higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N2

21 November 2023

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 $-10q^2 - 11q + 6 = 0$
$\Rightarrow (3 + 2q)(2 - 5q) = 0$ ✓
$\Rightarrow q = -\frac{3}{2}$ ✓ or $p = \frac{2}{5}$ ✓

ALTERNATIVE
$10q^2 + 11q - 6 = 0$ ✓
$\Rightarrow (2q + 3)(5q - 2) = 0$
$\Rightarrow q = -\frac{3}{2}$ ✓ or $p = \frac{2}{5}$ ✓

(3)

1.2 $Eqn.1:\ 2b + m = 50$
$Eqn.2:\ 8m - 2b = 220$ ✓
$Eqn.1 \Rightarrow m = 50 - 2b - - - - - Eqn.3$
$Eqn.3\ in\ Eqn.2 \Rightarrow 8(50 - 2b) - 2b = 220$ ✓
$\Rightarrow b = \frac{180}{18} = 10\ years$ ✓
$Eqn.3 \Rightarrow m = 50 - 2(10) = 30\ years$ ✓

ALTERNATIVE
$Eqn.1:\ 2b + m = 50$
$Eqn.2:\ 8m - 2b = 220$ ✓
$Eqn.1 + Eqn.2 \Rightarrow 9m = 270$ ✓
$\Rightarrow m = \frac{270}{9} = 30\ years$ ✓
$Eqn.1 \Rightarrow b = \frac{50 - 30}{2} = 10 years$ ✓

(4)

1.3 $k + (k + 3) - 9(k + 2) = 118$
$\Rightarrow k + k + 3 - 9k - 18 = 118$ ✓
$\Rightarrow\ k = -19$ ✓

(2)

1.4 1.4.1 $F = \sqrt{\frac{7}{e} + h^2}$
$\Rightarrow F^2 = \frac{7}{e} + h^2$ ✓
$\Rightarrow F^2 - h^2 = \frac{7}{e}$ ✓
$\Rightarrow e(F^2 - h^2) = 7$ ✓
$\Rightarrow e = \frac{7}{F^2 - h^2}$ ✓

(4)

1.4.2 $e = \frac{7}{(13)^2 - (3)^2} = \frac{7}{160} = 0{,}04375$

(1)
[14]

QUESTION 2

2.1 2.1.1

$$\frac{3a-1}{a+4}+\frac{8a}{a^2+3a-4}$$
$$=\frac{3a-1}{a+4}+\frac{8a}{(a+4)(a-1)} \quad ✓$$
$$=\frac{(3a-1)(a-1)+8a✓}{(a+4)(a-1)✓}$$
$$=\frac{3a^2-3a-a+1+8a}{(a+4)(a-1)} \quad ✓$$
$$=\frac{3a^2+4a+1}{(a-1)(a+4)} \quad ✓$$
$$=\frac{(3a+1)(a+1)}{(a+4)(a-1)} \quad ✓$$

(6)

2.1.2

$$\frac{n^2-9}{n-2}\div\frac{n^2-n-6}{n^2-4}$$
$$=\frac{(n+3)(n-3)✓}{(n-2)}\times\frac{(n-2)(n+2)✓}{(n-3)(n+2)✓}$$
$$=n+3 \quad ✓$$

(4)

2.2 2.2.1

$$3p+3q-9-pq=(3-q)(p-3) \quad ✓✓$$

$$45-5p^2=-5(p+3)(p-3) \quad ✓✓✓$$

$$p^2-9p+18=(p-3)(p-6) \quad ✓✓$$

(7)

2.2.2

$$\text{HCF}=(p-3) \quad ✓$$
$$\text{LCM}=-5(p-3)(p+3)(p-6)(3-q) \quad ✓✓$$

(3)

[20]

QUESTION 3

3.1 3.1.1

$$\log_3(\log_2 512)+\sqrt[3]{2\frac{10}{27}}$$
$$=\log_3(\log_2 2^9)+\left(\frac{64}{27}\right)^{\frac{1}{3}} \quad ✓$$
$$=\log_3 3^2+\left(\frac{4^3}{3^3}\right)^{\frac{1}{3}} \quad ✓$$
$$=2+\frac{4}{3}$$
$$=\frac{10}{3} \ or \ 3\frac{1}{3} \quad ✓$$

(3)

3.1.2 $\log_{64} 8 = \frac{\log_2 8}{\log_2 64}$ ✓

$= \frac{\log_2 2^3}{\log_2 2^6}$ ✓

$= \frac{3}{6} = \frac{1}{2}$ ✓

ALTERNATE

$\log_{64} 8 = \frac{\log_4 8}{\log_4 64}$ ✓

$= \frac{\log_4 4^{3/2}}{\log_4 4^3}$ ✓

$= \frac{3/2}{3}$

$= \frac{1}{2}$ ✓

3.1.3 $\frac{(8x^2y)(6xy^3)}{\sqrt[3]{\sqrt[4]{y^{36}x^{18}}}} = \frac{48x^{(2+1)}y^{(3+1)}}{x^{18\times\frac{1}{3}\times\frac{1}{4}} \times y^{36\times\frac{1}{3}\times\frac{1}{4}}}$ ✓

$= \frac{48x^3y^4}{x^{\frac{3}{2}} \times y^3}$ ✓

$= 48x^{3/2}\,y$ **OR** $48y\sqrt{x^3}$ ✓ (3)

3.2 $x^{-3/4} = 27$

$\Rightarrow x = (27)^{-4/3}$ ✓

$= (3^3)^{-4/3}$

$= \frac{1}{81}$ ✓ (2)

3.3 $R = \frac{31{,}4}{(3{,}02)^5 \times \sqrt[3]{652}}$

$\Rightarrow \log R = \log 31{,}4 - \left[5\log 3{,}02 + \frac{1}{3}\log 652\right]$ ✓

$\Rightarrow \log R = 1{,}4969 - [2{,}4000 + 0{,}9381]$ ✓

$= -1{,}842$ ✓

$\Rightarrow R = 10^{-1{,}8412}$

$= 0{,}0144$ ✓ (4)

[15]

QUESTION 4

4.1 4.1.1 $\pi r^2 h_{cyl} = \frac{1}{3}\pi r^2 h_{cone}$ *where* $h_{cyl} = r$ *and* $h_{cone} = 9cm$

$\Rightarrow \pi r^3 = 3\pi r^2$ *since* $h_{cyl} = r$ *and* $h_{cone} = 9cm$ ✓

$\Rightarrow \pi r^3 - 3\pi r^2 = 0$ ✓

$\Rightarrow \pi r^2(r-3) = 0$

$\Rightarrow r = 3cm$ ✓ (3)

4.1.2 S.A. of cylinder $= 2\pi r^2 + 2\pi rh$

$= 2\pi(3)^2 + 2\pi(3)(3)$ ✓

$= 133{,}097$ ✓ (2)

4.1.3 $\text{S. A. of cone} = \pi r^2 + \pi r\sqrt{h^2 + r^2}$
$= \pi(3)^2 + \pi(3)\sqrt{9^2 + 3^2}$ ✓
$= 117{,}686cm^2$ ✓ (2)

4.2 $21135 = \left[\frac{120 + 118}{2}\checkmark + 125 + 135 + 140 + 145 + 160 + 155 + 150 + 145 + 135\right]d\checkmark$
$\Rightarrow 21135 = 1409d$ ✓
$\Rightarrow d = 15$ ✓ (4)
[11]

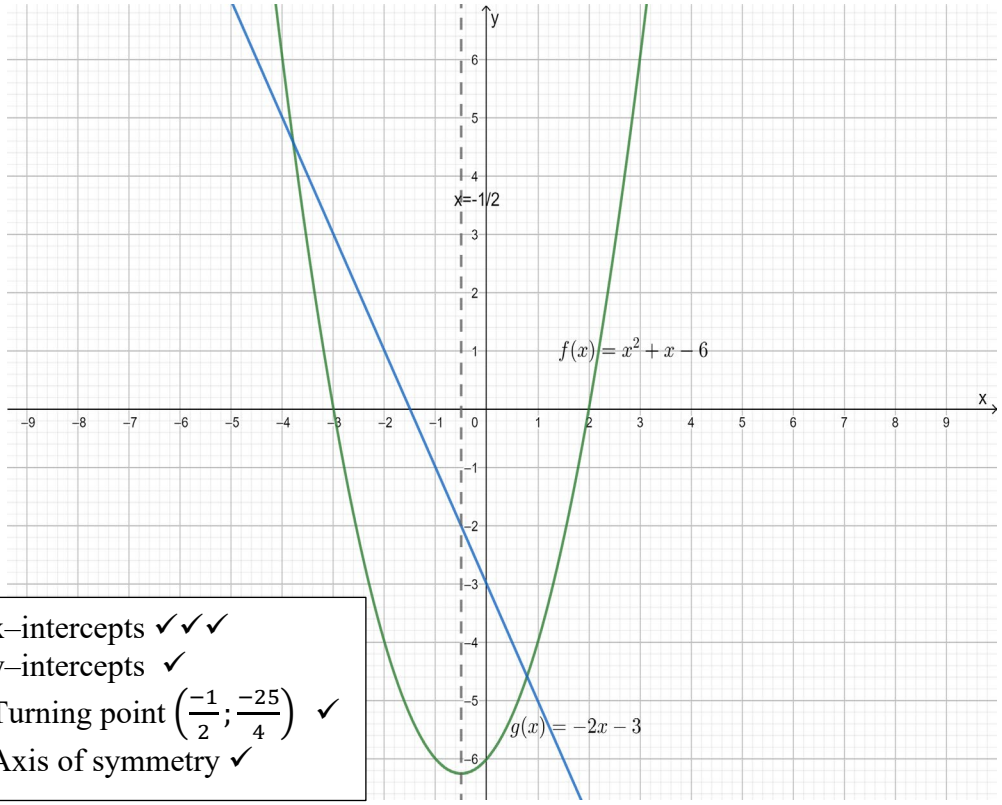
QUESTION 5

5.1 5.1.1

x	-4	-3	-2	-1	0	1	2	3	4
$f(x)$	6	**0**	**-4**	**-6**	-6	**-4**	**0**	**6**	14
$g(x)$	5	**3**	**1**	**-1**	-3	**-5**	**-7**	**-9**	-11

(2)

5.1.2



x–intercepts ✓✓✓
y–intercepts ✓
Turning point $\left(\frac{-1}{2}; \frac{-25}{4}\right)$ ✓
Axis of symmetry ✓

(6)

5.1.3 $x \approx 0.8\ and\ x \approx -3.8$ **[Accept accuracy of $\pm$ 0.1]**✓✓ (2)

5.1.4 $x = \frac{-1}{2(1)} = -\frac{1}{2}$✓ (1)

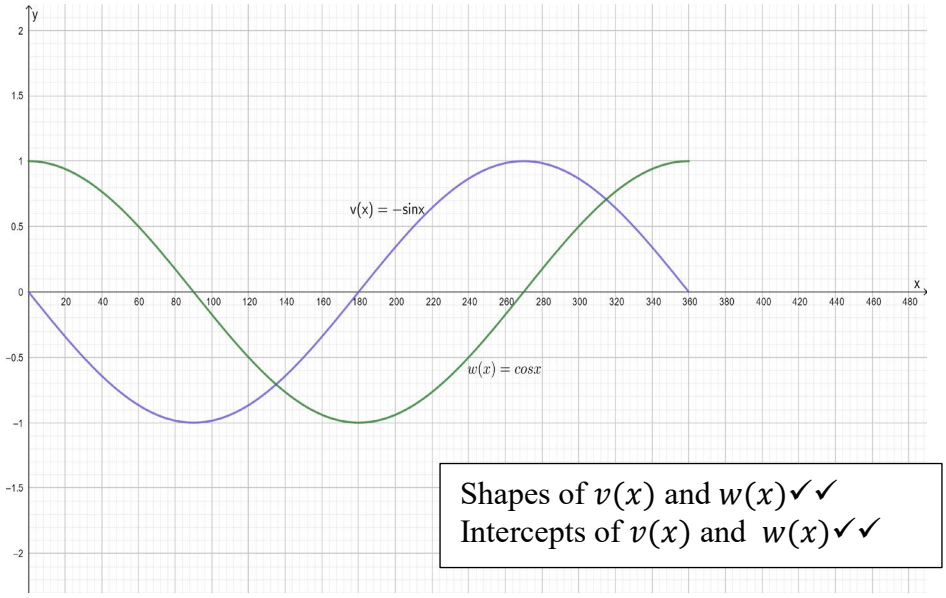
5.1.5 $y = \left(-\frac{1}{2}\right)^2 - \frac{1}{2} - 6 = -6{,}25 = -\frac{25}{4}$✓ (1)

5.2 5.2.1

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$v(x)$	0	-0,5	**-0,9**	-1	**-0,9**	-0,5	0	0,5	**0,9**	1	**0,9**	0,5	0✓
$w(x)$	1	**0,9**	00,5	0	-0,5	**-0,9**	-1	**-0,9**	-0,5	0	0,5	**0.9**	1✓

(2)

5.2.2



Shapes of $v(x)$ and $w(x)$✓✓
Intercepts of $v(x)$ and $w(x)$✓✓

(4)

5.2.3 $x = 135° \; and \; x = 315°$ ✓✓ (2)

[20]

QUESTION 6

6.1 $13{,}4 = 13{,}4 \times 57{,}3°$
$= 767.82°$ ✓
$= 767 + 0{,}82 \times 60'$
$= 767°, 49'$ ✓

ALTERNATIVE
$13{,}4 = 13{,}4 \times \frac{180°}{\pi}$
$= 767{,}76°$ ✓
$= 767 + 0{,}76 \times 60'$
$= 767°. 47'$ ✓

(2)

6.2 6.2.1 $r = \frac{l}{\theta} = \frac{12{,}5}{1{,}25} = 10 \; cm$ (1)

6.2.2 $Area = \frac{1}{2} \times r^2\theta$
$= \frac{1}{2} \times (10)^2(1{,}25)$ ✓
$= 62{,}5 \; cm^2$ ✓
$= \frac{125}{2} cm^2$

ALTERNATIVE
$Area = \frac{l^2}{2\theta}$
$= \frac{(12{,}5)^2}{2(1{,}25)}$ ✓
$= 62{,}5$ ✓
$= \frac{125}{2} cm^2$

(2)

6.3 6.3.1 $\omega = 2\pi N$

$\Rightarrow 150 = 2\pi N$ ✓

$\Rightarrow N = \dfrac{150}{2\pi} = 23{,}873\ rev.\ per\ second$ ✓ (2)

6.3.2 $N = 23{,}873 \times 60 \approx 1432\ rev.\ per\ minutes$ (1)

6.4 $D = \dfrac{x^2}{4h} + h$

$\Rightarrow 2x = \dfrac{x^2}{4h} + h$ ✓

$\Rightarrow 8xh = x^2 + 4h^2$

$\Rightarrow x^2 - 8xh + 4h^2 = 0$ ✓

$\Rightarrow \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\Rightarrow \dfrac{8h \pm \sqrt{64h^2 - 16h^2}}{2}$ ✓

$\Rightarrow x = \left(4 + 2\sqrt{3}\right)h$ ✓ **OR** $x = \left(4 - 2\sqrt{3}\right)h$

$\Rightarrow x = 7{,}73h$ **OR** $0{,}27h$ (4)

6.5 $adjacent = \sqrt{17^2 - (-8)^2} = 15$ ✓

$\Rightarrow 1 + tan^2\theta = 1 + \left(\dfrac{-8}{15}\right)^2$ ✓

$= \dfrac{289}{225}$

$= 1.284$ ✓ (3)

6.6 $tan27° = \dfrac{DM}{20}$ ✓

$\Rightarrow DM = 20tan27° = 10{,}191m$ ✓

$tan47° = \dfrac{BM}{20}$ ✓

$\Rightarrow BM = 20tan47° = 21{,}447m$ ✓

$BD = BM + DM = 10{,}191 + 21{,}447$

$\Rightarrow BD = 31{,}638m$ ✓

ALTERNATIVE

$tan63° = \dfrac{20}{DM}$ ✓

$\Rightarrow DM = \dfrac{20}{tan63°} = 10{,}191m$ ✓

$tan43° = \dfrac{20}{BM}$ ✓

$\Rightarrow BM = \dfrac{20}{tan43°} = 21{,}447m$ ✓

$BD = BM + DM$

$= 10{,}191 + 21{,}447$

$\Rightarrow BD = 31{,}638m$ ✓

(5)

[20]

TOTAL: 100

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