMULATIVE FREQUENCY GRAPH (OGIVE) 50 40 plott freq	(2
limit (all p 10 15 20 25 30	ing cum at upper s correctly points) e (smooth) nding (2;0)
Time in minutes	(3)
On graph at the y-value of 22,5 or 23 Median = \pm 15 minutes. Answer only: full marks Answer	

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2.1	a = 12,44		✓ value of a	
	b = 0.98	Answer only: full marks	✓ value of b	
	y = 12,44 + 0,98x		✓ equation	
				(3)
2.2.1	Percentage = $\frac{15}{50} \times 100$			
	= 30%		✓ answer	
	- 5070			(1)
2.2.2	$\hat{y} = 12,44 + 0,98x$		(1 // / 520	<u> </u>
	$\hat{y} = 12,44 + 0,98(30)$		✓ substitution of 30	
	$\hat{y} = 41,84$			
	= 42	Answer only: full marks	✓ answer as integer	
	OR	This were entry. Turn muchs	v answer as integer	
	$\hat{y} = 41.87$ (if using c	calculator)	\checkmark value of y	(2)
	$\hat{y} = 42$		✓ answer as integer	
	y 42		· answer as integer	(2)
				(2)
	OR			
	, 21			
	$\hat{y} = \frac{21}{50}$		✓ ✓ answer	(2)
				(2)
2.3.1	standard deviation =13	3,88	✓ ✓ answer	
				(2)
2.3.2	x = 50,67 - 45,67		✓ 50,67-45,67	. ,
	=5%	Answer only: full marks	✓ answer	
	-570			(2)
				[10]



3.1.1	Midpoint of EC:	
	$= \left(\frac{-2+2}{2} ; \frac{0+(-3)}{2}\right) = \left(0; \frac{-3}{2}\right)$	$\checkmark x \text{ value } \checkmark y \text{ value}$ (2)
3.1.2	$m_{\rm DC} = \frac{-3 - (-5)}{2 - (-2)} \text{ OR } \frac{-5 - (-3)}{-2 - 2}$	✓ substitution
	$= \frac{2}{4} = \frac{1}{2}$ Answer only: full marks	✓ answer (2)
3.1.3	$m_{AB} = \frac{1}{2}$ [AB DC]	$\checkmark m_{AB} = \frac{1}{2}$
	$y = \frac{1}{2}x + c$ $y - y_1 = \frac{1}{2}(x - x_1)$	
	$0 = \frac{1}{2}(-2) + c \qquad \mathbf{OR} \qquad y - 0 = \frac{1}{2}(x - (-2))$	\checkmark substitution of $(-2;0)$
	$c = 1$ $\therefore y = \frac{1}{2}x + 1$	✓ equation (3)
3.1.4	$\tan \alpha = m_{AB} = \frac{1}{2}$	$\checkmark \tan \alpha = \frac{1}{2}$
	α = 26,57°	\checkmark value of α
	$\theta = 90^{\circ} + 26,57^{\circ}$ [ext $\angle \text{of } \Delta$] =116,57°	\checkmark value of θ (3)

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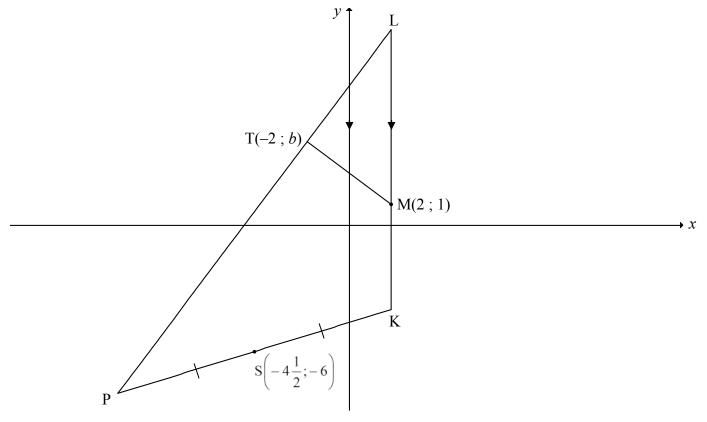
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2.2		
3.2	B(0; 1)	✓ coordinates of B
	$m_{\rm BC} = \frac{1 - (-3)}{0.2}$ OR $m_{\rm BC} = \frac{(-3) - 1}{2.0}$	
	0-2 2-0	$\sqrt{m_{\rm BC}} = -2$
	=-2 $=-2$	$m_{\rm BC} = -2$
	$m_{AB} \times m_{BC} = \frac{1}{2} \times -2$	
	$m_{AB} \times m_{BC} = \frac{1}{2} \times -2$	(man divert of anodients = 1
	=-1	✓ product of gradients = -1
	∴ AB ⊥ BC	
		(3)
3.3.1	ABC = 90°	
3.3.1		
	∴ EC is diameter [converse: ∠ in semi circle]	
	\therefore centre of circle= $\left(0; -\frac{3}{2}\right)$	
	$\frac{1}{2}$	✓ answer
		(1)
3.3.2	$(x-0)^2 + (y+\frac{3}{2})^2 = r^2$	✓ substitution of centre
	$\begin{pmatrix} x & 0 \end{pmatrix} \begin{pmatrix} y & 2 \end{pmatrix} = 7$	
	$(3)^2$	
	$\left[(-2-0)^2 + \left(0 + \frac{3}{2}\right)^2 = r^2 \mathbf{OR} (2-0)^2 + \left(-3 - \left(\frac{-3}{2}\right)\right)^2 = r^2 \right]$	✓ correct substitution of
		E(-1; 0), B(0; 1) or
	$\left(-\frac{1}{2} \right)^{2} \left(-\frac{1}{2} \right)^{2}$	C(2; -3) to calculate
	OR $(0-0)^2 + \left(1 - \left(\frac{-3}{2}\right)\right)^2 = r^2$	r^2 or r
	OR $r = \frac{EC}{2} = \frac{\sqrt{(-2-2)^2 + (0-(-3))^2}}{2}$	
	$\frac{\mathbf{OK} \mathbf{r} - \frac{1}{2} - \frac{1}{2}}{2}$	
	$\frac{3}{2}$. 1
	OR $r = 1 - (-\frac{3}{2})$	\checkmark value of r^2 or r
	25 5	
	$\therefore r^2 = \frac{25}{4} \text{or } r = \frac{5}{2}$	
	$(2)^2$ 25	
	$x^2 + \left(y + \frac{3}{2}\right)^2 = \frac{25}{4}$	✓ equation
		(4)
		[18]
		[10]

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4.1	$(x-2)^2 + (y-1)^2 = 25$ $(x-2)^2 + (y-1)^2 = 25$	✓ equation of the circle ✓ substitution of point T
	$(-2-2)^{2} + (b-1)^{2} = 25 (-2-2)^{2} + (b-1)^{2} = 25$ $(b-1)^{2} = 9 \mathbf{OF} 16 + b^{2} - 2b + 1 = 25$	
	$b-1 = \pm 3$ $b^2 - 2b - 8 = 0$	✓simplification
	$\therefore b = 4 \text{or} b \neq -2 \qquad \qquad \therefore b = 4 \text{or} b \neq -2$	✓ answer (4)
4.2.1	K(2; 1-5)	
	∴ K(2; -4) Answer only: full marks	$\checkmark x \text{ value } \checkmark y \text{ value}$ (2)
4.2.2	$m_{\rm MT} = \frac{4-1}{-2-2} = -\frac{3}{4}$	` '
	$m_{\rm PL} = \frac{4}{3}$ [radius \perp tangent]	$ \begin{array}{ccc} \checkmark & m_{\text{MT}} \\ \checkmark & m_{\text{PL}} = \frac{4}{3} \end{array} $
	$y = \frac{4}{3}x + c$	
	$4 = \frac{4}{3}(-2) + c$	✓ substitution of $m_{\rm PL}$ and the point T
	$c = \frac{20}{3}$ $y = \frac{4}{3}x + \frac{20}{3}$	and the point I
	$y = \frac{4}{3}x + \frac{20}{3}$	✓ equation
		(4)

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OR
$m_{\rm MT} = \frac{4-1}{-2-2} = -\frac{3}{4}$
$m_{\rm PL} = \frac{4}{3}$ [radius \perp tangent]
$y - y_1 = \frac{4}{3}(x - x_1)$
$y-4=\frac{4}{3}(x+2)$
$y = \frac{4}{3}x + \frac{20}{3}$
OR
P(-11; -8)

$$\sim m_{\rm M}$$

$$\checkmark m_{\rm PL} = \frac{4}{3}$$

- ✓ substitution of m_{PL} and the point T
- ✓ equation

(4)

$$P(-11; -8)$$

$$m_{PL} = \frac{4 - (-8)}{-2 - (-11)}$$

$$= \frac{4}{3}$$

$$y = \frac{4}{3}x + c$$

✓ coordinates of P

$$\checkmark m_{\rm PL} = \frac{4}{3}$$

 $-8 = \frac{4}{3}(-11) + c$ $c = \frac{20}{3}$ $y = \frac{4}{3}x + \frac{20}{3}$

- ✓ substitution of m_{PL} and the point P or T
- ✓ equation

(4)

$$y_{L} = \frac{4}{3}(2) + \frac{20}{3} = \frac{28}{3}$$

 $L\left(2; \frac{28}{3}\right)$ and $K\left(2; -4\right)$: $LK = \frac{28}{3} - (-4) = \frac{40}{3}$

 $\checkmark y_{\rm L} = \frac{28}{3}$

Coordinates of P:

$$\frac{x+2}{2} = -4\frac{1}{2}$$
 and $\frac{y-4}{2} = -6$

✓ length of LK

$$\therefore x = -11$$

$$y = -8$$

$$\therefore P(-11; -8)$$

$$(-11) = 13$$

 \perp height (PH) = 2 - (-11) = 13

$$\checkmark x_P \checkmark y_P$$

✓ length of ⊥ height

Area \triangle PKL = $\frac{1}{2}$ (LK)(PH)

 $= \frac{1}{2} \left(\frac{40}{3} \right) (13) \quad P(-11; -8)$

✓ substitution into the area formula

$$=\frac{260}{3}$$

 $=\frac{260}{3}$ **OR** 86,67 square units

✓ answer

(7)

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4.2.2		T
4.2.3	OR	
	$y_{\rm L} = \frac{4}{3}(2) + \frac{20}{3} = \frac{28}{3}$	$\bigvee y_{\rm L} = \frac{28}{3}$
	$L\left(2; \frac{28}{3}\right)$ and $K\left(2; -4\right)$: $LK = \frac{28}{3} - (-4) = \frac{40}{3}$	✓ length of LK
	Coordinates of P: $\frac{x+2}{2} = -4\frac{1}{2} \text{ and } \frac{y-4}{2} = -6$ $L(2; \frac{28}{3})$	
	$\therefore x = -11 \qquad y = -8$ $\therefore P(-11; -8)$	$\checkmark x_{p} \checkmark y_{p}$
	$PK^{2} = (-11-2)^{2} + (-8-(-4))^{2}$ $PK = \sqrt{185} \text{ units}$ $m_{PK} = \frac{-8-(-4)}{-11-2} = \frac{4}{13}$ $P(-11; -8)$ $H(2; -8)$	
	$-11-2 13$ $\tan \theta = \frac{4}{13} \therefore \theta = 17,1027^{\circ}$ $\therefore P\hat{K}L = 90^{\circ} + 17,1027^{\circ} = 107,1^{\circ}$	✓ PŔL
	Area \triangle PKL = $\frac{1}{2}$ (PK)(LK).sin PKL = $\frac{1}{2} \left(\sqrt{185} \right) \left(\frac{40}{3} \right) \sin 107,10^{\circ}$ = 86,67 square units	✓ substitution into the area rule ✓ answer
	- 80,07 square units	(7)
4.3	The centres of the two circles lie on the same vertical line $x = 2$, and the sum of the radii = 10 $n-1=10$ $1-n=10$	✓ correct method ✓ sum of radii = 10
	n=11 or $n=-9$	$\checkmark n = 11 \checkmark n = -9$
	Answer only: full marks	(4)
		[21]

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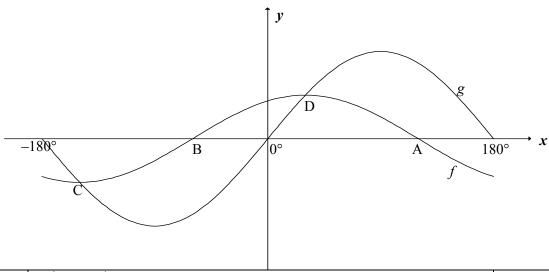
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5.1.1	sin191°	
	$=-\sin 11^{\circ}$	√-sin11°
		(1)
5.1.2	cos 22°	
	$=\cos(2\times11^{\circ})$	
	$=1-2\sin^2 11^\circ$	✓ answer
	-1 Z5III 11	(1)
5.2	$a_{00}(x_{1}, 1000) + \sqrt{2} \sin(x_{1}, 150)$	(1)
0.2	$\cos(x-180^\circ) + \sqrt{2}\sin(x+45^\circ)$	
	$=-\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$	$\sqrt{-\cos x}$ expansion
	-((1) (1)	
	$= -\cos x + \sqrt{2} \left(\sin x \left(\frac{1}{\sqrt{2}} \right) + \cos x \left(\frac{1}{\sqrt{2}} \right) \right)$	✓ special angle ratios
	$(\sqrt{2})$	
	$=-\cos x + \sin x + \cos x$	✓ simplification of last
		2 terms
	$=\sin x$	√answer
		(5)
	OR	
	_	
	$\cos(x-180^\circ) + \sqrt{2}\sin(x+45^\circ)$	
	$= -\cos x + \sqrt{2}(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$	$\sqrt{-\cos x}$ $\sqrt{-\cos x}$ expansion
	` '	
	$= -\cos x + \sqrt{2} \left(\sin x \left(\frac{\sqrt{2}}{2} \right) + \cos x \left(\frac{\sqrt{2}}{2} \right) \right)$	✓ special angle ratios
	$\begin{bmatrix} -\cos x + \sqrt{2}(\sin x(2)) + \cos x(2) \end{bmatrix}$	
	$=-\cos x + \sin x + \cos x$	✓ simplification of last
	$=-\cos x + \sin x + \cos x$	2 terms
	$=\sin x$	✓ answer
	$= \sin x$	
5.3	$\sin P + \sin Q = \sin P + \cos P$	$\sqrt{\sin Q = \cos P}$ (5)
3.3		$\nabla \sin Q = \cos r$
	$\left(\sin P + \cos P\right)^2 = \left(\frac{7}{5}\right)^2$	(aguarin a
	$\left(\frac{\sin 1 + \cos 1}{5}\right) - \left(\frac{5}{5}\right)$	✓ squaring
	3 49	✓ expansion
	$\sin^2 P + 2\sin P\cos P + \cos^2 P = \frac{49}{25}$	CAPAIISIOII
	25	
	$2\sin P\cos P = \frac{49}{25} - 1$	$\sqrt{\sin^2 P + \cos^2 P} = 1$
	25	511 1 1 000 1 -1
	$\sin 2P = \left(\frac{49}{25} - \frac{25}{25}\right)$	
	(25 25)	
	_ 24	√answer
	$=\frac{24}{25}$	(5)
		[12]
	1	

Mathematics P2/Wiskunde V2

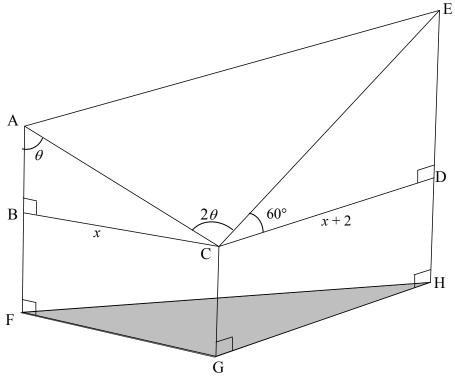
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6.1	$\cos(x - 30^\circ) = 2\sin x$	
	$\cos x \cos 30^\circ + \sin x \sin 30^\circ = 2\sin x$	✓ expansion
	$\frac{\sqrt{3}}{2}\cos x + \frac{1}{2}\sin x = 2\sin x$	✓ special ∠s
	$\frac{\sqrt{3}}{2}\cos x = \frac{3}{2}\sin x$	✓ simplification
	$\tan x = \frac{\sqrt{3}}{3}$	✓ equation in tan
	$x = 30^{\circ} + k.180^{\circ}; k \in \mathbb{Z}$	✓ 30° ✓ <i>k</i> .180°; <i>k</i> ∈ <i>Z</i>
	OR	OR
	$x = 30^{\circ} + k.360^{\circ} \text{ or } x = 210^{\circ} + k.360^{\circ}; k \in \mathbb{Z}$	\checkmark 30° and 210° \checkmark k.360°; k ∈ Z
		(6)



6.2.1(a)	A(120°; 0)	✓ answer
		(1)
6.2.1(b)	C(-150°; -1)	$\checkmark x$ value $\checkmark y$ value
		(2)
6.2.2(a)	$x \in (-90^{\circ}; 30^{\circ}) \text{ OR } -90^{\circ} < x < 30^{\circ}$	✓ endpoints
		✓ correct interval
		(2)
6.2.2(b)	$x \in (-160^{\circ}; 20^{\circ}) \text{ OR } -160^{\circ} < x < 20^{\circ}$	✓endpoints
		✓ correct interval
		(2)
6.2.3	$y = 2^{2\sin x + 3}$	
	Range of $y = 2\sin x$: $y \in [-2; 2]$ OR $-2 \le y \le 2$	
	Range of $y = 2\sin x + 3$: $y \in [1; 5]$ OR $1 \le y \le 5$	√ 1 √ 5
	Range: $y = 2^{2\sin x + 3}$: $y \in [2; 32]$ OR $2 \le y \le 32$	✓ 2 ✓ 32
	Answer only: full marks	✓ correct interval
	Answer only. Tull marks	(5)
		[18]





7.1.1	$\sin \theta = \frac{x}{AC}$ $AC = \frac{x}{\sin \theta}$ $AC = \frac{x}{\sin \theta}$ $AC = \frac{x}{\sin \theta}$	✓ trig ratio ✓ simplification (2)
7.1.2	$\cos 60^{\circ} = \frac{x+2}{\text{CE}} \qquad \text{OR} \qquad \frac{\sin 30}{x+2} = \frac{\sin 90^{\circ}}{\text{CE}}$ $CE = \frac{x+2}{\cos 60^{\circ}} \qquad CE = \frac{x+2}{\sin 30^{\circ}}$ $= \frac{x+2}{1} = 2(x+2) \qquad = 2(x+2)$	✓ trig ratio✓ making CE the subject
7.2	Area $\triangle ACE = \frac{1}{2}AC.EC.\sin A\hat{C}E$ $= \frac{1}{2} \left(\frac{x}{\sin \theta}\right) (2(x+2))\sin 2\theta$ $= \frac{x(x+2) \times 2\sin \theta \cos \theta}{\sin \theta}$	(2) $\checkmark \text{ use area rule }$ correctly $\checkmark \text{ substitution of}$ $\frac{x}{\sin \theta} (2(x+2))$ $\checkmark \text{ substitution of }$ $\sin 2\theta$
	$=2x(x+2)\cos\theta$	(3)

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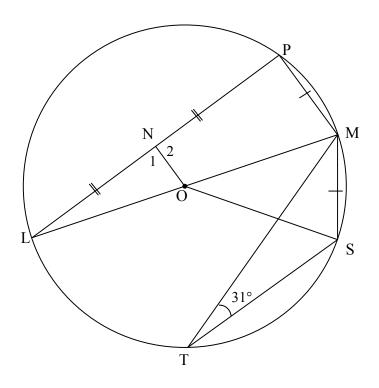
7.3	EC = 2(12 + 2) = 28 $AE^{2} = AC^{2} + EC^{2} - 2(AC)(EC)\cos ACE$	✓ EC ✓ use cosine rule correctly
	$= \left(\frac{12}{\sin 55^{\circ}}\right)^{2} + 28^{2} - 2\left(\frac{12}{\sin 55^{\circ}}\right)(28)\cos 110^{\circ}$	✓ substitution
	AE = 35,77m	✓ answer (4)
		[11]

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QUESTION/VRAAG 8

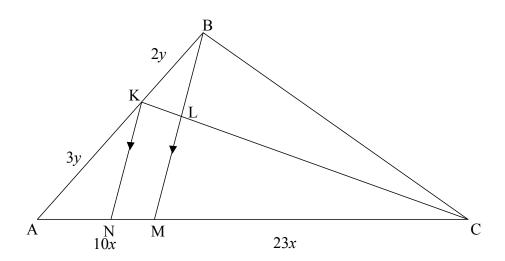
8.1



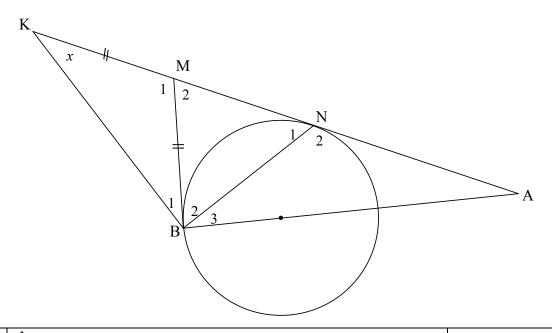
8.1.1(a)	$\hat{MOS} = 62^{\circ} \ [\angle \text{ at centre} = 2 \times \angle \text{ at circumf/middelpts} \angle = 2 \circ \text{mtreks} \angle]$	✓ S ✓ R	(2)
8.1.1(b)	$\hat{L}=31^{\circ}$ [equal chords; equal $\angle s /= koorde; = \angle e$]	✓ S ✓ R	(2)
8.1.2	LN = NP and $LO = OM$	✓ LO = OM	
	$\therefore ON = \frac{1}{2} PM \qquad [midpoint theorem/middelpuntstelling]$	✓ S ✓ R	
	$\therefore ON = \frac{1}{2}MS \qquad [PM = MS]$	✓ S	
	OR $\hat{N}_1 = 90^{\circ}$ [line from centre to midpt chord/lyn v midpt na midpt kd]	✓ S R	(4)
	$\hat{P} = 90^{\circ}$ [\(\neq \text{in semi-circle}/\text{\neq} \text{in halfsirkel}\)] \hat{L} is common/gemeen		
	\therefore \triangle NLO $\parallel \triangle$ PLM ($\angle \angle \angle$)	✓ S/R	
	$\frac{NL}{PL} = \frac{NO}{PM} = \frac{1}{2}$	✓ S	
	$\therefore ON = \frac{1}{2}PM$		
	$\therefore ON = \frac{1}{2}MS \qquad [PM = MS]$	✓ S	(4)

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8.2



8.2.1	$\frac{AN}{AM} = \frac{AK}{AB}$ [line one side of Δ OR prop theorem; KN BM/	✓ R
	$ lyn $ sy van Δ OR eweredigheidst; $ lyn $ $ l$	
	$\frac{AN}{AM} = \frac{3y}{5y} = \frac{3}{5}$	✓ S (2)
8.2.2	$\frac{AM}{MG} = \frac{10x}{22}$ [given]	
	$\begin{array}{ll} MC & 23x \\ AM = 5y = 10x & \therefore & y = 2x \end{array}$	✓ S
	$\frac{LC}{KL} = \frac{MC}{NM}$ [line one side of Δ OR prop theorem; KN LM/	✓ R
	$ lyn $ sy van Δ OR eweredigheidst; $ KN $ $ BM $	
	$= \frac{23x}{2y} = \frac{23x}{4x} = \frac{23}{4}$	✓ S (3)
		(3)
	OR	
	$\frac{AM}{MC} = \frac{10x}{23x} [given]$	
	$\frac{AN}{MN} = \frac{3y}{2y} = \frac{6x}{4x}$	✓ S
	$\frac{LC}{KL} = \frac{MC}{NM}$ [line one side of Δ OR prop theorem; KN LM/	✓ R
	$lyn \mid\mid sy \ van \ \Delta \ \textbf{\textit{OR}} \ eweredigheidst; \ KN \mid\mid BM \mid$	
	$=\frac{23x}{2}=\frac{23x}{4}=\frac{23}{4}$	✓ S
	2y $4x$ 4	(3)
		[13]



$\hat{\mathbf{B}}_1 = x$ [\angle 's opp = sides/ \angle e teenoor = sye]	✓S
$\hat{\mathbf{M}}_2 = 2x$ [ext \angle of Δ] OR $\hat{\mathbf{M}}_1 = 180^{\circ} - 2x$ [\angle s of Δ]	✓S ✓R
BM = MN [2 tans from a common point/raaklyne vanuit dieselfde punt]	✓S ✓R
$\hat{N}_1 = \frac{180^\circ - 2x}{2} = 90^\circ - x [\angle \text{'s opp} = \text{sides}/\angle e \text{ teenoor} = sye]$	✓ answer (6)
OR NM = BM [2 tans from a common point/raaklyne vanuit dieselfde punt]	✓S ✓R
$\hat{B}_2 = \hat{N}_1 \ [\angle's \ opp = sides/\angle e \ teenoor = sye]$	✓S ✓R
$\hat{\mathbf{B}}_1 = x$ [\(\angle '\mathbf{s}\) opp = sides/\(\angle e\) teenoor = sye	✓S
1	
$\hat{N}_1 = 90^{\circ} - x$	✓ answer (6)
MBA = $\hat{B}_2 + \hat{B}_3 = 90^{\circ}$ [tangent⊥diameter/raaklyn⊥middellyn] $\hat{B}_3 = 90^{\circ} - \hat{B}_2$	✓S ✓ R
$=90^{\circ} - (90^{\circ} - x) = x$	✓ S
$\hat{\mathbf{B}}_3 = \hat{\mathbf{K}} = x$	✓ S
.: AB is a tangent/raaklyn converse tan-chord theorem/ omgekeerde raakl koordst]	✓ R (5)
	$\hat{\mathbf{M}}_2 = 2x \qquad [\text{ext } \angle \text{ of } \Delta] \mathbf{OR} \hat{\mathbf{M}}_1 = 180^\circ - 2x \ [\angle \text{s of } \Delta]$ $\mathbf{BM} = \mathbf{MN} \qquad [2 \text{ tans from a common point}/raaklyne \ vanuit \ dieselfde \ punt]$ $\hat{\mathbf{N}}_1 = \frac{180^\circ - 2x}{2} = 90^\circ - x [\angle \text{'s opp} = \text{sides}/\angle e \ teenoor = sye]$ \mathbf{OR} $\mathbf{NM} = \mathbf{BM} [2 \text{ tans from a common point}/raaklyne \ vanuit \ dieselfde \ punt]$ $\hat{\mathbf{B}}_2 = \hat{\mathbf{N}}_1 \ [\angle \text{'s opp} = \text{sides}/\angle e \ teenoor = sye]$ $\hat{\mathbf{B}}_1 = x [\angle \text{'s opp} = \text{sides}/\angle e \ teenoor = sye]$ $\mathbf{In} \ \Delta \ \mathbf{KBN}:$ $x + x + \hat{\mathbf{B}}_2 + \hat{\mathbf{N}}_1 = 180^\circ [\text{sum of } \angle \text{'s of } \Delta]$ $2x + 2\hat{\mathbf{N}}_1 = 180^\circ$ $x + \hat{\mathbf{N}}_1 = 90^\circ$ $\hat{\mathbf{N}}_1 = 90^\circ - x$ $\mathbf{M}\hat{\mathbf{B}}\mathbf{A} = \hat{\mathbf{B}}_2 + \hat{\mathbf{B}}_3 = 90^\circ \ [\text{tangent} \bot \text{diameter}/raaklyn \bot middellyn]$ $\hat{\mathbf{B}}_3 = 90^\circ - (90^\circ - x) = x$ $\hat{\mathbf{B}}_3 = \hat{\mathbf{K}} = x$ $\therefore \ \mathbf{AB} \ \text{is a tangent}/raaklyn \ \text{converse tan-chord theorem}/$

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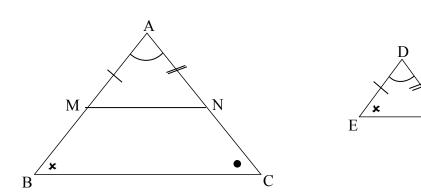
OR $\hat{B}_2 = \hat{N}_1$ $\hat{B}_1 + \hat{B}_2 = x + (90^\circ - x) = 90^\circ$ $\therefore \text{ KN is diameter/middellyn} [\text{converse } \angle \text{ in semi-circle/} \\ omgekeerde \ \angle \text{ in halfsirkel}]$ $\text{MBA} = \hat{B}_2 + \hat{B}_3 = 90^\circ \qquad [\text{tangent } \bot \text{ diameter}]$ $\therefore \text{ AB is a tangent/raaklyn} \text{converse tan-chord theorem/} \\ omgekeerde \ raakl \ koordst]]$	✓S ✓ R ✓ S ✓ R ✓ R
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Mathematics P2/Wiskunde V2 SC/SS/NSC/NSS – Marking Guidelines/Nasienriglyne

DBE/2019

QUESTION/VRAAG 10

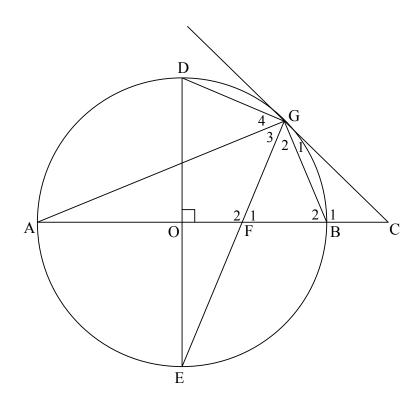
10.1



10.1	Constr: Let M and N lie on AB and AC respectively such that AM = DE and AN = DF. Draw MN. Konst: Merk M en N op AB en AC onderskeidelik af sodanig dat AM = DE en AN = DF. Verbind MN. Proof: In Δ AMN and Δ DEF AM = DE [Constr] AN = DF [Constr] = D [Given] ∴ ΔAMN ≡ Δ DEF(SAS) ∴ AMN = Ê = B	✓ Constr / Konstr ✓ Δ AMN≡Δ DEF ✓SAS
	MN BC [corresp \angle 's are equal/ooreenkomstige $\angle e =$] $\frac{AB}{AB} = \frac{AC}{AB} = AC$	✓MN BC and R
	$\frac{AM}{AM} = \frac{AC}{AN}$ [AM = DE and AN = DF]	$\checkmark \frac{AB}{AM} = \frac{AC}{AN} \checkmark R$
	DE DF [AW-DE and AW-DI]	
		(6)

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10.2



10.2.1(a)	DÔB=90°	
	$D\hat{G}F = \hat{G}_3 + \hat{G}_4 = 90^\circ$ [\(\neq \text{in semi-circle}/\neq \text{in halfsirkel}\)]	✓ S ✓ R
	$D\hat{O}B + D\hat{G}F = 180^{\circ}$	
	∴ DGFO is a cyclic quad. [converse: opp ∠s of cyclic quad/ omgekeerde teenoorst ∠e v koordevh] OR	✓ R
	\angle s of quad = $180^{\circ}/\angle e \ van \ koordevh = 180^{\circ}]$	(3)
	OR TÂT 200	
	EÔB=90°	
	$D\hat{G}F = \hat{G}_3 + \hat{G}_4 = 90^\circ$ [\(\neq \text{in semi-circle}/\neq \text{in halfsirkel}\)]	✓ S ✓R
	$E\hat{O}B = D\hat{G}F$	
	∴ DGFO is a cyclic quad [converse: ext ∠ = opp int ∠/ omgekeerde buite∠ = teenoorst ∠] OR	✓ R
	$\operatorname{ext} \angle \operatorname{of quad} = \operatorname{opp int} \angle / \operatorname{buite} \angle \operatorname{v} \operatorname{vh} = \operatorname{teenoorst} \angle]$	(3)
10.2.1(b)	$\hat{F}_1 = \hat{D}$ [ext \angle of cyclic quad/buite \angle v koordevh]	✓ S ✓ R
	$\hat{G}_1 + \hat{G}_2 = \hat{D}$ [tan-chord theorem/raakl koordst]	✓ S ✓ R
	$\therefore \hat{\mathbf{F}}_1 = \hat{\mathbf{G}}_1 + \hat{\mathbf{G}}_2$	
	$\therefore GC = CF$ [sides opp equal \angle s/sye teenoor = \angle e]	✓ R (5)

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10.2.2(a)	AB = DE = 14 [diameters/middellyne]	✓ S
	\therefore OB = 7 units	✓ S
	\therefore BC = OC – OB = 11 – 7 Answer only: full marks	4.0
	= 4 units	✓ S
10.2.2(b)	In \triangle CGB and \triangle CAG	(3)
10.2.2(0)		
	$\hat{G}_1 = \hat{A} = x$ [tan-chord theorem/raakl koordst]	✓ S/R
	$\hat{C} = \hat{C}$ [common]	
	$\Delta CGB \parallel \Delta CAG [\angle, \angle, \angle]$	✓ S
	$\frac{CG}{CA} = \frac{CB}{CG}$	✓ S
	$\frac{CG}{18} = \frac{4}{CG}$	
		✓ CA = 18
	$CG^2 = 72$	
	$CG = \sqrt{72}$ or $6\sqrt{2}$ or 8,49 units	✓answer
		(5)
10.2.2(c)	OF = OC - FC	(6)
	$=11-\sqrt{72}$	✓ OF
	oF OF	, O1
	$\tan E = \frac{OF}{OE}$	✓ trig ratio
	$11 - \sqrt{72}$	
	$=\frac{11-\sqrt{72}}{7}=0.36$	✓ substitution
	$\hat{E} = 19,76^{\circ}$	✓ answer
	L = 17,70	(4)
	OR	(4)
	OF = OC - FC	
	$=11-\sqrt{72}$	✓ OF
	$FE^2 = OE^2 + OF^2$	
	$=7^2+(11-\sqrt{72})^2$	
	FE = 7,437 = 7,44	
	$\cos E = \frac{OE}{FE} \qquad OR \qquad \sin E = \frac{OF}{FE}$	✓ trig ratio
	$=\frac{7}{7,44}=0,94 \qquad \qquad =\frac{11-\sqrt{72}}{7,44}=0,338$	
	7,44	✓ substitution
	1	

TOTAL/TOTAAL.	150
101AL/101AAL:	130

 $\hat{E} = 19,76^{\circ}$

✓ answer

(4) [26]

 $\hat{E} = 19,76^{\circ}$