higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(First paper)
NQF LEVEL 2

23 November 2020

This marking guideline consists of 10 pages.

INSTRUCTIONS TO MARKERS

1. Examiners are reminded that the subject Mathematics lends itself to a variety of methods and therefore several different alternative answers. Mark all mathematically correct answers.

2. The answers provided in this memorandum are therefore not exhaustive. Marks are allocated for a specific principle and the markers must adhere to the mark allocation.

3. Mark the questions and follow up, for example: Error in the first step of differentiation, mistake in converting from surd to exponential, does not imply that the student can't differentiate. Follow up.

4. Marks are allocated per step, but if a student omitted a step and there is evidence or reason that he/she can derive at the next step without calculation, then the mark must still be given to the student.

5. Take note that marks have been allocated to simplification. This is to differentiate between your 80 and 90 percenters.

6. Steps must be marked and not only the final answer. Ticks must correspond with the total. Put your ticks and crosses neatly and legibly in RED pen only.

7. If the answer does not look the same as in the marking guideline, it could be an alternative method or a method that is not known to you as marker. Please take a moment before you mark, verify the student's response.

8. Do not at all adjust marks of students in order to give them a pass mark.

✓ = full mark
√ = half mark

QUESTION 1

1.1 1.1.1 D
1.1.2 B
1.1.3 B
1.1.4 A
1.1.5 C

(5 × 1) (5)

1.2 $4,\dot{4}\dot{1}\dot{3}$

Let $x = 4,\dot{4}\dot{1}\dot{3}$

$1000x = 4\,413,\dot{4}\dot{1}\dot{3}$ √

$\therefore 1000x - x = 4409$ √

$\therefore \quad 999x = 4\,409$

$\therefore \quad x = \frac{4409}{999}$ √

$x = 4\frac{413}{999}$ √

(2)

1.3 1.3.1

$\frac{\sqrt{10}-\sqrt{5}}{\sqrt{10}}$

$= \frac{\sqrt{2.5}-\sqrt{5}}{\sqrt{2}.\sqrt{5}}$

$= \frac{\sqrt{2}.\sqrt{5}-\sqrt{5}}{\sqrt{2}\sqrt{5}}$ √

$= \frac{\sqrt{5}\left(\sqrt{2}-1\right)}{\sqrt{2}.\sqrt{5}}$ √

$= \frac{\sqrt{2}-1}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \neq \frac{2-\sqrt{2}}{4}$ √

(Answer only – No marks)

Alternate

$\frac{\sqrt{10}-\sqrt{5}}{\sqrt{10}}$

$= \frac{\sqrt{10}-\sqrt{5}}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}}$ ✓

$= \frac{10-\sqrt{15}}{10}$ ✓

(Answer only – No marks)

(2)

1.3.2
$$\frac{\sqrt{48}\,x+\sqrt{(27x^2)}}{\sqrt{(48x^2)}}$$
$$=\frac{\sqrt{4.4.3}\,x+\sqrt{(3.3.3x^2)}}{\sqrt{(4.4.3x^2)}}$$
$$=\frac{4\sqrt{3}\,x-3\sqrt{3}\,x}{4\sqrt{3}\,x}\ \surd\ \surd$$
$$=\frac{\sqrt{3}\,x(4-3)}{4\sqrt{3}\,x}\ \surd$$
$$=\frac{1}{4}\ \checkmark$$
(3)

1.4 1.4.1
$$\frac{3xy^{-2}\times x^0}{x^{-4}}$$
$$=\frac{3x\times 1\times x^4}{y^2}\ \surd\ \surd$$
$$=\frac{3x^5}{y^2}\ \surd$$
(2)

1.4.2
$$\frac{x^2y^3\times x^3y^4}{(2x^{-3}y)^2}\div\frac{x^5y^7}{\sqrt{4}x^2y^3}$$
$$=\frac{x^2y^3\times x^3y^4}{2^2x^{-6}y^2}\ \surd\times\frac{\sqrt{4}x^2y^3}{x^5y^7}$$
$$=\frac{2x^7y^{10}}{4x^{-1}y^9}\ \surd\ \surd$$
$$=\frac{x^8y}{2}\ \surd\ \surd$$
(3)

1.4.3
$$\frac{6^x.2^{x+2}}{4^x.3^{x-2}}$$
$$=\frac{(2.3)^x.2^x.2^2}{(2^2)^x.3^x.3^{-2}}\ \surd$$
$$=\frac{2^x.3^x.2^x.2^2}{2^{2x}.3^x.3^{-2}}\ \surd$$
$$=\frac{4.2^{2x}.3^x.3^2}{2^{2x}.3^x}\ \surd\ \surd$$
$$=36\ \checkmark$$
(3)

1.5 1.5.1 $A_t = A_o(1+rt)$

$\frac{A_t}{A_o} = 1 + r \times t$ √

$\therefore \frac{A_t}{A_o} - 1 = r \times t$ √√

$\therefore t = \left(\frac{A_t}{A_o} - 1\right) \div r$ √

or $t = \left(\frac{A_t}{A_o} - 1\right) \times \frac{1}{r}$

or $t = \left(\frac{A_t - A_o}{A_o\ r}\right)$

Alternate

$\frac{A_1}{A_0} = 1 + r \times t$ √

$\frac{A_1}{A_0} - 1 = r \times t$ √

$t = \frac{\frac{A_1}{A_0} - 1}{r}$ ✓

(2)

1.5.2 $t = \left(\frac{2625}{1500} - 1\right) \div \left(\frac{15}{100}\right)$ √

$t = 0,75 \times \left(\frac{100}{15}\right) = 5 years$ √

Alternate

$t = \frac{\frac{2\,625}{1\,500} - 1}{\frac{15}{100}}$ √

= 5 years √

(1)

1.6 1.6.1 2; 6; 10; 14; 18; 22; 26... √√√√

(2)

1.6.2 $T_n = a + (n-1)d$

$T_{50} = 2 + (49)4$ √√√

$T_{50} = 2 + 196$

$T_{50} = 198$ √

(2)

1.6.3 $T_n = a + (n-1)d$

$2862 = 2 + (n-1)4$ √√√

$2860 = 4n - 4$ √

$2864 = 4n$

$\therefore n = 716 years$ √

(3)

[30]

QUESTION 2

2.1 2.1.1

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{1+2}{5-0}$$

$$m = \frac{3}{5} \text{ and y-intercept} = -2 \quad \surd$$

$$\therefore y = \frac{3}{5}x - 2 \quad \surd \surd$$

Alternative:

$$y - y_1 = m(x - x_1)$$

$$y - 1 = \frac{3}{5}(x - 5) \quad \surd$$

$$\therefore y = \frac{3}{5}x - 2 \quad \surd$$

or alternatively substitute $(5;1)$

$$y = \frac{3}{5}x + c$$

$$1 = \frac{3}{5}(5) + c \quad \surd$$

$$c = -2 \quad \surd$$

$$\therefore y = \frac{3}{5}x - 2 \quad \surd$$

(Mark all mathematically correct methods.) (2)

2.1.2 Straight-line graph ✓ (1)

2.1.3 $x \neq 2$ where $x \in R$ ✓

OR

$\{x | x < 2 \text{ or } x > 2 \text{ where } x \in R\}$ ✓

OR

$x \in (-\infty; 2) \text{ and } (2; \infty)$ where $x \in R$ ✓ (2)

2.1.4 Discontinuous✓

There is an open point on the graph at $x = 2$ ✓

OR

The graph does not exist at $x = 2$ ✓

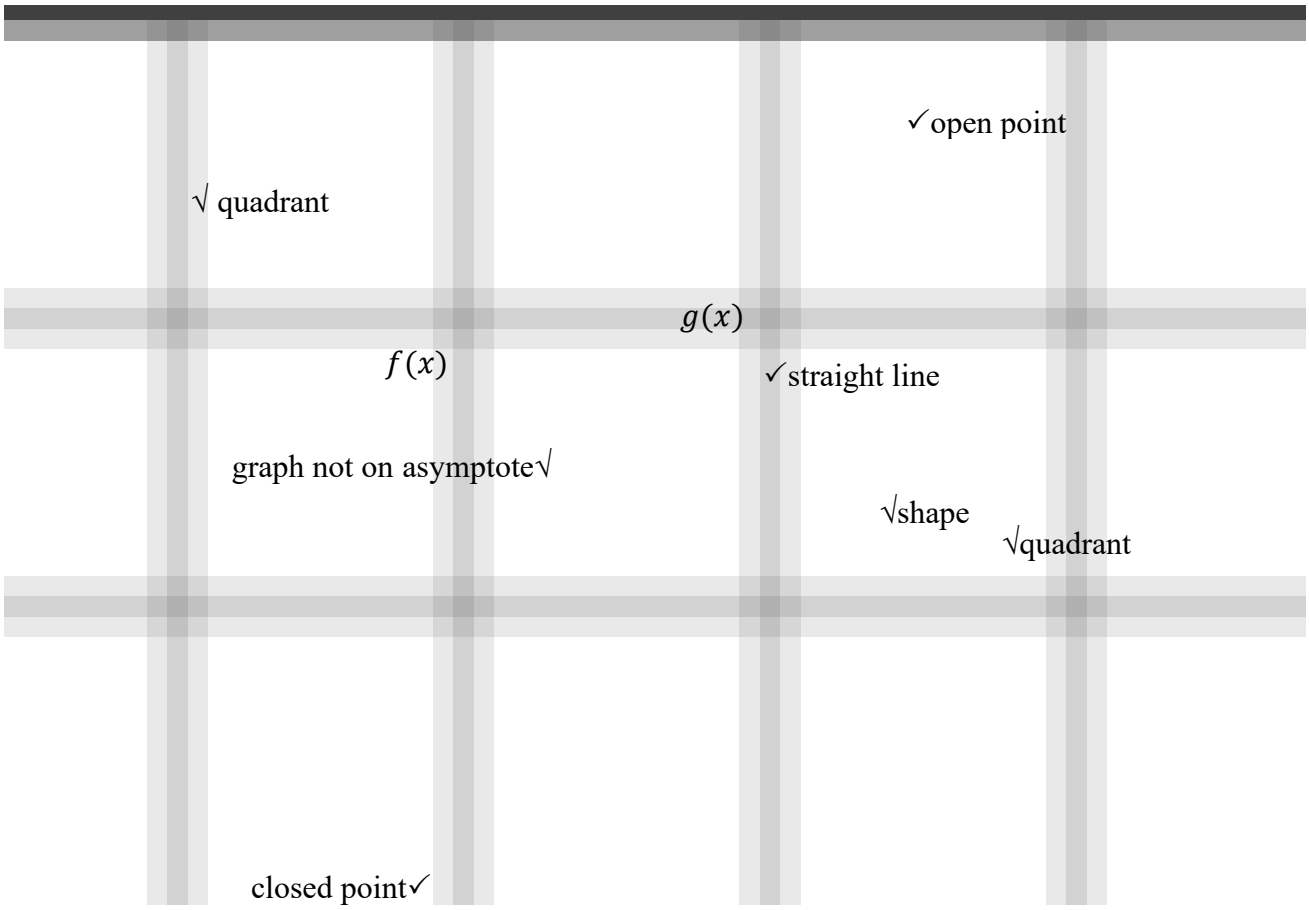
OR

You have to lift your pen to draw the graph ✓ (2)

2.2 2.2.1 B
2.2.2 D
2.2.3 D
2.2.4 A
2.2.5 C
2.2.6 D
2.2.7 B

(7 × 1) (7)

2.3 2.3.1 ANSWER SHEET



Marks to be allocated as follows. (5)
3 marks for the straight line (closed point✓at (-2;-4);✓straight line shape through origin, ✓open point at (4;8)
2 marks for hyperbola (√ for arm in quadrant 1; √ for arm in quadrant 4; graph not on asymptote√;√ shape)

2.3.2 $Range = \{y; \overset{\checkmark}{y \neq 3}; \overset{\checkmark}{y \in R}\}$ (2)

2.3.3 $y = 3$
$x = 0$ (2)

2.3.4 The graph will be in quadrant 1 and 3
OR
The graph will change from increasing to decreasing. ✓ (1)
[24]

QUESTION 3

3.1 3.1.1 $4x^2 - 9$ (1)

3.1.2
$$(x^2 + y)(4x + 3xy + x^{-1}y^2)$$
$$= 4x^3 + 3x^3y + xy^2 + 4xy + 3xy^2 + x^{-1}y^3$$
$$= 4x^3 + 3x^3y + 4xy^2 + 4xy + x^{-1}y^3$$
(Answer can be left with a negative exponent.) (2)

3.2 3.2.1
$$20x^2 - 45y^2$$
$$= 5(4x^2 - 9y^2)$$
$$= 5(2x - 3y)(2x + 3y)$$ (2)

3.2.2
$$2x^2 - 5x - 3$$
$$= (2x + 1)(x - 3)$$ (2)

3.2.3
$$(5x^2 - 15x) + (12y - 4xy)$$
$$= 5x(x - 3) + 4y(3 - x)$$
$$= 5x(x - 3) - 4y(x - 3)$$
$$= (5x - 4y)(x - 3)$$

Alternate
$$(5x^2 - 4xy) + (-15x + 12y)$$
$$= x(5x - 4y) + 3(-5x + 4y)$$
$$= x(5x - 4y) - 3(5x - 4y)$$
$$= (5x - 4y)(x - 3)$$ (3)

3.3
$$\frac{6x^3y^2 + 21x^2y^2 + 18xy^2}{18xy^2}$$
$$= \frac{3x\,y^2(2x^2 + 7x + 6)}{18xy^2}$$
$$= \frac{(2x^2 + 7x + 6)}{6}$$
$$= \frac{(x + 2)(2x + 3)}{6}$$ (3)

3.4 3.4.1
$$\frac{2}{x} = \frac{-4}{x + 5}$$
$$2x + 10 = -4x$$
$$\therefore 6x = -10$$
$$\therefore x = \frac{-10}{6} = -1\frac{2}{3} = -1,\dot{6}$$ (2)

3.4.2 $x^2-6x+9=x-1$

$x^2-7x+10=0$ √

$(x-5)(x-2)=0$ √

$\therefore x=5$ √ *or* $x=2$ √ (2)

3.4.3 $27^{x+1}=9^{x-2}$

$(3^3)^{x+1}$ √ $=(3^2)^{x-2}$ √

$3^{3x+3}=3^{2x-4}$ √

$3x+3=2x-4$ √

$x=-7$ √ (3)

3.5 3.5.1 $6-5x\geq 4x-9$

$-9x\geq -15$ √ √

$x\leq \frac{15}{9}$ √

$x\leq \frac{5}{3}$

$x\leq 1\frac{2}{3}$ (2)

3.5.2 √ direction √closed dot (1)

3.6

$2x-y=7$ eq 1

$3x+2y=28$ eq 2

From eq1

$y=2x-7$ *eq* 3 √

Substitute eq 3 into eq 2

$3x+2(2x-7)=28$ √

$3x+4x-14=28$ √

$7x=42$

$\therefore x=6$ √

Substitute x in eq 3

$y=2(6)-7=5$ √ √

Alternative

$2x-y=7$ eq 1

$3x+2y=28$ eq 2

eq $1\times 2 \Rightarrow 4x-2y=14$ *eq* 3 √

eq 3 + eq 2 √ √

$\Rightarrow 7x=42$

$\therefore x=6$ √

Substitute x in eq 1

$2(6)-y=7$ √

$\therefore y=5$ √

(3)
[26]

QUESTION 4

4.1 4.1.1 A: $R92\,060,00 - R96\,000,00 = -R3\,940$ ✓
B: $R97\,490,00 - R91\,500,00 = R5\,990,00$ ✓ (2)

4.1.2 $R92\,060 - R97\,490 = -R5\,430$ ✓
Deficit (The answer must be negative) (1)

4.1.3 (a) Variance = R13 350 – R16 000 = -R2 650 ✓
(b) It is a favourable scenario ✓
(2 × 1) (2)

4.2 4.2.1 G
4.2.2 E
4.2.3 B
4.2.4 D
4.2.5 A
(5 × 1) (5)

4.3 4.3.1

$A_t = A_o(1+\frac{r}{100}t)$ √

$A_t = 15\,000(1+\frac{18}{100}(3))$ √ √ √

$A_t = R23\,100$ ✓ (3)

4.3.2

$A_t = A_o\left(1+\frac{r}{100}\right)^n$ √

$A_t = 15\,000\left(1+\frac{18}{100}\right)^3$ √

$A_t = 15\,000(1,643)$ √

$A_t = R24\,645,48$ ✓ (3)

4.3.3

$A_t = A_o\left(1+\frac{r}{100}\right)^n$ √

$18\,017,36 = 15\,000\left(1+\frac{r}{100}\right)^3$ √ √ √

$\frac{18\,017,36}{15\,000} = \left(1+\frac{r}{100}\right)^3$

$\left(\frac{18\,017,36}{15\,000}\right)^{\frac{1}{3}} = 1+\frac{r}{100}$ √

$1,063 - 1 = \frac{r}{100}$ √

$\therefore r = 6,3\%$ ✓ (4)

[20]

TOTAL: 100