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

This memorandum consists of 21 pages.
Hierdie memorandum bestaan uit 21 bladsye.
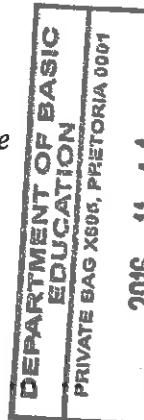
NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.
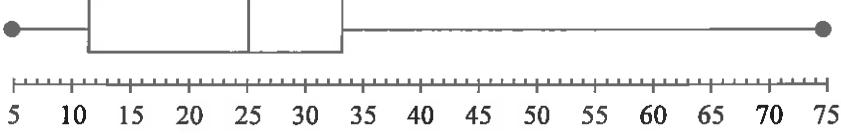
LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

5	8	15	20	25	27	31	36	75

| 1.1	Range/*Omvang* = 75 − 5 = 70	✓ answer/*antw* (1)
1.2	Std dev/*Std afwyking* = 19,56	✓ rounding/afronding ✓ answer/*antw* (2)
1.3	Median/*Mediaan* = 25	✓ answer/*antw*　(1)
1.4	$Q_1 = \dfrac{8+15}{2} = 11,5$ $Q_2 = \dfrac{31+36}{2} = 33,5$ 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]**

QUESTION/*VRAAG* 2
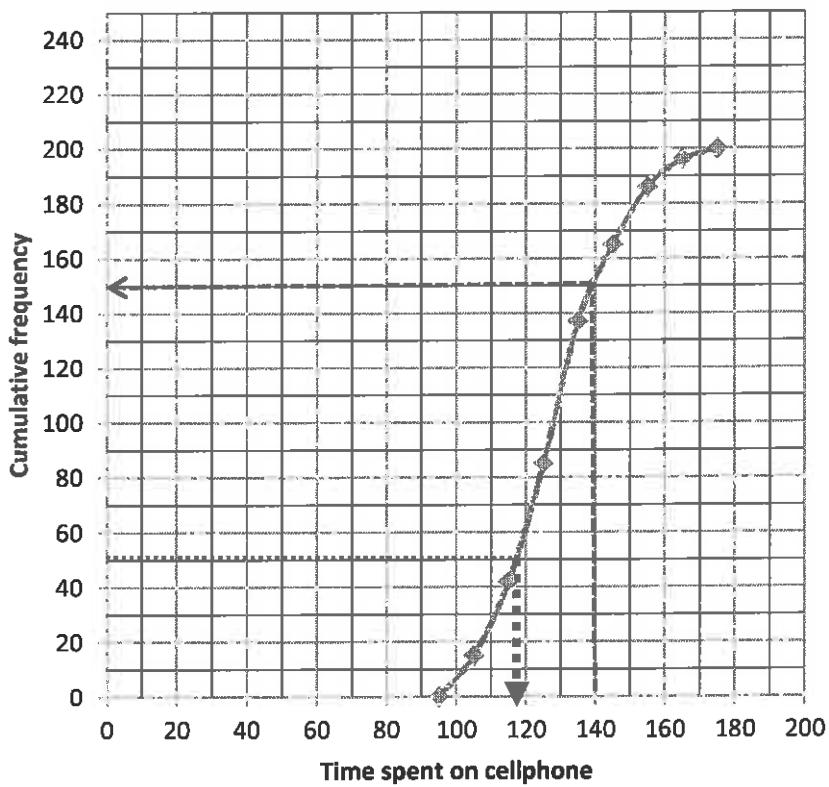
2.1

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

(2)

2.2

✓Grounding/ *Ankerpunt*
✓✓
8 points correct/
8 punte korrek
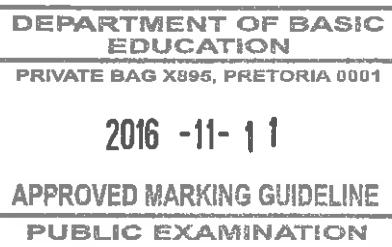
OR/*OF*

✓ Grounding/ *Ankerpunt*

✓
4–7 points correct
4-7 punte korrek

(3)

2.3	$Q_1 = 118$ Accept any answer between (115 and 120)	✓ CA ✓ CA answer/*antw* (2)
2.4	*Number of learners / Getal leerders* $= 200 - 150$ $\qquad\qquad\qquad\qquad\qquad\qquad = 50$ Accept 150 or any other reading between (145 and 155)	✓CA 150 ✓CA 50 (2) **[9]**
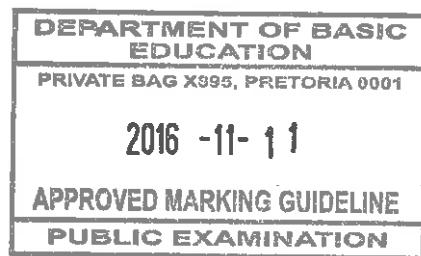
QUESTION/*VRAAG* 3

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

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

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OR/*OF*

From B to A

$$(x;y) \rightarrow (x+4;y-17)$$
$$D(-4+4;3-17)$$
$$D(0\;;-14)$$

$\checkmark x+4$

$\checkmark y-17$

$\checkmark$ subst

$\checkmark D(0\;;-14)$

(4)
[15]
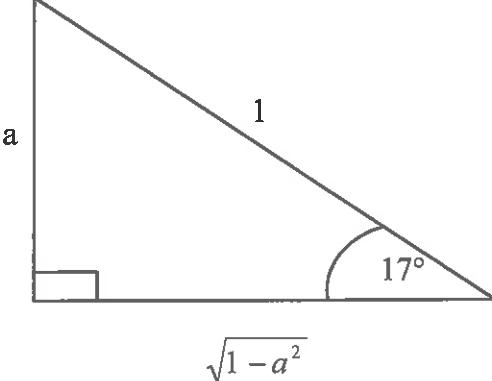
QUESTION/*VRAAG* 4

4.1	$m_{MP} = m_{PN}$ $$\frac{2-0}{0-k} = \frac{4-2}{3-0}$$ $$\frac{2}{-k} = \frac{2}{3}$$ $$k = -3$$	✓ $m_{MP} = m_{PN}$ ✓ subst. in gradient form./*vorm* ✓ answer/*antw* (3)
4.2	$\tan\alpha = m_{PN}$ $$\tan\alpha = \frac{2}{3}$$ $$\alpha = 33,69°$$ $\tan\beta = m_{AB}$ $$\tan\beta = -\frac{1}{2}$$ $$\beta = -26,57° + 180°$$ $$= 153,43°$$ OR/*OF* $\tan\beta = m_{AB}$ $$\tan\beta = -\frac{1}{2}$$ $$KA = \tan^{-1}\left(\frac{1}{2}\right)$$ $$= 26.57°$$ $$\beta = 180° - 26.57°$$ $$= 153,43°$$ $$\theta = 153,43° - 33,69°$$ $$= 119,74°$$	✓ $\alpha = 33,69°$ ✓ $\tan\beta = -\frac{1}{2}$ ✓ $153,43°$ ✓CA $119,74°$ (4)
4.3	$$-\frac{1}{2}x + 4 = 0$$ $$x = 8$$ $$R(8;0)$$ $MR = 8 - (-3)$ OR/*OF* $MR = \sqrt{(-3-8)^2 - 0^2}$ $$= 11 units \text{ / } eenhede$$	✓ $y = 0$ ✓ $x = 8$ ✓CA answer/*antw* (3)
4.4	$Area \text{ of } \triangle MNR = \frac{1}{2}(MR).\perp height$ $$= \frac{1}{2}(11)(y - value \text{ of } N)$$ $$= \frac{1}{2}(11)(4)$$ $$= 22 \quad sq \text{ } units/vk \text{ } eenh$$	✓ area formula/*formule* ✓ subst y-value of N subst y- waarde van N ✓CA answer/*antw*

	OR/*OF*	
	$MN = \sqrt{(3-(-3))^2 + (4-0)^2}$ $= \sqrt{36+16}$ $= \sqrt{52}$ units/*eenh* Area of/*Opp van* $\Delta MNR = \dfrac{1}{2} \times \sqrt{52} \times 11 \times \sin 33,69°$ $= 21,999$ ≈ 22 sq units/*vk eenh*	✓ CA $\sqrt{52}$ ✓ subst in area form *Subst in oppervlak formule* ✓CA answer/*antw* (3) **[13]**

QUESTION/*VRAAG* 5

|		
5.1.1	$x^2 + y^2 = r^2$ $(-8)^2 + (t)^2 = 17^2$ $t^2 = 225$ $t = -15$	✓ subst in pyth ✓ answer/*antw* (2)
5.1.2(a)	$\cos(-\theta)$ $= \cos\theta$ $= \dfrac{-8}{17}$	✓ $\cos\theta$ ✓ answer/*antw* (2)
5.1.2(b)	$1 - \sin\theta = 1 - \dfrac{-15}{17}$ $= \dfrac{17}{17} + \dfrac{15}{17}$ $= \dfrac{32}{17}$	✓CA subst ✓CA answer/*antw* (2)

5.2.1	$\tan 17° = \dfrac{a}{\sqrt{1-a^2}}$
	
	       a 1
	
	               17°
	        $\sqrt{1-a^2}$
		✓ Sketch/Pythagoras
		Skets/ Pythagoras
		✓ $\sqrt{1-a^2}$
		
		✓CA answer/*antw*
		
		Answer only : Full marks/ *Slegs antwoord:* **Vol punte**
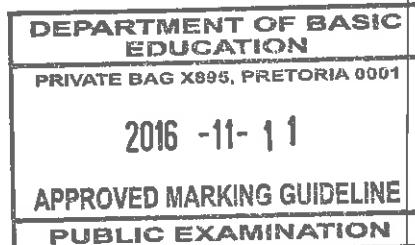
		(3)
5.2.2	$\sin 107°$ $= \sin(90° + 17°)$ $= \cos 17°$ $= \sqrt{1 - a^2}$ **OR/*OF*** $\sin 107°$ $= \sin(180° - 73°)$ $= \sin 73°$ $= \sqrt{1 - a^2}$	✓ $\cos 17°$ ✓CA $\sqrt{1 - a^2}$ ✓$\sin 73°$ ✓CA $\sqrt{1 - a^2}$ (2)
5.2.3	$\cos^2 253° + \sin^2 557°$ $= (-\cos 73)^2 + (-\sin 17°)^2$ $= (-a\ )^2 + (-a\ )^2$ $= 2a^2$	✓ $\cos^2 73°$ ✓ $\sin^2 17°$ ✓ subst of ratios/ *subst van trig* *verhoudings* ✓ answer/*antw* (4)
5.3	$\dfrac{\cos(180° + 45°)\sin(180° - 45°) + \sin(360° - 30°)}{\tan(180° + 45°)}$ $= \dfrac{(-\cos 45°).(\sin 45°) - \sin 30°}{\tan 45°}$ $= \dfrac{\left(-\dfrac{\sqrt{2}}{2}\right)\left(\dfrac{\sqrt{2}}{2}\right) - \dfrac{1}{2}}{1}$ $= -1$	✓ $-\cos 45°$ ✓ $\sin 45°$ ✓ $-\sin 30°$ ✓$\tan 45°$ ✓Special angle ratios *Spesiale hoeke* ✓CA answer/*antw* (6)

| 5.4	$RHS = \dfrac{-1}{\tan^2 x \cdot \cos^2 x}$	
	$= \dfrac{-1}{\dfrac{\sin^2 x}{\cos^2 x} \times \cos^2 x}$	✓ $\tan x = \dfrac{\sin x}{\cos x}$
	$= \dfrac{-1}{\sin^2 x}$	✓ simplification/*vereenv.*
	$= \dfrac{-1}{1 - \cos^2 x}$	✓ identity/ identiteit
	$= \dfrac{1}{\cos^2 x - 1}$	
	$= \dfrac{1}{(\cos x + 1)(\cos x - 1)}$	✓ factors /*faktore*
	$= LHS$	
	OR/*OF*	
	$LHS = \dfrac{1}{(\cos x + 1)(\cos x - 1)}$	✓ $\cos^2 x - 1$
	$= \dfrac{1}{\cos^2 x - 1}$	✓ $-\sin^2 x$
	$= \dfrac{1}{-\sin^2 x}$	✓ $\dfrac{-1}{\sin^2 x}$
	$= \dfrac{-1}{\sin^2 x}$	
	$= \dfrac{-1}{\dfrac{\sin^2 x}{\cos^2 x} \times \dfrac{\cos^2 x}{1}}$	✓ $\dfrac{\sin^2 x}{\cos^2 x} \times \dfrac{\cos^2 x}{1}$
	$= \dfrac{-1}{\tan^2 x \cdot \cos^2 x}$	

OR/*OF*

$$RHS = \frac{-\cos^2 x}{\sin^2 x . \cos^2 x}$$

$$= \frac{-1}{\sin^2 x}$$

$$LHS = \frac{1}{\cos^2 x - 1}$$

$$= \frac{1}{-\sin^2 x}$$

$$RHS = LHS$$

✓ $\dfrac{1}{\tan^2 x} = \dfrac{\cos^2 x}{\sin^2 x}$

✓ $\dfrac{-1}{\sin^2 x}$

✓ $\cos^2 x - 1$

✓ $-\sin^2 x$

(4)

5.5

$2\sin x \cos x - \cos x = 0$

$\cos x(2\sin x - 1) = 0$

$\cos x = 0$ *or* $\sin x = \dfrac{1}{2}$

$x = 90° + 360°. \, k, \quad k \in Z$ $x = 30° + 360° k, \, k \in Z$ *or*

$x = 270° + 360°. \, k, \, k \in Z$ $x = 150° + 360° \, k, k \in Z$

or

$x = 90° + 180° \, k, k \in Z$

or

$x = \pm 90° + 360° k, k \in Z$
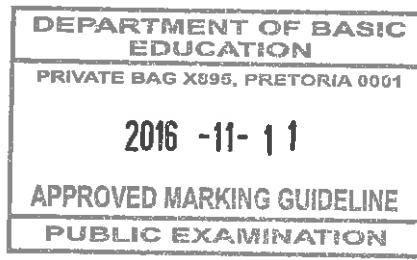
✓ factors / *faktore*

✓ both equations/
beide verg.

✓ BOTH general
solutions for
$\cos x = 0$/
*Altwee algemene
oplossings vir
cos x = 0*

✓✓ general solutions
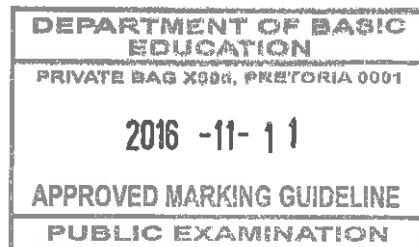
for $\sin x = \dfrac{1}{2}$
*algemene
oplossings vir*

$\sin x = \dfrac{1}{2}$

✓ $k \in Z$

(6)

[31]
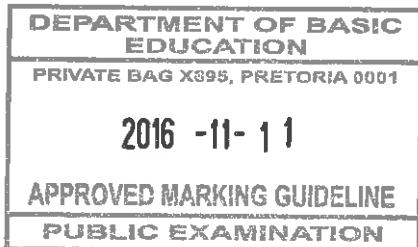
QUESTION/*VRAAG* 6

6.1	$b = 30°$	✓ answer/*antw* (1)
6.2	$360°$	✓ answer/*antw* (1)
6.3	$f(x) = g(x)$ $x = -150°$ $x = 30°$	✓ $x = -150°$ ✓ $x = 30°$ (2)
6.4	$\sin(90° - x) > g(x)$ $\cos x > g(x)$ $f(x) > g(x)$ $x \in (-150°; 30°)$ $or -150° < x < 30°$	✓ $\cos x$ ✓ 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]

QUESTION/*VRAAG* 7

7.1	$AB^2 = AD^2 + BD^2$ [*pythagoras*]	✓ $B(a\cos C\,;a\sin C)$
	$c^2 = (b - a\cos\hat{C})^2 + (a\sin\hat{C})^2$	✓ $A(b\,;0)$
	$\quad = b^2 - 2ab\cos\hat{C} + a^2\cos^2\hat{C} + a^2\sin^2\hat{C}$	✓ distance formula/ *afstand formule.*
	$\quad = b^2 - 2ab\cos\hat{C} + a^2(\cos^2\hat{C} + \sin^2\hat{C})$	✓ expansion/*ontwikk.*
	$\quad = a^2 + b^2 - 2ab\cos\hat{C}$	✓common factor/ *gemene faktor*
		✓ square identity/ *vierkants identiteit* (6)

7.1.2		
	$c^2 = a^2 + b^2 - 2ab\cos\hat{C}$	$c^2 = a^2 + b^2 - 2ab\cos\hat{C}$
	$\therefore \cos\hat{C} = \dfrac{a^2 + b^2 - c^2}{2ab}$	$\therefore \cos\hat{C} = \dfrac{a^2 + b^2 - c^2}{2ab}$
	$1 + \cos\hat{C} = 1 + \dfrac{a^2 + b^2 - c^2}{2ab}$	✓making cos C the subject of formula/*maak cos C die onderwerp van die formule*
	$\quad = \dfrac{2ab}{2ab} + \dfrac{a^2 + b^2 - c^2}{2ab}$	
	$\quad = \dfrac{a^2 + 2ab + b^2 - c^2}{2ab}$	✓Adding 1 on both sides/ *Tel 1 by albei kante*
	$\quad = \dfrac{(a+b)^2 - c^2}{2ab}$	✓ simplifying/ *vereenvoudig*
	$\quad = \dfrac{(a+b+c)(a+b-c)}{2ab}$	✓ factorising/ *faktorisering*

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*
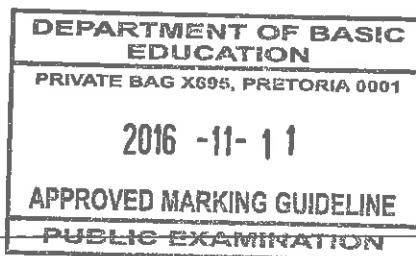
✓making 2abcosC the subject of the formula/ *Maak 2abcos C die onderwerp vn die formule*

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

QUESTION/VRAAG 8
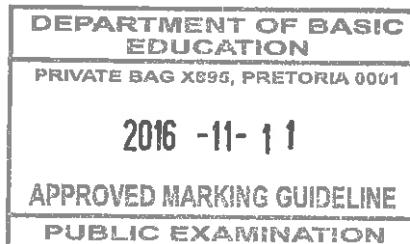
8.1	$$\tan 35,5° = \frac{0,5}{AB}$$ $$AB = \frac{0,5}{\tan 35,5°}$$ $$= 0,7 \ m$$	✓ subst ✓ answer/*antw* (2)
8.2	Volume of cone $= \frac{1}{3} \times \pi (0,5)^2 \times 0,7$ $= 0,18 \, m^3$ Volume of a cylinder $= \pi (0,5)^2 \times 1,1$ $= 0,86 \, m^3$ $\frac{3}{4}$ of volume $= \frac{3}{4} \times (0,18 + 0,86)$ $= \frac{3}{4} \times (1,04) \, m^3$ $= 0,78 \, m^3$ *Time taken by pump* $= \dfrac{0,78 \, m^3}{0,52 \, m^3/h}$ $= 1,5 \, hours$	✓CA V of cone/*keël* ✓CA V of cylinder/ *silinder* ✓CA 0,78 m³ ✓CA answer/*antw* (4)
		[6]

QUESTION/*VRAAG* 9

9.1	Equal to twice the angle subtended by the arc at the circumference	✓ ✓ answer/*antw* (2)
9.2.1	$\hat{R} = 30$ [∠ at centre $= 2 \times ∠$ at circumference]	✓ S ✓ R (2)
9.2.2	$N\hat{S}T = 30°$ [equal chords subtends equal angles]	✓ S ✓ R (2) **[6]**
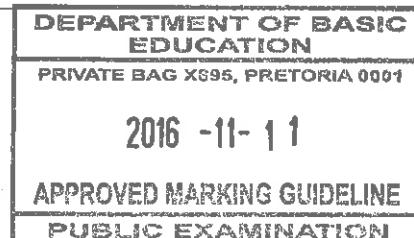
QUESTION/*VRAAG* 10
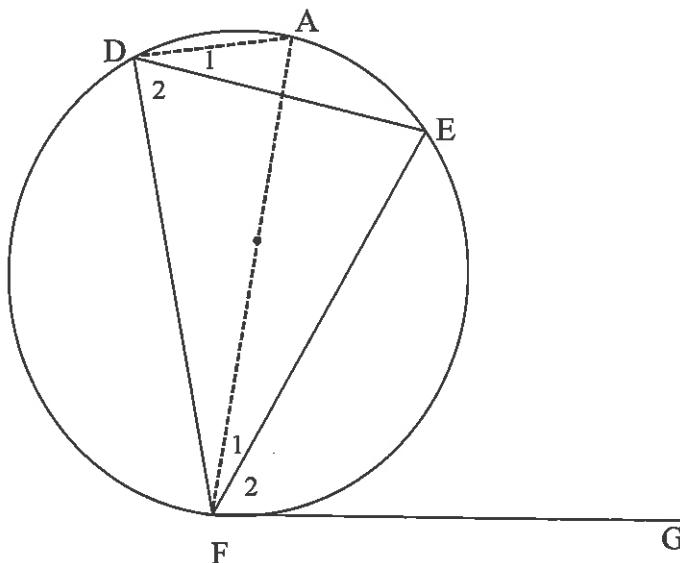
10.1	$D\hat{E}G = x + 20°$ [alt ∠'s, ED $\mid\mid$ FG] **OR/OF** $D\hat{E}G = 170° - 2x$ [opp angles of cyclic quad]	✓ S ✓R ✓ S ✓R (2)
10.2	$x + 20° + 2x + 10° = 180°$ *[opp ∠ of cyclic quad]* $3x = 150°$ $x = 50°$ $D\hat{H}G = 2(50°) + 10°$ $= 110°$ **OR/*OF*** $x + 20° = 170° - 2x$ [alt 's, ED $\mid\mid$ FG] $3x = 150°$ $x = 50$ $D\hat{H}G = 2(50°) + 10°$ $= 110°$	✓ S ✓R ✓ answer/*antw* ✓ 110° ✓ S✓R ✓ answer/*antw* ✓110° (4) **[6]**

QUESTION/*VRAAG* 11

11.1	$SP = SR$ [tangents from the same point]	✓ S
		✓ S
	$P\hat{R}S = 42{,}83°$ [<'s between equal sides]	
	$O\hat{R}S = 90°$ [tan $\perp$ rad]	✓ S/R
	$O\hat{R}N = 90° - 42{,}83°$	
	$\quad = 47{,}17°$	✓ $O\hat{R}N$
	$N\hat{O}R = 90° - 47{,}17°$ [sum <'s of Δ]	
	$\quad = 42{,}83°$	✓ answer/*antw*
		(5)
11.2	$Let\ OR = x$	✓ S
	$\quad OS = x + 9$	
	$\quad O\hat{R}S = 90°$ [tan $\perp$ rad]	✓ S
	$x^2 + 15^2 = (x+9)^2$ [Pythagoras]	
	$x^2 + 225 = x^2 + 18x + 81$	✓ Using Pythagoras / *Gebruik Pythagoras*
	$18x = 144$	
	$x = 8 units$	
	$radius = 8 units$ $\qquad$ OR/OF	✓ answer/*antw*
	$In\,\triangle NRS$	
	$\cos 42{,}83° = \dfrac{NR}{15}$	
	$NR = 15\cos 42{,}83°$	$✓ \cos 42{,}83° = \dfrac{NR}{15}$
	$\quad = 11$	✓ 11
	$In\,\triangle ORN$	
	$\sin 42{,}83° = \dfrac{11}{OR}$	$✓ \sin 42{,}83° = \dfrac{11}{OR}$
	$OR = \dfrac{11}{\sin 42{,}83} = 16{,}18$	✓ 16,18
		(4)
		[9]

QUESTION/*VRAAG* 12

12.1	Construction: Draw diameter AOF. Join A to D.	✓Constr/*Kons*
	$\hat{F}_1 + \hat{F}_2 = 90°$ *[tan $\perp$ diameter]*	✓ S
	$\hat{D}_1 = \hat{F}_1$ *[∠'s in the same segment]*	✓ R
	$\hat{D}_1 + \hat{D}_2 = 90°$ *[∠ in a semi circle]*	✓S ✓ R
	$\therefore \hat{F}_2 = \hat{D}_2$	
	$E\hat{F}G = F\hat{D}E$	
	OR / OF	
	Construction : Draw diameter AOF . Join A to E.	
	$\hat{F}_1 + \hat{F}_2 = 90°$ *[tan $\perp$ diameter]*	
	$A\hat{E}F = 90°[∠'s \ in \ the \ semi \ circle]$	
	$\hat{C} + \hat{F}_1 = 90°[sum \ of ∠'s \ in \ \Delta]$	
	$\therefore \hat{F}_1 + \hat{F}_2 = \hat{C} + \hat{F}_1$	
	$\therefore \hat{F}_2 = \hat{C}$	
	but $\hat{C} = \hat{D}[∠'s \ in \ the \ same \ segment]$	
	$\therefore \hat{F}_2 = \hat{D}_2$	
	$E\hat{F}G = F\hat{D}E$	(5)

	OR / OF *Construction: Draw radii OF and OE* Let $E\hat{O}F = 2x$ $\therefore \hat{D} = x$ [$\angle$ *at centre* $= 2 \times \angle$ *at circumference*] $O\hat{F}E = 90° - x$ [*sum of* int $\angle$'s of $\triangle$] $\therefore E\hat{F}G = x$ [*rad* $\perp$ tan] $\therefore E\hat{F}G = F\hat{D}E$	
12.2.1	$B\hat{A}C = 90°$ [$\angle$ in a semi circle] $\quad \hat{E}_2 = 90°$ [line drawn from centre to midpont of chord] $\quad \therefore B\hat{A}C = \hat{E}_2$ BA $\|$ OD [corresp. $\angle$'s are equal] **OR/*OF*** $B\hat{A}C = 90°$ [$\angle$ in a semi circle] $\hat{E}_4 = 90°$ [*Line from centre to midpo* int *of chord*] $B\hat{A}C = \hat{E}_4$ $\Rightarrow$ BA $\|$ OD [Alt $\angle$'s are equal]	✓ S / R ✓ S ✓R ✓ R ✓ S / R ✓ S ✓R ✓ R (4)
12.2.2	$\hat{A}_1 = x$ $\hat{B} = x$ [tan– *chord theorem*] $\hat{O}_1 = x$ [*corresp* $\angle$'s *equal, AB* $\|$ *OD]* $\hat{A}_1 = \hat{O}_1$ $\quad \therefore AOCD$ is a *cyclic quadrilateral* [*conv.* $\angle$'s in the same segment] **OR/*OF*** Let $\hat{O}_1 = a$ $\hat{C}_1 = 90° - a$ [int. $\angle$'s of $\triangle$] $\therefore \hat{A}_2 = 90° - a$ [$\angle$'s opp $=$ sides] $\therefore \hat{A}_1 = a$ $\quad\quad$ [tan $\perp$ rad] $\therefore \hat{O}_1 = \hat{A}_1$ $\therefore AOCD$ is a cyclic quadrilateral. [*Converse* $\angle$'s in the same segment]	✓ S ✓ R ✓ S ✓ R ✓ R ✓ S ✓ S ✓ S ✓ R ✓ R (5)
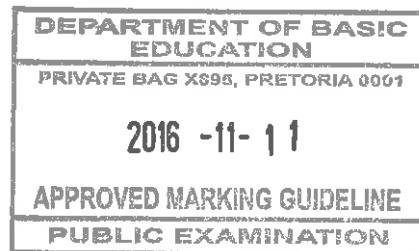
12.2.3	$A\hat{O}C = 2x$ [$\angle$ at centre $= 2 \times \angle$ at circumf.]	✓ S ✓R
	$\hat{O}_1 = x$	
	$\therefore \hat{O}_2 = x$	
	$\hat{C}_2 = \hat{O}_2 = x$ [$\angle$'s in the same segment]	✓ S / R
	$\therefore \hat{C}_2 = \hat{B} = x$	
	$\therefore DC$ is a tangent to circle [conv. tan $-$ chord]	✓ R
	OR/*OF*	
	$O\hat{C}D = 90°$ [opp $\angle$'s of cyclic quadrilateral]	✓ S ✓R
	$\therefore CD$ is a tangent .[Converse tan $\perp$ rad]	✓ S ✓R
	OR/*OF*	
	$\hat{B} = \hat{A}_3$ [$\angle$'s opp $=$ sides]	✓ S / R
	$\hat{A}_3 = O_2$ [Alt $\angle$'s ;	✓ S / R
	$\hat{O}_2 = \hat{C}_2$ [Angles in the same segment]	✓ S / R
	$\therefore \hat{C}_2 = \hat{B}$	
	$\therefore DC$ is a tangent. [Converse tan $-$ chord]	✓ R (4)
		[18]

TOTAL/*TOTAAL*:   **150**

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
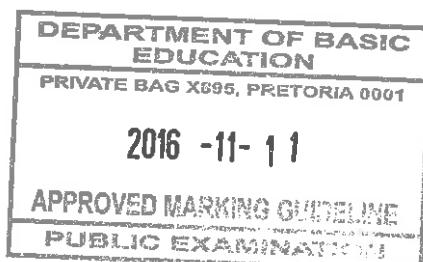
1. Due to a typographical error in sub question 8.2, the rate was given as 0,52m²/h. This is incorrect. The correct rate should have been 0,52m³/h.

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 EXAMINATIOS

DATE: /5 - 11 - 16.

DEPARTMENT OF BASIC
EDUCATION
PRIVATE BAG X895, PRETORIA 0001

2016 -11- 1 1

APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION

Basic Education • Baslese Onderwys • Imfundvo Lesisekelo • ifundosisekelo • IMfundo Eyisisekelo • IMfundo esiSiseko • Dyondzo ya le Hansi
Pfunzo ya Mutheo • Thuto ya Motheo • Thuto ya Motheo • Thuto e Potlana

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

Mark out of 146	Converted to 150	Mark out of 146	Converted to 150	Mark out of 146	Converted to 150	Mark out of 146	Converted to 150
1	1	45	46	89	91	133	137
2	2	46	47	90	92	134	138
3	3	47	48	91	93	135	139
4	4	48	49	92	95	136	140
5	5	49	50	93	96	137	141
6	6	50	51	94	97	138	142
7	7	51	52	95	98	139	143
8	8	52	53	96	99	140	144
9	9	53	54	97	100	141	145
10	10	54	55	98	101	142	146
11	11	55	57	99	102	143	147
12	12	56	58	100	103	144	148
13	13	57	59	101	104	145	149
14	14	58	60	102	105	146	150
15	15	59	61	103	106		
16	16	60	62	104	107		
17	17	61	63	105	108		
18	18	62	64	106	109		
19	20	63	65	107	110		
20	21	64	66	108	111		
21	22	65	67	109	112		
22	23	66	68	110	113		
23	24	67	69	111	114		
24	25	68	70	112	115		
25	26	69	71	113	116		
26	27	70	72	114	117		
27	28	71	73	115	118		
28	29	72	74	116	119		
29	30	73	75	117	120		
30	31	74	76	118	121		
31	32	75	77	119	122		
32	33	76	78	120	123		
33	34	77	79	121	124		
34	35	78	80	122	125		
35	36	79	81	123	126		
36	37	80	82	124	127		
37	38	81	83	125	128		
38	39	82	84	126	129		
39	40	83	85	127	130		
40	41	84	86	128	132		
41	42	85	87	129	133		
42	43	86	88	130	134		
43	44	87	89	131	135		
44	45	88	90	132	136		