



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

MATHEMATICS P2/WISKUNDE V2

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

**This memorandum consists of 21 pages.
*Hierdie memorandum bestaan uit 21 bladsye.***

DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X996, PRETORIA 0001
2016 -11- 11
APPROVED MARKING GUIDELINE PUBLIC EXAMINATION

WkWhite
15/11/2016

NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

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QUESTION/VRAAG 1

5	8	15	20	25	27	31	36	75
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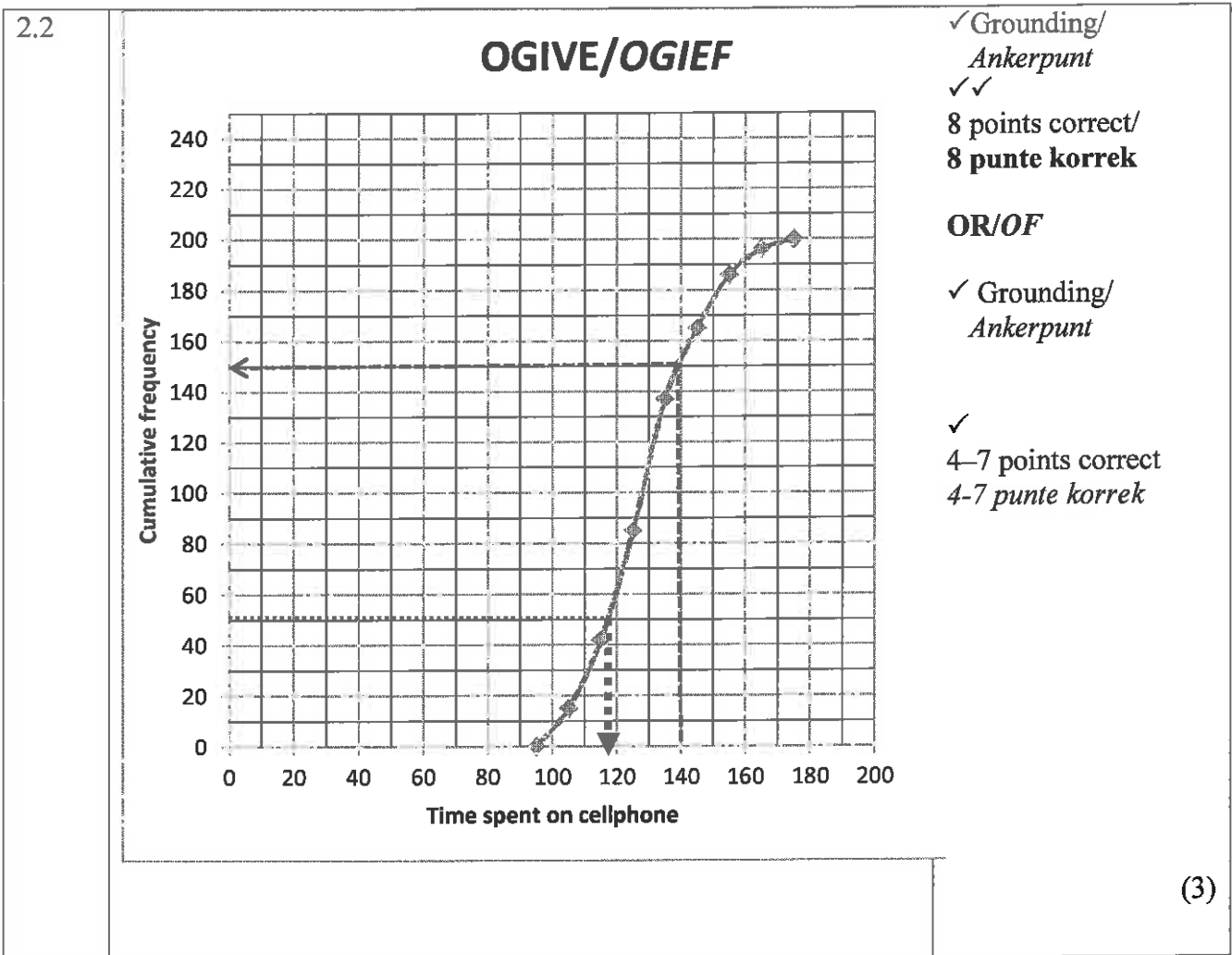
1.1	$\text{Range/Omvang} = 75 - 5$ $= 70$	✓ answer/antw (1)
1.2	$\text{Std dev/Std afwyking} = 19,56$	✓ rounding/afroning ✓ answer/antw (2)
1.3	$\text{Median/Mediaan} = 25$	✓ answer/antw (1)
1.4	$Q_1 = \frac{8+15}{2} = 11,5$ $Q_2 = \frac{31+36}{2} = 33,5$ $\text{IQR} = Q_3 - Q_1$ $= 33,5 - 11,5$ $= 22$	✓ $Q_1 = 11,5$ ✓ $Q_3 = 33,5$ ✓ CA answer/antw (3)
1.5		✓ Q_1 and Q_3 ✓ Q_2 ✓ min and max min en maks (3)
1.6	Skewed to the right/skeef na regs Positively skewed/positief skeef	✓ answer/antw (1)
1.7	Outlier/uitskieter = 75 OR/OF $33.5 + 1.5(22) = 66.5$ Outlier/uitskieter = 75	✓ answer/antw ✓ answer/antw (1) [12]

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QUESTION/VRAAG 2

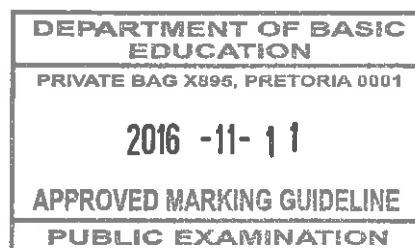
2.1	<table border="1"> <thead> <tr> <th>TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)</th> <th>FREQUENCY FREKWENSIE f</th> <th>CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf</th> </tr> </thead> <tbody> <tr> <td>$95 < x \leq 105$</td> <td>15</td> <td>15</td> </tr> <tr> <td>$105 < x \leq 115$</td> <td>27</td> <td>42</td> </tr> <tr> <td>$115 < x \leq 125$</td> <td>43</td> <td>85</td> </tr> <tr> <td>$125 < x \leq 135$</td> <td>52</td> <td>137</td> </tr> <tr> <td>$135 < x \leq 145$</td> <td>28</td> <td>165</td> </tr> <tr> <td>$145 < x \leq 155$</td> <td>21</td> <td>186</td> </tr> <tr> <td>$155 < x \leq 165$</td> <td>10</td> <td>196</td> </tr> <tr> <td>$165 < x \leq 175$</td> <td>4</td> <td>200</td> </tr> </tbody> </table>	TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)	FREQUENCY FREKWENSIE f	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf	$95 < x \leq 105$	15	15	$105 < x \leq 115$	27	42	$115 < x \leq 125$	43	85	$125 < x \leq 135$	52	137	$135 < x \leq 145$	28	165	$145 < x \leq 155$	21	186	$155 < x \leq 165$	10	196	$165 < x \leq 175$	4	200	<p>✓ first 4 correct / eerste 4 korrek CF values /KF waardes</p> <p>✓ last 4 correct CF values/ laaste 4 korrekte KF waardes</p>
	TIME SPENT/ TYD SPANDEER (IN MINUTES/ MINUTE)	FREQUENCY FREKWENSIE f	CUMULATIVE FREQUENCY/ KUMULATIEWE FREKWENSIE cf / kf																										
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	$145 < x \leq 155$	21	186																										
	$155 < x \leq 165$	10	196																										
$165 < x \leq 175$	4	200																											

(2)



(3)

2.3	$Q_1 = 118$ Accept any answer between (115 and 120)	✓ CA ✓ CA answer/antw (2)
2.4	$\text{Number of learners / Getal leerders} = 200 - 150$ $= 50$ Accept 150 or any other reading between (145 and 155)	✓ CA 150 ✓ CA 50 (2) [9]



Wkw

QUESTION/VRAAG 3

<p>3.1</p>	$M = \left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2} \right)$ $= \left(\frac{6+2}{2} ; \frac{-2+15}{2} \right)$ $= \left(4 ; \frac{13}{2} \right)$	<p>✓ x-coordinate x-koordinaat ✓ y- coordinate y-koordinaat (2)</p>
<p>3.2</p>	$m_{BC} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{15 - 3}{2 - (-4)}$ $= 2$ $m_{MN} = m_{BC} = 2 \quad [BC \parallel MN]$ <p>OR/OF</p> $N \left(1 ; \frac{1}{2} \right)$ $m_{MN} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{13 - 1}{4 - 1}$ $= 2$	<p>✓ subst into gradient form./subst in gradiëntform ✓ answer/antw ✓ gradients equal/ gradiënte gelyk ✓ N(1; 1/2) ✓ subst into gradient form./subst in gradient form ✓ answer/antwoord (3)</p>
<p>3.3</p>	$y - y_1 = m(x - x_1)$ $y - \frac{13}{2} = 2(x - 4)$ $y = 2x - \frac{3}{2} \quad \text{OR/OF}$ $y = mx + c$ $\frac{13}{2} = 2(4) + c$ $-\frac{3}{2} = c$ $y = 2x - \frac{3}{2}$	<p>✓ subst (4; 13/2) and m = 2 into str line eq. / subst (4; 13/2) en m = 2 in reguitlyn verg. ✓ answer/antw (2)</p>

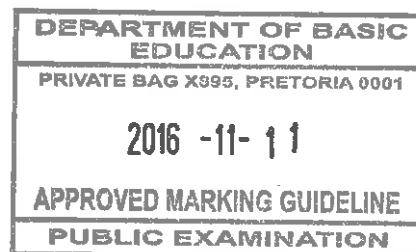
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<p>3.4</p>	<p>N is a midpoint of AC / <i>N is die middelpunt van AC</i> [Line through midpoint of one side parallel to second side / <i>omgekeerde van mdpt stelling.</i>]</p> $N\left(\frac{-4+6}{2}; \frac{3+(-2)}{2}\right)$ $= N\left(1; \frac{1}{2}\right)$ <p>OR/OF</p> $m_{AC} = \frac{3 - (-2)}{(-4) - 6}$ $= -\frac{1}{2}$ <p>Equation of AC $y - y_1 = m(x - x_1)$</p> $y - 3 = -\frac{1}{2}(x - (-4))$ $y = -\frac{1}{2}x + 1$ $-\frac{1}{2}x + 1 = 2x - \frac{3}{2}$ $-x + 2 = 4x - 3$ $x = 1$ $y = 2(1) - \frac{3}{2}$ $= \frac{1}{2}$ <p>$N\left(1; \frac{1}{2}\right)$</p>	<p>✓ S ✓ R ✓ x-value/waarde ✓ y-value/waarde</p> <p>✓ gradient of AC</p> <p>✓ equation of AC/ <i>Vergelyking van AC</i></p> <p>✓ equating/gelykstelling</p> <p>✓ $N\left(1; \frac{1}{2}\right)$</p> <p>(4)</p>
<p>3.5</p>	<p>N is the midpoint of BD and the midpoint of AC [diagonals of parm bisect] <i>N is die midpt v BD en midpt v AC [hoeklyne van parm halveer]</i></p> $\left(\frac{2+x}{2}; \frac{y+15}{2}\right) = \left(1; \frac{1}{2}\right)$ $\frac{2+x}{2} = 1 \qquad \frac{y+15}{2} = \frac{1}{2}$ $x = 0 \qquad y = -14$ <p>$D(0; -14)$</p>	<p>✓ CA $\frac{2+x}{2} = 1$</p> <p>✓ CA $\frac{y+15}{2} = \frac{1}{2}$</p> <p>✓ CA $x = 0$ ✓ CA $y = -14$</p> <p>Answer only: Full marks / Slegs antwoord: Vol punte</p>

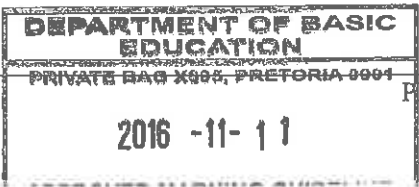
	<p>OR/OF</p> <p>From B to A</p> <p>$(x; y) \rightarrow (x+4; y-17)$</p> <p>$D(-4+4; 3-17)$</p> <p>$D(0; -14)$</p>	<p>✓ $x+4$</p> <p>✓ $y-17$</p> <p>✓ subst</p> <p>✓ $D(0; -14)$</p> <p>(4)</p> <p>[15]</p>
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WKN

QUESTION/VRAAG 4

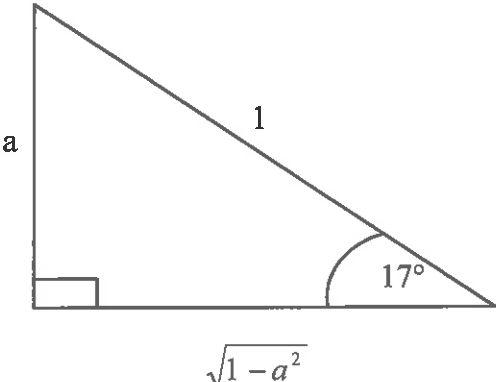
<p>4.1</p>	$m_{MP} = m_{PN}$ $\frac{2-0}{0-k} = \frac{4-2}{3-0}$ $\frac{2}{-k} = \frac{2}{3}$ $k = -3$	<p>✓ $m_{MP} = m_{PN}$ ✓ subst. in gradient form./vorm ✓ answer/antw (3)</p>
<p>4.2</p>	$\tan \alpha = m_{PN}$ $\tan \alpha = \frac{2}{3}$ $\alpha = 33,69^\circ$ $\tan \beta = m_{AB}$ $\tan \beta = -\frac{1}{2}$ $\beta = -26,57^\circ + 180^\circ$ $= 153,43^\circ$ <p>OR/OF $\tan \beta = m_{AB}$</p> $\tan \beta = -\frac{1}{2}$ $KA = \tan^{-1}\left(\frac{1}{2}\right)$ $= 26,57^\circ$ $\beta = 180^\circ - 26,57^\circ$ $= 153,43^\circ$ $\theta = 153,43^\circ - 33,69^\circ$ $= 119,74^\circ$	<p>✓ $\alpha = 33,69^\circ$ ✓ $\tan \beta = -\frac{1}{2}$ ✓ $153,43^\circ$ ✓ CA $119,74^\circ$ (4)</p>
<p>4.3</p>	$-\frac{1}{2}x + 4 = 0$ $x = 8$ $R(8;0)$ $MR = 8 - (-3) \text{ OR/OF } MR = \sqrt{(-3-8)^2 - 0^2}$ $= 11 \text{ units / eenhede}$	<p>✓ $y = 0$ ✓ $x = 8$ ✓ CA answer/antw (3)</p>
<p>4.4</p>	$\text{Area of } \triangle MNR = \frac{1}{2} (MR) \cdot \perp \text{ height}$ $= \frac{1}{2} (11)(y - \text{value of } N)$ $= \frac{1}{2} (11)(4)$ $= 22 \text{ sq units/vk eenh}$	<p>✓ area formula/formule ✓ subst y-value of N subst y- waarde van N ✓ CA answer/antw</p>



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	<p>OR/OF</p> $MN = \sqrt{(3 - (-3))^2 + (4 - 0)^2}$ $= \sqrt{36 + 16}$ $= \sqrt{52} \text{ units/eenh}$ <p>Area of/Opp van $\Delta MNR = \frac{1}{2} \times \sqrt{52} \times 11 \times \sin 33,69^\circ$</p> $= 21,999$ $\approx 22 \text{ sq units/vk eenh}$	<p>✓ CA $\sqrt{52}$</p> <p>✓ subst in area form <i>Subst in oppervlak formule</i></p> <p>✓ CA answer/antw</p> <p style="text-align: right;">(3) [13]</p>
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QUESTION/VRAAG 5

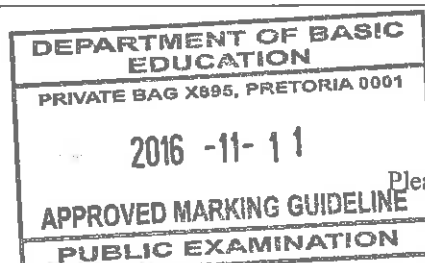
5.1.1	$x^2 + y^2 = r^2$ $(-8)^2 + (t)^2 = 17^2$ $t^2 = 225$ $t = -15$	<p>✓ subst in pyth</p> <p>✓ answer/antw</p> <p style="text-align: right;">(2)</p>
5.1.2(a)	$\cos(-\theta)$ $= \cos \theta$ $= \frac{-8}{17}$	<p>✓ $\cos \theta$</p> <p>✓ answer/antw</p> <p style="text-align: right;">(2)</p>
5.1.2(b)	$1 - \sin \theta = 1 - \frac{-15}{17}$ $= \frac{17}{17} + \frac{15}{17}$ $= \frac{32}{17}$	<p>✓ CA subst</p> <p>✓ CA answer/antw</p> <p style="text-align: right;">(2)</p>
5.2.1	$\tan 17^\circ = \frac{a}{\sqrt{1-a^2}}$ 	<p>✓ Sketch/Pythagoras Skets/Pythagoras</p> <p>✓ $\sqrt{1-a^2}$</p> <p>✓ CA answer/antw</p> <p>Answer only : Full marks/ Slegs antwoord: Vol punte</p>

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		(3)
5.2.2	$\sin 107^\circ$ $= \sin(90^\circ + 17^\circ)$ $= \cos 17^\circ$ $= \sqrt{1 - a^2}$ <p>OR/OF</p> $\sin 107^\circ$ $= \sin(180^\circ - 73^\circ)$ $= \sin 73^\circ$ $= \sqrt{1 - a^2}$	$\checkmark \cos 17^\circ$ $\checkmark \text{CA } \sqrt{1 - a^2}$ $\checkmark \sin 73^\circ$ $\checkmark \text{CA } \sqrt{1 - a^2}$
		(2)

5.2.3	$\cos^2 253^\circ + \sin^2 557^\circ$ $= (-\cos 73^\circ)^2 + (-\sin 17^\circ)^2$ $= (-a)^2 + (-a)^2$ $= 2a^2$	$\checkmark \cos^2 73^\circ$ $\checkmark \sin^2 17^\circ$ $\checkmark \text{subst of ratios/}$ subst van trig verhoudings $\checkmark \text{answer/antw}$
5.3	$\frac{\cos(180^\circ + 45^\circ)\sin(180^\circ - 45^\circ) + \sin(360^\circ - 30^\circ)}{\tan(180^\circ + 45^\circ)}$ $= \frac{(-\cos 45^\circ) \cdot (\sin 45^\circ) - \sin 30^\circ}{\tan 45^\circ}$ $= \frac{\left(-\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \frac{1}{2}}{1}$ $= -1$	$\checkmark -\cos 45^\circ$ $\checkmark \sin 45^\circ$ $\checkmark -\sin 30^\circ$ $\checkmark \tan 45^\circ$ $\checkmark \text{Special angle ratios}$ Speciale hoeke $\checkmark \text{CA answer/antw}$
		(6)



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5.4

$$\begin{aligned}
 RHS &= \frac{-1}{\tan^2 x \cdot \cos^2 x} \\
 &= \frac{-1}{\frac{\sin^2 x}{\cos^2 x} \times \cos^2 x} \\
 &= \frac{-1}{\sin^2 x} \\
 &= \frac{-1}{1 - \cos^2 x} \\
 &= \frac{1}{\cos^2 x - 1} \\
 &= \frac{1}{(\cos x + 1)(\cos x - 1)} \\
 &= LHS
 \end{aligned}$$

OR/OF

$$\begin{aligned}
 LHS &= \frac{1}{(\cos x + 1)(\cos x - 1)} \\
 &= \frac{1}{\cos^2 x - 1} \\
 &= \frac{1}{-\sin^2 x} \\
 &= \frac{-1}{\sin^2 x} \\
 &= \frac{-1}{\frac{\sin^2 x}{\cos^2 x} \times \frac{\cos^2 x}{1}} \\
 &= \frac{-1}{\tan^2 x \cdot \cos^2 x}
 \end{aligned}$$

✓ $\tan x = \frac{\sin x}{\cos x}$

✓ simplification/vereenv.

✓ identity/ identiteit

✓ factors /faktore

✓ $\cos^2 x - 1$

✓ $-\sin^2 x$

✓ $\frac{-1}{\sin^2 x}$

✓ $\frac{\sin^2 x}{\cos^2 x} \times \frac{\cos^2 x}{1}$

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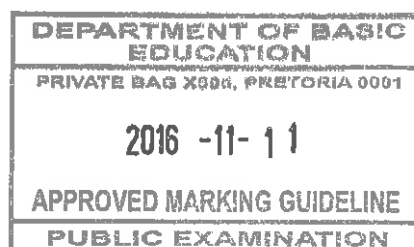
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	<p>OR/OF</p> $RHS = \frac{-\cos^2 x}{\sin^2 x \cdot \cos^2 x}$ $= \frac{-1}{\sin^2 x}$ $LHS = \frac{1}{\cos^2 x - 1}$ $= \frac{1}{-\sin^2 x}$ <p>$RHS = LHS$</p>	$\checkmark \frac{1}{\tan^2 x} = \frac{\cos^2 x}{\sin^2 x}$ $\checkmark \frac{-1}{\sin^2 x}$ $\checkmark \cos^2 x - 1$ $\checkmark -\sin^2 x$ <p style="text-align: right;">(4)</p>
<p>5.5</p>	$2 \sin x \cos x - \cos x = 0$ $\cos x (2 \sin x - 1) = 0$ $\cos x = 0 \qquad \text{or} \qquad \sin x = \frac{1}{2}$ $x = 90^\circ + 360^\circ \cdot k, k \in Z \qquad x = 30^\circ + 360^\circ k, k \in Z \qquad \text{or}$ $x = 270^\circ + 360^\circ \cdot k, k \in Z \qquad x = 150^\circ + 360^\circ k, k \in Z$ <p>or</p> $x = 90^\circ + 180^\circ k, k \in Z$ <p>or</p> $x = \pm 90^\circ + 360^\circ k, k \in Z$ <div style="text-align: center; border: 1px solid black; padding: 5px; margin-top: 20px;"> <p>DEPARTMENT OF BASIC EDUCATION</p> <p>PRIVATE BAG X895, PRETORIA 0001</p> <p>2016 -11- 11</p> <p>APPROVED MARKING GUIDELINE</p> <p>PUBLIC EXAMINATION</p> </div>	$\checkmark \text{factors / faktore}$ $\checkmark \text{both equations/ beide verg.}$ $\checkmark \text{BOTH general solutions for } \cos x = 0/ \text{Altwee algemene oplossings vir } \cos x = 0$ $\checkmark \text{general solutions for } \sin x = \frac{1}{2} \text{ algemene oplossings vir } \sin x = \frac{1}{2}$ $\checkmark k \in Z$ <p style="text-align: right;">(6) [31]</p>

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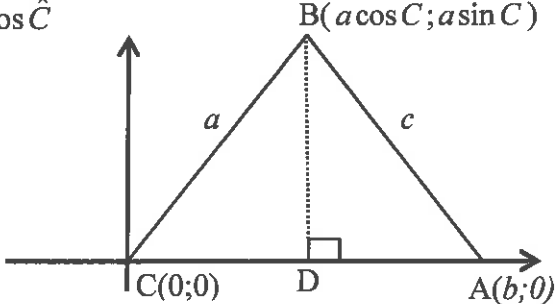
QUESTION/VRAAG 6

6.1	$b = 30^\circ$	✓ answer/antw (1)
6.2	360°	✓ answer/antw (1)
6.3	$f(x) = g(x)$ $x = -150^\circ$ $x = 30^\circ$	✓ $x = -150^\circ$ ✓ $x = 30^\circ$ (2)
6.4	$\sin(90^\circ - x) > g(x)$ $\cos x > g(x)$ $f(x) > g(x)$ $x \in (-150^\circ; 30^\circ)$ or $-150^\circ < x < 30^\circ$	✓ $\cos x$ ✓ end points/eindpnte ✓ notation/notasie (3)
6.5	Range: $y \in [2; 4]$ or / of $2 \leq y \leq 4$	✓ end points/eindpnte ✓ notation/notasie (2)
		[9]



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QUESTION/VRAAG 7

<p>7.1</p>	<p> $AB^2 = AD^2 + BD^2$ [pythagoras] $c^2 = (b - a \cos \hat{C})^2 + (a \sin \hat{C})^2$ $= b^2 - 2ab \cos \hat{C} + a^2 \cos^2 \hat{C} + a^2 \sin^2 \hat{C}$ $= b^2 - 2ab \cos \hat{C} + a^2 (\cos^2 \hat{C} + \sin^2 \hat{C})$ $= a^2 + b^2 - 2ab \cos \hat{C}$ </p> 	<ul style="list-style-type: none"> ✓ $B(a \cos C; a \sin C)$ ✓ $A(b; 0)$ ✓ distance formula/ afstand formule. ✓ expansion/ontwikk. ✓ common factor/ gemene faktor ✓ square identity/ vierkants identiteit <p>(6)</p>
<p>7.1.2</p>	<p> $c^2 = a^2 + b^2 - 2ab \cos \hat{C}$ $\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$ $1 + \cos \hat{C} = 1 + \frac{a^2 + b^2 - c^2}{2ab}$ $= \frac{2ab}{2ab} + \frac{a^2 + b^2 - c^2}{2ab}$ $= \frac{a^2 + 2ab + b^2 - c^2}{2ab}$ $= \frac{(a+b)^2 - c^2}{2ab}$ $= \frac{(a+b+c)(a+b-c)}{2ab}$ </p>	<p> $c^2 = a^2 + b^2 - 2ab \cos \hat{C}$ $\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$ </p> <ul style="list-style-type: none"> ✓ making cos C the subject of formula/maak cos C die onderwerp van die formule ✓ Adding 1 on both sides/ Tel 1 by albei kante ✓ simplifying/ vereenvoudig ✓ factorising/ faktorisering

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OR / OF

$$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$$

$$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$$

$$RHS = \frac{(a+b)^2 - c^2}{2ab}$$

$$= \frac{a^2 + 2ab + b^2 - c^2}{2ab}$$

$$= \frac{a^2 + b^2 - c^2}{2ab} + \frac{2ab}{2ab}$$

$$= \cos \hat{C} + 1$$

= LHS

OR / OF

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$2ab \cos C = a^2 + b^2 - c^2$$

$$2ab + 2ab \cos C = a^2 + 2ab + b^2 - c^2$$

$$2ab(1 + \cos C) = (a+b)^2 - c^2$$

$$1 + \cos C = \frac{(a+b)^2 - c^2}{2ab}$$

$$c^2 = a^2 + b^2 - 2ab \cos \hat{C}$$

$$\therefore \cos \hat{C} = \frac{a^2 + b^2 - c^2}{2ab}$$

✓ Making cos C the subject of the formula/
Maak cos C die onderwerp van die formule

✓ writing as a difference of 2 squares/
Skryf as die verskil tussen twee vierkante

✓ expansion/ontwikkel

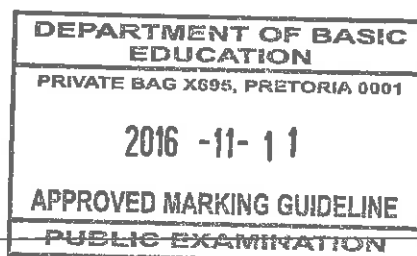
✓ splitting up the fraction / Deel die breuk in twee

✓ making $2ab \cos C$ the subject of the formula/
Maak $2ab \cos C$ die onderwerp van die formule

✓ adding 2ab on both sides of equation/
tel 2ab aan beide kante van die vergelyking

✓ common factor/
gemene faktor

✓ factorise the trinomial/
faktoriseer die drieterm

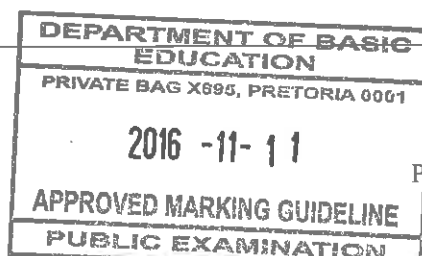


(4)

7.2.1	<p>In $\triangle ABD$</p> $\frac{BD}{\sin 109,16^\circ} = \frac{90,52}{\sin 31,23^\circ}$ $BD = \frac{90,52 \times \sin 109,16^\circ}{\sin 31,23^\circ}$ $= 164,92 \text{ m}$	<p>✓ sine rule/sinusreël</p> <p>✓ subst</p> <p>✓ answer/antw.</p> <p>(3)</p>
7.2.2	$CD^2 = 164,92^2 + 235^2 - 2 \times 164,92 \times 235 \times \cos 48,88^\circ$ $CD^2 = 31448,4874$ $CD = 177,34 \text{ m}$	<p>✓ cos rule/cosinusreël</p> <p>✓ subst</p> <p>✓ CA answer/antw.</p> <p>(3)</p>
		[16]

QUESTION/VRAAG 8

8.1	$\tan 35,5^\circ = \frac{0,5}{AB}$ $AB = \frac{0,5}{\tan 35,5^\circ}$ $= 0,7 \text{ m}$	<p>✓ subst</p> <p>✓ answer/antw</p> <p>(2)</p>
8.2	<p>Volume of cone $= \frac{1}{3} \times \pi (0,5)^2 \times 0,7$</p> $= 0,18 \text{ m}^3$ <p>Volume of a cylinder $= \pi (0,5)^2 \times 1,1$</p> $= 0,86 \text{ m}^3$ <p>$\frac{3}{4}$ of volume $= \frac{3}{4} \times (0,18 + 0,86)$</p> $= \frac{3}{4} \times (1,04) \text{ m}^3$ $= 0,78 \text{ m}^3$ <p>Time taken by pump $= \frac{0,78 \text{ m}^3}{0,52 \text{ m}^3/\text{h}}$</p> $= 1,5 \text{ hours}$	<p>✓ CA V of cone/keël</p> <p>✓ CA V of cylinder/silinder</p> <p>✓ CA 0,78 m³</p> <p>✓ CA answer/antw</p> <p>(4)</p>
		[6]



WVW

QUESTION/VRAAG 9

9.1	Equal to twice the angle subtended by the arc at the circumference	✓ ✓ answer/antw (2)
9.2.1	$\hat{R} = 30$ [\angle at centre = $2 \times \angle$ at circumference]	✓ S ✓ R (2)
9.2.2	$\hat{NST} = 30^\circ$ [equal chords subtends equal angles]	✓ S ✓ R (2) [6]

QUESTION/VRAAG 10

10.1	$D\hat{E}G = x + 20^\circ$ [alt \angle 's, ED FG] OR/OF $D\hat{E}G = 170^\circ - 2x$ [opp angles of cyclic quad]	✓ S ✓ R ✓ S ✓ R (2)
10.2	$x + 20^\circ + 2x + 10^\circ = 180^\circ$ [opp \angle of cyclic quad] $3x = 150^\circ$ $x = 50^\circ$ $D\hat{H}G = 2(50^\circ) + 10^\circ$ $= 110^\circ$ OR/OF $x + 20^\circ = 170^\circ - 2x$ [alt 's, ED FG] $3x = 150^\circ$ $x = 50$ $D\hat{H}G = 2(50^\circ) + 10^\circ$ $= 110^\circ$	✓ S ✓ R ✓ answer/antw ✓ 110° ✓ S ✓ R ✓ answer/antw ✓ 110° (4) [6]

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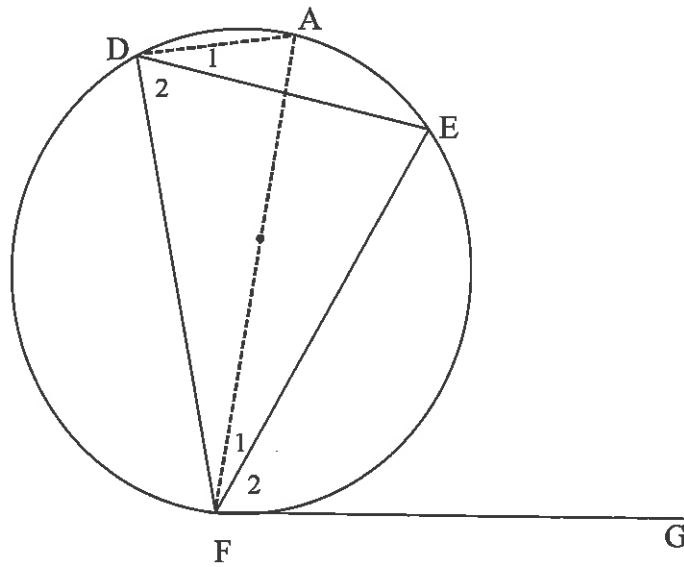
QUESTION/VRAAG 11

<p>11.1</p>	<p>SP = SR [tangents from the same point] $\hat{P}RS = 42,83^\circ$ [\hat{c}'s between equal sides] $\hat{O}RS = 90^\circ$ [tan \perp rad] $\hat{O}RN = 90^\circ - 42,83^\circ$ $= 47,17^\circ$ $\hat{N}OR = 90^\circ - 47,17^\circ$ [sum \hat{c}'s of Δ] $= 42,83^\circ$</p>	<p>✓ S ✓ S ✓ S/R ✓ $\hat{O}RN$ ✓ answer/antw</p> <p>(5)</p>
<p>11.2</p>	<p>Let $OR = x$ $OS = x + 9$ $\hat{O}RS = 90^\circ$ [tan \perp rad] $x^2 + 15^2 = (x + 9)^2$ [Pythagoras] $x^2 + 225 = x^2 + 18x + 81$ $18x = 144$ $x = 8 \text{ units}$ <i>radius = 8 units</i></p> <p style="text-align: center;">OR/OF</p> <p><i>In ΔNRS</i> $\cos 42,83^\circ = \frac{NR}{15}$ $NR = 15 \cos 42,83^\circ$ $= 11$</p> <p><i>In ΔORN</i> $\sin 42,83^\circ = \frac{11}{OR}$ $OR = \frac{11}{\sin 42,83} = 16,18$</p>	<p>✓ S ✓ S ✓ Using Pythagoras / <i>Gebruik Pythagoras</i> ✓ answer/antw</p> <p>✓ $\cos 42,83^\circ = \frac{NR}{15}$ ✓ 11 ✓ $\sin 42,83^\circ = \frac{11}{OR}$ ✓ 16,18</p> <p>(4)</p>
		<p>[9]</p>

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QUESTION/VRAAG 12



<p>12.1</p>	<p>Construction: Draw diameter AOF. Join A to D.</p> $\hat{F}_1 + \hat{F}_2 = 90^\circ \text{ [tan } \perp \text{ diameter]}$ $\hat{D}_1 = \hat{F}_1 \text{ [}\angle\text{'s in the same segment]}$ $\hat{D}_1 + \hat{D}_2 = 90^\circ \text{ [}\angle\text{ in a semi circle]}$ $\therefore \hat{F}_2 = \hat{D}_2$ $E\hat{F}G = F\hat{D}E$ <p style="text-align: center;">OR / OF</p> <p>Construction : Draw diameter AOF. Join A to E.</p> $\hat{F}_1 + \hat{F}_2 = 90^\circ \text{ [tan } \perp \text{ diameter]}$ $A\hat{E}F = 90^\circ \text{ [}\angle\text{'s in the semi circle]}$ $\hat{C} + \hat{F}_1 = 90^\circ \text{ [sum of } \angle\text{'s in } \Delta\text{]}$ $\therefore \hat{F}_1 + \hat{F}_2 = \hat{C} + \hat{F}_1$ $\therefore \hat{F}_2 = \hat{C}$ <p>but $\hat{C} = \hat{D}$ [}\angle\text{'s in the same segment]}</p> $\therefore \hat{F}_2 = \hat{D}_2$ $E\hat{F}G = F\hat{D}E$	<p>✓ Constr/Kons</p> <p>✓ S</p> <p>✓ R</p> <p>✓ S ✓ R</p> <p style="text-align: right;">(5)</p>
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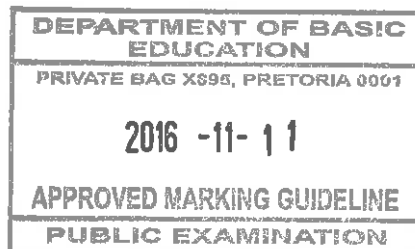
	<p>OR/OF</p> <p><i>Construction: Draw radii OF and OE</i></p> <p>Let $\hat{E}\hat{O}F = 2x$</p> <p>$\therefore \hat{D} = x$ [\angle at centre = $2 \times \angle$ at circumference]</p> <p>$\hat{O}\hat{F}E = 90^\circ - x$ [sum of int \angle's of Δ]</p> <p>$\therefore \hat{E}\hat{F}G = x$ [rad \perp tan]</p> <p>$\therefore \hat{E}\hat{F}G = \hat{F}\hat{D}E$</p>	
12.2.1	<p>$\hat{B}\hat{A}C = 90^\circ$ [\angle in a semi circle]</p> <p>$\hat{E}_2 = 90^\circ$ [line drawn from centre to midpont of chord]</p> <p>$\therefore \hat{B}\hat{A}C = \hat{E}_2$</p> <p>$BA \parallel OD$ [corresp. \angle's are equal]</p> <p>OR/OF</p> <p>$\hat{B}\hat{A}C = 90^\circ$ [\angle in a semi circle]</p> <p>$\hat{E}_4 = 90^\circ$ [Line from centre to midpo int of chord]</p> <p>$\hat{B}\hat{A}C = \hat{E}_4$</p> <p>$\Rightarrow BA \parallel OD$ [Alt \angle's are equal]</p>	<p>✓ S / R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>✓ S / R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>(4)</p>
12.2.2	<p>$\hat{A}_1 = x$</p> <p>$\hat{B} = x$ [tan– chord theorem]</p> <p>$\hat{O}_1 = x$ [corresp \angle's equal, $AB \parallel OD$]</p> <p>$\hat{A}_1 = \hat{O}_1$</p> <p>$\therefore AOCD$ is a cyclic quadrilateral [conv. \angle's in the same segment]</p> <p>OR/OF</p> <p>Let $\hat{O}_1 = a$</p> <p>$\hat{C}_1 = 90^\circ - a$ [int. \angle's of Δ]</p> <p>$\therefore \hat{A}_2 = 90^\circ - a$ [\angle's opp = sides]</p> <p>$\therefore \hat{A}_1 = a$ [tan \perp rad]</p> <p>$\therefore \hat{O}_1 = \hat{A}_1$</p> <p>$\therefore AOCD$ is a cyclic quadrilateral. [Converse \angle's in the same segment]</p>	<p>✓ S ✓ R</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>✓ S</p> <p>✓ S</p> <p>✓ S ✓ R</p> <p>✓ R</p> <p>(5)</p>

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<p>12.2.3</p>	<p>$\hat{AOC} = 2x$ [\angle at centre = $2 \times \angle$ at circumf.] $\hat{O}_1 = x$ $\therefore \hat{O}_2 = x$ $\hat{C}_2 = \hat{O}_2 = x$ [\angle's in the same segment] $\therefore \hat{C}_2 = \hat{B} = x$ $\therefore DC$ is a tan gent to circle [conv. tan – chord]</p> <p>OR/OF</p> <p>$\hat{OCD} = 90^\circ$ [opp \angle's of cyclic quadrilateral] $\therefore CD$ is a tan gent. [Converse tan \perp rad]</p> <p>OR/OF</p> <p>$\hat{B} = \hat{A}_3$ [\angle's opp = sides] $\hat{A}_3 = \hat{O}_2$ [Alt \angle's; $\hat{O}_2 = \hat{C}_2$ [Angles in the same segment] $\therefore \hat{C}_2 = \hat{B}$ $\therefore DC$ is a tan gent. [Converse tan – chord]</p>	<p>✓ S ✓ R ✓ S / R ✓ R ✓ S ✓ R ✓ S ✓ R ✓ S / R ✓ S / R ✓ S / R ✓ R (4)</p>
<p>[18]</p>		

TOTAL/TOTAAL: 150



WZW



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TO: HEADS OF EXAMINATION SECTIONS
HEADS OF CURRICULUM SECTIONS

EXAMINATION INSTRUCTION NO 36 OF 2016

AMENDMENTS TO THE MARKING GUIDELINE OF THE 2016 COMMON EXAMINATION FOR GRADE 11: MATHEMATICS P2

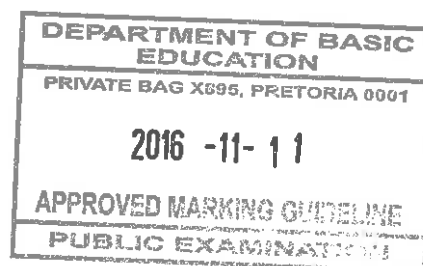
Error on both English and Afrikaans versions: Question 8

1. Due to a typographical error in sub question 8.2, the rate was given as $0,52\text{m}^2/\text{h}$. This is incorrect. The correct rate should have been $0,52\text{m}^3/\text{h}$.
2. As a result this sub question which counts for 4 marks must be excluded.
3. Consequently the total marks for the question paper must be reduced to 146 marks, then scaled up to 150 marks.
4. Refer to **Annexure A** that provides the conversion table that must be used to calculate the learner's total marks.
5. For further information please contact the Director: Examinations and Assessment, Ms P Ogunbanjo at 012 357 3909 or email: Ogunbanjo.p@dbe.gov.za


DR RR POLIAH

CHIEF DIRECTOR: NATIONAL ASSESSMENT AND PUBLIC EXAMINATIONS

DATE: 15-11-16.



Annexure A: GRADE 11 MATHEMATICS:ENGLISH AND AFRIKAANS VERSIONS- MARKS CONVERTED FROM 146 TO 150

Mark out of 146	Converted to 150
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
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34	35
35	36
36	37
37	38
38	39
39	40
40	41
41	42
42	43
43	44
44	45

Mark out of 146	Converted to 150
45	46
46	47
47	48
48	49
49	50
50	51
51	52
52	53
53	54
54	55
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78	80
79	81
80	82
81	83
82	84
83	85
84	86
85	87
86	88
87	89
88	90

Mark out of 146	Converted to 150
89	91
90	92
91	93
92	95
93	96
94	97
95	98
96	99
97	100
98	101
99	102
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124	127
125	128
126	129
127	130
128	132
129	133
130	134
131	135
132	136

Mark out of 146	Converted to 150
133	137
134	138
135	139
136	140
137	141
138	142
139	143
140	144
141	145
142	146
143	147
144	148
145	149
146	150

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