



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MATHEMATICS N2

27 March 2024

This marking guideline consists of 7 pages.

QUESTION 1

$$\begin{aligned}
 1.1 \quad T &= \frac{mR - nr}{mne} \\
 \Rightarrow mR - nr &= Tmne \checkmark \\
 \Rightarrow mR &= Tmne + nr \checkmark \\
 \Rightarrow mR &= n(Tme + r) \checkmark \\
 \Rightarrow n &= \frac{mR}{Tme + r} \checkmark
 \end{aligned}$$

ALTERNATIVE

$$\begin{aligned}
 T &= \frac{mR}{mne} - \frac{r}{me} & \left(\frac{Tme + r}{mR} \right) &= \frac{1}{n} \\
 T + \frac{r}{me} &= \frac{1}{n} \left(\frac{R}{e} \right) & n &= \frac{mR}{Tme + r} \\
 \left(\frac{Tme + r}{me} \right) \frac{e}{R} &= \frac{1}{n}
 \end{aligned}$$

(4)

$$\begin{aligned}
 1.2 \quad 3r^2 - 4r + 1 &= 0 \\
 \Rightarrow 3r^2 - 4r + 1 &= 0 \checkmark \\
 \Rightarrow r &= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(1)}}{2(3)} \checkmark \\
 \Rightarrow r &= \frac{1}{3} \checkmark \text{ or } r = 1 \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 1.3 \quad 4m &= 8n + 20 \text{ --- (Eq1)} \\
 6n &= 70 + 7m \text{ --- (Eq2)} \\
 (Eq1) \Rightarrow m &= 2n + 5 \text{ --- (Eq3) } \checkmark \\
 (Eq3) \text{ into (Eq2)} & \\
 \Rightarrow 6n &= 70 + 7(2n + 5) \checkmark \\
 \Rightarrow n &= -\frac{105}{8} = -13.125 \checkmark \\
 (Eq3) \Rightarrow m &= -\frac{85}{4} = -21.25 \checkmark
 \end{aligned}$$

ALTERNATIVE

$$\begin{aligned}
 24m - 48n &= 120 \text{ --- (Eq1) } \times 6 \\
 48n - 56m &= 560 \text{ --- (Eq2) } \times 8 \checkmark \\
 (Eq1) + (Eq2) &\Rightarrow -32m = 680 \checkmark \\
 \Rightarrow m &= -\frac{680}{32} = -\frac{85}{4} = -21.25 \checkmark \\
 (Eq2) \Rightarrow n &= -\frac{560 + 56(-13.125)}{48} = -21.25 \checkmark
 \end{aligned}$$

Note: Accept any other method

(4)

$$\begin{aligned}
 1.4 \quad \Rightarrow -4t - 12 &= -15 - 9t \checkmark \\
 \Rightarrow -4t + 9t &= -15 + 12 \\
 \Rightarrow 5t &= -3 \\
 \Rightarrow t &= -3/5 \checkmark
 \end{aligned}$$

(2)

[14]

QUESTION 2

$$\begin{aligned}
 2.1 \quad 2.1.1 \quad 5a^2 - 5a - 5ac + 5c &= 5(a - 1)(a - c) \checkmark \checkmark \checkmark \\
 15a^2 - 30ac + 15c &= 15(a - c)^2 \checkmark \checkmark
 \end{aligned}$$

(5)

$$\begin{aligned}
 2.1.2 \quad \text{HCF} &= 5(a - c) \checkmark \\
 \text{LCM} &= 15(a - c)^2(a - 1) \checkmark \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 2.2 \quad 2.2.1 \quad \frac{2x^2 - 4x}{x^2 + 6x + 9} \times \frac{3x^2 - 12}{3x + 6} \div \frac{3x^2 + 15x + 18}{x + 2} \\
 = \frac{2x(x - 2) \checkmark}{(x + 3)^2 \checkmark} \times \frac{3(x + 2)(x - 2) \checkmark}{3(x + 2) \checkmark} \times \frac{(x + 2)}{3(x + 2)(x + 3) \checkmark} \\
 = \frac{2x(x - 2)^2}{3(x + 3)^3} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 2.2.2 \quad & \frac{m}{mn - n^2} + \frac{n}{m^2 - mn} + \frac{1}{m} \\
 &= \frac{\frac{m}{m}}{\frac{n(m-n)}{m}} + \frac{\frac{n}{n}}{\frac{m(m-n)}{n}} + \frac{1}{m} \checkmark \\
 &= \frac{m^2 + n^2 + n(m-n) \checkmark}{mn(m-n) \checkmark} \\
 &= \frac{m^2 + n^2 + mn - n^2 \checkmark}{mn(m-n)} \\
 &= \frac{m(m+n) \checkmark}{mn(m-n)} \\
 &= \frac{m+n}{n(m-n)} \checkmark
 \end{aligned}$$

(6)
[20]

QUESTION 3

$$\begin{aligned}
 3.1 \quad 3.1.1 \quad & \left[\frac{pq}{(pq)^{-3}} \right]^{\frac{1}{4}} = [(pq)(pq)^3]^{\frac{1}{4}} \checkmark \\
 &= [(pq)^4]^{\frac{1}{4}} \checkmark \\
 &= pq \checkmark
 \end{aligned}$$

ALTERNATIVE

$$\begin{aligned}
 \left[\frac{pq}{(pq)^{-3}} \right]^{\frac{1}{4}} &= \left[\frac{1}{(pq)^{-1}(pq)^{-3}} \right]^{\frac{1}{4}} \checkmark \\
 &= \left[\frac{1}{(pq)^{-4}} \right]^{\frac{1}{4}} \checkmark \\
 &= pq \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 3.1.2 \quad & \frac{\log a^2 + \log b^2}{\log a^4 + \log b^4} \\
 &= \frac{2\log a + 2\log b}{4\log a + 4\log b} \checkmark \\
 &= \frac{2(\log a + \log b)}{4(\log a + \log b)} \checkmark \\
 &= \frac{1}{2} \checkmark
 \end{aligned}$$

ALTERNATIVE

$$\begin{aligned}
 & \frac{\log a^2 + \log b^2}{\log a^4 + \log b^4} \\
 &= \frac{\log a^2 b^2}{\log a^4 b^4} \checkmark \\
 &= \frac{2\log ab}{4\log ab} \checkmark \\
 &= \frac{1}{2} \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 3.2 \quad 3.2.1 \quad & (p)^{\frac{2}{3}} = 9 \\
 & \Rightarrow p = (9)^{\frac{3}{2}} \checkmark \\
 &= (3^2)^{\frac{3}{2}} \\
 &= 27 \checkmark = 3^3
 \end{aligned}$$

(2)

$$\begin{aligned}
 3.2.2 \quad & \frac{1}{p} \log_3 27 = p \\
 & \Rightarrow \frac{1}{p} \log_3 3^3 = p \checkmark \\
 & \Rightarrow \frac{3}{p} \log_3 3 = p \checkmark \\
 & \Rightarrow p^2 = 3 \checkmark \\
 & \Rightarrow p = \sqrt{3} = 1,732 \checkmark
 \end{aligned}$$

ALTERNATIVE

$$\begin{aligned}
 & \frac{1}{p} \log_3 27 = p \\
 & \Rightarrow \log_3 3^3 = p^2 \checkmark \\
 & \Rightarrow 3 \log_3 3 = p^2 \checkmark \\
 & \Rightarrow p^2 = 3 \checkmark \\
 & \Rightarrow p = \sqrt{3} = 1,732 \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 3.3 \quad & x = \frac{64,5 \times 3}{\sqrt[7]{182}} \\
 & \Rightarrow \log x = \log \left[\frac{64,5 \times 3}{\sqrt[7]{182}} \right] \checkmark \\
 & = \log 64,5 + \log 3 - \frac{1}{7} \log 182 \checkmark \\
 & = 1,9638 \\
 & \Rightarrow x = 10^{1,9638} = 92,003 \checkmark
 \end{aligned}$$

(3)
[15]

QUESTION 4

$$\begin{aligned}
 4.1 \quad 4.1.1 \quad & SA = 4\pi r^2 \\
 & \Rightarrow 6\,400\pi = 4\pi r^2 \checkmark \\
 & \Rightarrow r^2 = \frac{6\,400\pi}{4\pi} = 1\,600 \checkmark \\
 & \Rightarrow r = \sqrt{1\,600} = 40 \text{ cm} \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 4.1.2 \quad & V = \frac{4}{3}\pi r^3 \\
 & = \frac{4}{3} \times \pi (40)^3 \checkmark \\
 & = 268\,082.573 \text{ cm}^3 \text{ OR } \frac{256\,000}{3} \pi \text{ cm}^3 \checkmark
 \end{aligned}$$

(2)

$$\begin{aligned}
 4.1.3 \quad & \Rightarrow r^2 = \frac{8100\pi}{4\pi} = 2025 \text{ if S.A.} = 8100\pi \checkmark \\
 & \therefore \text{Mpho is wrong} \checkmark
 \end{aligned}$$

NOTE: Accept any other valid calculation.

(2)

$$\begin{aligned}
 4.2 \quad & \text{Area} = \left[\frac{2,5 + 3}{2} \checkmark + 5 + 30 + 35 + 20 + 10 + 6 \checkmark \right] \times 5 \checkmark \\
 & = 543,75 \text{ OR } \frac{2175}{4} \checkmark
 \end{aligned}$$

(4)
[11]

QUESTION 5

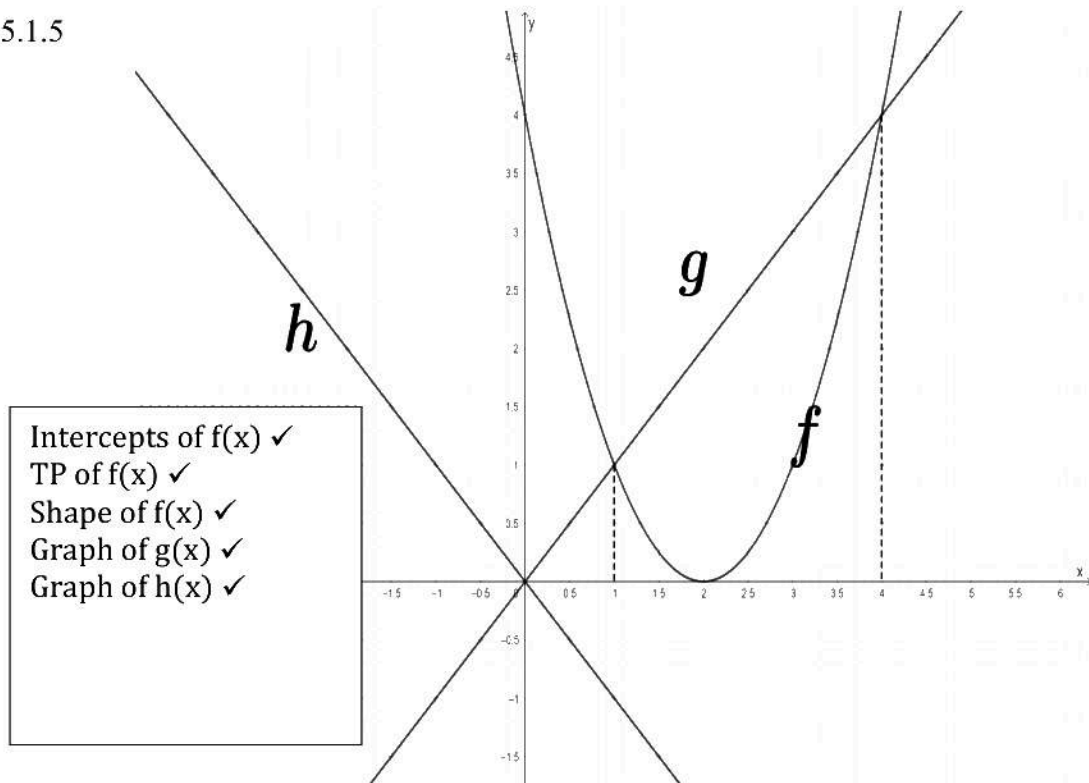
5.1 5.1.1 $y = 4$ ✓ (1)

5.1.2 $x^2 - 4x + 4 = 0$
 $\Rightarrow x = 2$ ✓ **OR** $x = 2$ ✓ (2)

5.1.3 $x = \frac{-(-4)}{2(1)} = 2$ ✓ (1)

5.1.4 $y = (2)^2 - 4(2) + 4 = 0$ ✓ (1)

5.1.5



(3)

5.2 5.2.1 See 5.1.5 above (2)

5.2.2 $x = 1$ ✓ **and** $x = 4$ ✓ (2)

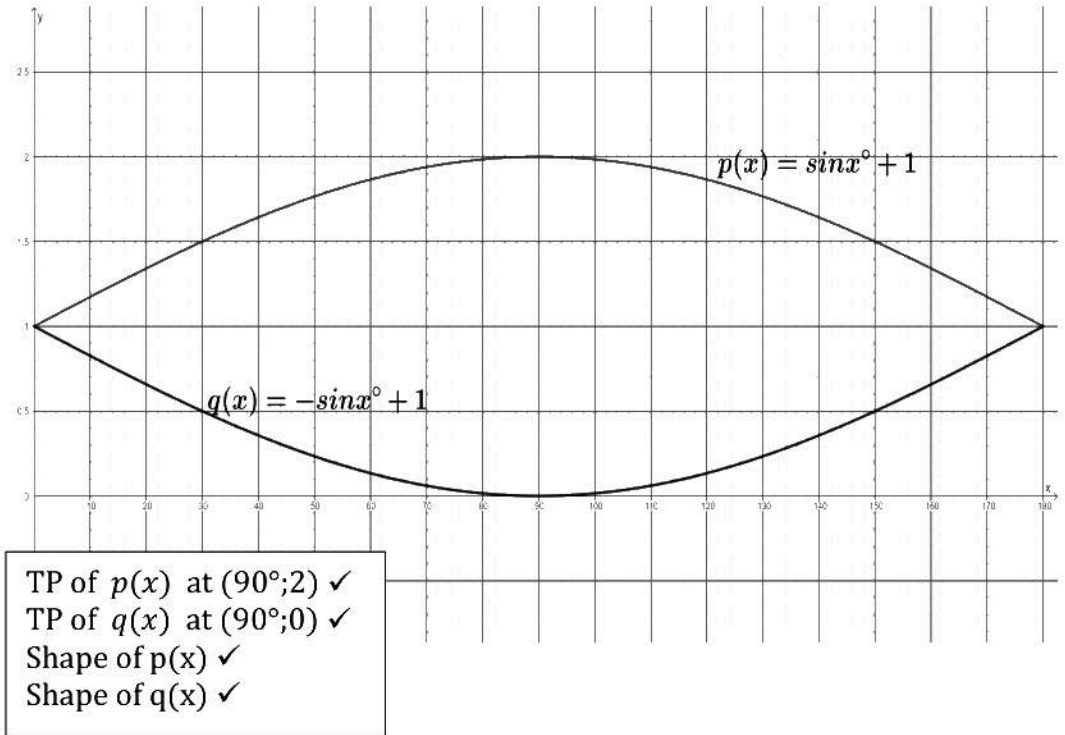
5.2.3 The graphs of $f(x)$ and $h(x)$ do not intersect or meet each other. ✓ (1)

5.3 5.3.1

x	0°	30°	60°	90°	120°	150°	180°
$p(x)$	1	1,5	1,866	2	1,866	1,5	1
$q(x)$	1	0,5	0,134	0	0,134	0,5	1

NOTE: 1 mark for any 5 correct values ✓ ✓ (2)

5.3.2



(4)

5.3.3 $y = 1$ or $x = 90^\circ$ ✓

(1)

[20]

QUESTION 6

6.1 1,35 revolutions = $1,35 \times 360^\circ = 486^\circ$ ✓

(1)

6.2 6.2.1
$$V = \frac{36\text{km}}{h} = \frac{36 \times 1000}{3600} = 10\text{m/s} \checkmark$$
$$N = \frac{V}{\pi D} = \frac{10}{\pi \times \frac{3}{2}} = \frac{20}{3\pi} = 2,122 \text{ revs. per sec.} \checkmark$$

(2)

6.2.2
$$N = 2,122 \times 60$$
$$= 127,323 \text{ revs. per minute} \checkmark$$

(1)

6.3
$$\theta = 150^\circ \times \frac{\pi}{180^\circ} = \frac{150^\circ}{57,3} = \frac{5\pi}{6} = 2,618 \text{ rads} \checkmark$$
$$r = \frac{21\text{cm}}{2} = 10,5 \text{ cm} \checkmark$$
$$\therefore \text{Area} = \frac{1}{2} \times (10,5)^2 \times 2,618 \checkmark$$
$$= 144,317 \text{ cm}^2 \text{ OR } \frac{735\pi}{16} \text{ cm}^2 \checkmark$$

(4)

$$\begin{aligned}
 6.4 \quad 6.4.1 \quad D &= \frac{(12)^2}{4(18)} + 18 = 20 \text{ cm} \checkmark \checkmark \\
 \Rightarrow r &= \frac{20}{2} \text{ cm} = 10 \text{ cm} \checkmark
 \end{aligned} \tag{3}$$

$$6.4.2 \quad \text{The diameter will double since } D = \frac{(24)^2}{4(36)} + 36 = 40 \checkmark \tag{1}$$

$$\begin{aligned}
 6.5 \quad \operatorname{cosec} \alpha &= -\frac{5}{4} \Rightarrow \sin \alpha = -\frac{4}{5} = \frac{y}{r} \checkmark \\
 \Rightarrow x &= \sqrt{5^2 - (-4)^2} = -3 \text{ since } 180^\circ \leq \alpha \leq 270^\circ \checkmark \\
 \therefore \tan \alpha - \sin \alpha &= \frac{-4}{-3} - \frac{-4}{5} = \frac{32}{15} \checkmark
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 6.6 \quad \tan 30^\circ &= \frac{24}{BC} \checkmark \\
 \Rightarrow BC &= \frac{24}{\tan 30^\circ} = 41,569 \text{ m} = 24\sqrt{3} \text{ m} \checkmark \\
 \cos 33^\circ &= \frac{DE}{36} \checkmark \\
 \Rightarrow DE &= 36 \cos 33^\circ = 30,192 \text{ m} \checkmark \\
 \therefore CD &= 80 \text{ m} - 41,569 \text{ m} - 30,192 \text{ m} = 8,239 \text{ m} \checkmark
 \end{aligned} \tag{5}$$

[20]

TOTAL: 100