higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

MATHEMATICS N2

28 MARCH 2014

This marking guideline consists of 9 pages.

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INSTRUCTIONS AND INFORMATION

1. ✓ *equals 1 mark.*

2. Half marks are not allocated, unless indicated otherwise.

3. Where a formula is required, using the wrong formula is a principle error and NO marks are allocated.

4. Students should show ALL formulae and intermediate steps and simplify where possible.

5. ALL final answers must be rounded off to THREE decimal places (unless indicated otherwise).

6. Questions may be answered in any order, but subsections of questions must be kept together. If subsections are separated, the student must be penalised by ONE mark.

7. Where a student copied wrong from the question paper, and the standard of the question is still the same, the student will be penalised by ONE mark.
If the copying error simplifies the question and makes it easier, the student forfeits the marks.

8. Questions must be answered in blue or black ink. Answers in PENCIL are not marked as it is regarded as rough work.

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QUESTION 1

1.1 1.1.1 $8a^2b^2 - 64ab^3$

$= 8ab^2(a - 8b)$ ✓ ✓ (2)

1.1.2 $3a^2 + 4a - 3a - 4$

$= a(3a + 4) - (3a + 4)$ ✓

$= (3a + 4)(a - 1)$

✓ ✓

$3a^2 + 4a - 3a - 4$

$= 3a^2 + a - 4$

$= (3a + 4)(a - 1)$ (3)

1.2 $x^2 - 16 = (x - 4)(x + 4)$

$x^2 - 7x + 12 = (x - 3)(x - 4)$

$2px - 8p = 2p(x - 4)$

$2x^2 - 2x - 24 = 2(x - 4)(x + 3)$ ✓ ✓ ✓ ✓ *(one mark per expression)*

HCF: $(x - 4)$ ✓ *(if only ONE expression was factorised wrong – follow up)*

LCM: $2p(x - 4)(x + 4)(x - 3)(x + 3)$ ✓ ✓ (7)

1.3 $\dfrac{4x^2 - 1}{4x^2 + 2x}$

$= \dfrac{(2x - 1)(2x + 1)}{2x(2x + 1)}$ ✓ ✓ ✓

$= \dfrac{2x - 1}{2x}$ (3)

1.4 1.4.1 $\dfrac{x^2 + x - 6}{3x^2 - 12x} \div \dfrac{x^3 - 2x^2}{x^2 - 16} \times \dfrac{3x^3}{x + 4}$

$= \dfrac{(x + 3)(x - 2)}{3x(x - 4)} \times \dfrac{(x - 4)(x + 4)}{x^2(x - 2)} \times \dfrac{3x^3}{x + 4}$ ✓ ✓ ✓ ✓ *(mark per factor)*

$= (x + 3)$

✓ (5)

1.4.2 $\dfrac{3}{x} + \dfrac{2}{x^2} - \dfrac{5}{3ax}$

$= \dfrac{9ax + 6a - 5x}{3ax^2}$ ✓ ✓ ✓ *(one mark for LCM, two marks for numerator)* (3)

[23]

QUESTION 2

2.1

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi(70)^2(350)$$

$$= 1795943,80 \text{ mm}^3$$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3 \quad ✓✓✓✓$$

$$1795943,80 = \frac{4}{3}\pi r^3$$

$$r^3 = 428750$$

$$r = 75,405\text{mm} \qquad (4)$$

2.2

$$A = \text{distance}\left(\frac{1st + last}{2} + \text{sum of other ordinates}\right)$$

$$= 9\left(\frac{3+0}{2} + 68\right) \quad ✓✓$$

$$= 9(69,5)$$

$$= 625,5 \text{ mm}^2$$

✓ *answer* (3)

2.3

$$F = \frac{mv^2}{gr} \text{.....}(v)$$

$$Fgr = mv^2$$

$$\frac{Fgr}{m} = v^2 \quad ✓✓$$

$$\therefore \pm\sqrt{\frac{Fgr}{m}} = v \qquad (2)$$

2.4

$$A = \pi(R^2 - \frac{r}{x}) \text{.....}(r)$$

$$\frac{A}{\pi} = R^2 - \frac{r}{x}$$

✓ ✓ ✓ *mark per manipulation*

$$\frac{r}{x} = R^2 - \frac{A}{\pi}$$

$$r = x(R^2 - \frac{A}{\pi}) \qquad (3)$$

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2.5 *length* : $2x$

width : x

Perimeter $= 2l + 2b$

$6 = 2(2x) + 2(x)$ ✓ ✓ ✓ ✓

$6 = 6x$

$1 = x$

Length : 2

Width : 1

(4)
[16]

QUESTION 3

3.1 $3x^2 - 15x - 42 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{15 \pm \sqrt{(-15)^2 - 4(3)(-42)}}{2(3)}$$ ✓ ✓ ✓

$$x = \frac{15 \pm \sqrt{729}}{6}$$

$x = 7$ or $x = -2$ ✓

or $x^2 - 5x - 14 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(-14)}}{2(1)}$$

$$x = \frac{5 \pm \sqrt{81}}{2}$$

$x = 7$ or $x = -2$

[Answers only – NO marks allocated] (4)

3.2 $$\frac{25^{x+2}.5^{x-1}}{125^{x+1}}$$

$$= \frac{5^{2x+4}.5^{x-1}}{5^{3x+3}}$$ ✓ ✓ ✓

$$= \frac{5^{3x+3}}{5^{3x+3}}$$

$= 5^0 = 1$ ✓

(4)

3.3 $3^{8x-2} = 1$

$3^{8x-2} = 3^0$

$8x - 2 = 0$ ✓

$$x = \frac{1}{4}$$ ✓

(2)

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3.4 3.4.1

$$\log_5 25+2\log 100-3\log_3 27$$
$$=2\log_5 5+2(2)\log 10-3(3)\log_3 3$$
$$=2+4-9 \quad \checkmark\checkmark\checkmark$$
$$=-3 \quad \checkmark$$

(4)

3.4.2

$$\frac{\log 4}{3\log 64} \quad \checkmark\checkmark \quad \text{or} \quad \frac{2\log 2}{18\log 2}$$
$$=\frac{\log 4}{9\log 4}=\frac{1}{9} \qquad =\frac{1}{9}$$

(2)

3.5

$$x=\frac{12{,}3\ \times\ \sqrt{10{,}8}}{(4{,}6)^2}$$

$$\ln x=\ln 12{,}3+\frac{1}{2}\ln 10{,}8-2\ln 4{,}6$$
$$\ln x=2{,}51+1{,}19-3{,}052$$
$$\ln x=0{,}648$$
$$x=1{,}912$$

$\checkmark\checkmark\checkmark\checkmark$ *expansion, mark per value*
$\checkmark$ *answer*

or $\ln x=0{,}647$
$\therefore x=1{,}910$
(Rounding off at final step)

(5)
[21]

QUESTION 4

4.1 4.1.1

$$w=2\pi n$$
$$w=2\pi\left(\frac{100}{60}\right) \quad \checkmark\checkmark \textit{formula, substitution}$$
$$w=10{,}472 \text{ rad/sec}$$
$\checkmark$ *answer*

(3)

4.1.2

$$v=\pi Dn$$
$$v=\pi\left(\frac{29}{100}\right)\left(\frac{100}{60}\right) \quad \checkmark\checkmark \textit{convert to m, convert to seconds}$$
$$v=1{,}518 \text{ m/sec}$$
$\checkmark$

(3)

4.2 4.2.1

$$A=0{,}5r^2\theta$$
$$169{,}8=0{,}5(12{,}3)^2.\theta \quad \checkmark\checkmark\checkmark$$
$$\theta=2{,}245 \text{ rad}$$

(3)

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4.2.2 $2,245\times\frac{180}{\pi}=128,629025^o=128^o37,7'$ ✓

or more accurately $128^o37,742'$

(1)

4.3 $D=h+\frac{x^2}{4h}$

$88=12,4+\frac{x^2}{4(12,4)}$ ✓ ✓ ✓ *formula, substitution, value*

$3749,76=x^2$

$x=61,235\ cm$

✓ *answer*

(4)
[14]

QUESTION 5

5.1 5.1.1 $AB^2+BC^2=AC^2$

$7^2+BC^2=25^2$

$BC^2=625-49$ ✓ ✓ ✓

$BC^2=576$

$BC=24cm$

(3)

5.1.2 $5\sin\theta+12\tan\theta$

$=5(\frac{7}{25})+12(\frac{7}{24})$ ✓ ✓ *for each ratio*

$=\frac{7}{5}+\frac{7}{2}$

$=\frac{49}{10}=4,9$

✓ *answer*

**Answer only – NO marks*

(3)

5.1.3 $\sin\theta=\frac{7}{25}$

$\sin\theta=0,28$ ✓ ✓

$\theta=16,3^o$

(2)

5.2 5.2.1 $\cos\ 34^\circ12'+4\sec\ 120^o$

$=0,827+4(-2)$ ✓

$=-7,173$

**Answer only – full marks*

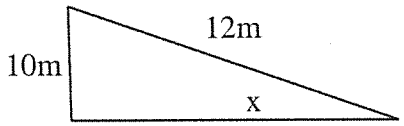
(1)

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5.2.2 $\dfrac{\sqrt{9\sin 90^o}}{3\cos 180^o} = \dfrac{\sqrt{9}}{-3} = \dfrac{3}{-3} = -1$ ✓

**Answer only – full marks* (1)

5.3



$\sin x = \dfrac{10}{12}$

$x = \sin^{-1}(0,833)$ ✓✓✓

$x = 56,4^0$

(3)
[13]

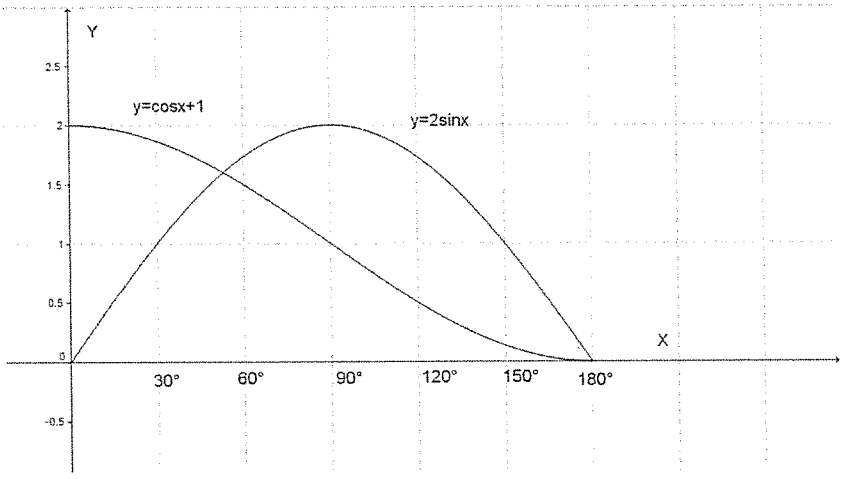
QUESTION 6

6.1

$y = \cos x + 1$ and $y = 2\sin x$ for $0^o \le x \le 180^o$

x	0^o	30	60	90	120	150	180
$y = \cos x + 1$	2	1,87	1,5	1	0,5	0,133	0
$y = 2\sin x$	0	1	1,73	2	1,73	1	0

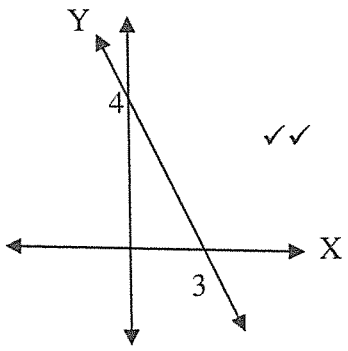
**marks allocated on graph*



Mark allocation	
Any two points on y=cosx+1 eg. (180°,0), (0°,2)	2 marks
Any two points on y=2sinx eg. (90°,2) (180°,0)	2 marks
Shapes/domain up to 180 °	1 mark

(5)

6.2 6.2.1



✓✓

Allocation of marks	
1 mark for x-intercept (3;0)	1
1 mark for y-intercept at (0;-4)	1

(2)

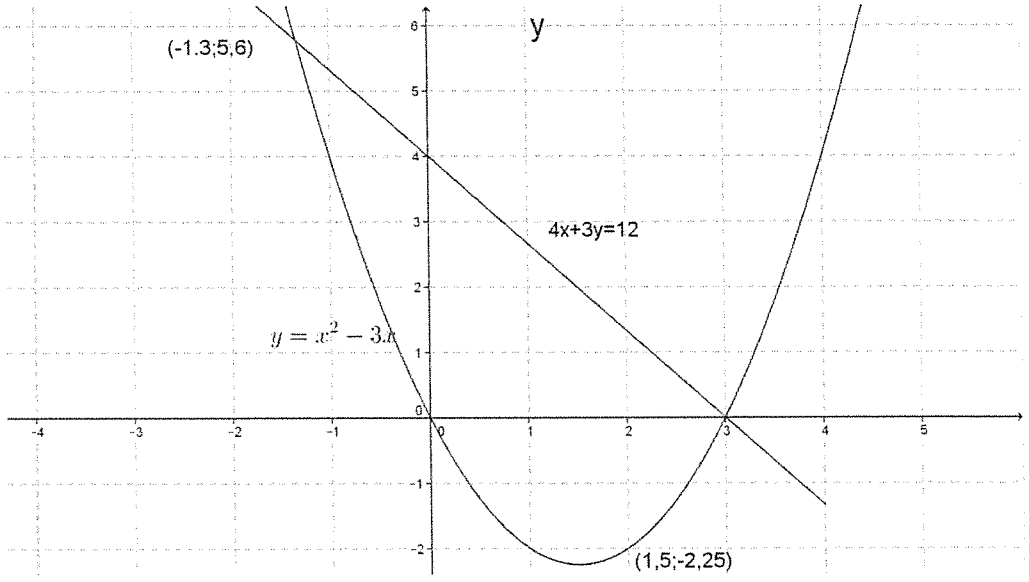
6.2.2 $X-\text{intercepts}: x(x-3)=0$

$x=0 \quad \text{or} \quad x=3$

$Y-\text{intercept}: y=0$

$\text{Turningpoint}: x=\frac{3}{2}=1,5$

$y=-2,25$



Allocation of marks	
1 mark for turning point (1,5; -2,25)	1
1 mark for y-intercept at (0;0)	1
1 mark for both x intercepts(0;0) and (3;0)	1
shape	1

(4)

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6.2.3 The coordinates of the points of intersection of the two graphs:
(3;0) and (-1,3 ; 5,8)
✓ ✓ *Follow up from the student's graph* (2)
[13]

TOTAL: 100

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