higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

MATHEMATICS N2

APRIL 2016

This marking guideline consists of 11 pages.

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INSTRUCTIONS AND INFORMATION

1. **✓ equals 1 mark an √ equals ½ 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 can be penalised by ONE mark.

7. Where a student copied wrongly 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

$$2x^2a - 8a - 8x^2 + 32$$
$$2a(x^2 - 4) - 8(x^2 - 4)$$
$$= 2(a - 4)(x - 2)(x + 2) \quad ✓ \quad ✓ \quad ✓ \quad ✓$$

(4)

1.1.2

$$3x^3y - 12x^2y + 9xy$$
$$= 3xy(x^2 - 4x + 3)$$
$$= 3xy(x - 3)(x - 1)$$

✓ ✓ ✓

(3)

1.2 1.2.1

$$\frac{2}{x} + \frac{2x}{3} - \frac{3x}{2}$$
$$= \frac{12 + 4x^2 - 9}{6x} \quad ✓$$
$$= \frac{12 - 5x^2}{6x} \quad ✓ \quad ✓$$

(3)

1.2.2

$$1 - \frac{3 - a}{3a}$$
$$= \frac{3a - 3 + a}{3a} \quad ✓ \quad ✓$$
$$= \frac{4a - 3}{3a} \quad ✓$$

(3)

1.2.3

$$\frac{2ax - 4a}{x^2 - 2x - 3} \div \frac{1}{4x - 12} \times \frac{x + 1}{4ax - 8a}$$
$$= \frac{2a(x - 2)}{(x - 3)(x + 1)} \times \frac{4(x - 3)}{1} \times \frac{x + 1}{4a(x - 2)} \quad ✓ \quad ✓ \quad ✓ \quad ✓$$
$$= 2 \quad ✓$$

(5)
[18]

QUESTION 2

2.1
$$-3x^2 - 4x + 5 = 0$$
$$3x^2 + 4x - 5 = 0$$
$$x = \frac{-4 \pm \sqrt{(-4)^2 - 4(3)(-5)}}{6} \checkmark$$
$$x = \frac{-4 \pm \sqrt{76}}{6} \checkmark$$

$x = 0,786 \quad or \quad x = -2,120$ ✓ ✓ (4)

2.2 2.2.1
$$B = \sqrt{\frac{pq}{Kx}} .....(x)$$
$$\therefore B^2 = \frac{pq}{Kx} \checkmark$$
$$\therefore x = \frac{pq}{KB^2} \checkmark$$
✓ (3)

2.2.2
$$I = \frac{nE}{R + nr} .....(n)$$

$$IR + Inr = nE$$
$$\therefore IR = nE - Inr$$
$$\therefore IR = n(E - Ir) \checkmark$$
$$\therefore n = \frac{IR}{E - IR} \checkmark$$
$$or\ n = \frac{-IR}{IR - E} \checkmark$$
(3)

2.3
$$9\ell + c = 137,81.....(1) \checkmark$$
$$14\ell + c = 198,26.....(2)$$
$$(1) - (2) \quad -5\ell = -60,45 \checkmark$$
$$\therefore \ell = 12,09 \checkmark$$

From (1) $9(12,09) + c = 137,81$
$$\therefore c = 137,81 - 108,81$$
$$\therefore c = 29 \checkmark$$
(4)
[14]

QUESTION 3

3.1
$$\frac{a^5b^3}{a^{-2}b^4}\times\sqrt{\sqrt[3]{a^{18}b^{36}}}$$
$$=\frac{a^7}{b}\times\sqrt{a^6b^{12}} \quad ✓ \quad ✓$$
$$=\frac{a^7}{b}\times a^3b^6 \quad ✓$$
$$=a^{10}b^5 \quad ✓$$ (4)

3.2
$$3.2^x=24$$
$$2^x=8 \quad ✓$$
$$2^x=2^3$$
$$x=3 \quad ✓$$ (3)

3.3 .
$$x=\frac{13{,}4^5\times\sqrt{265}}{12{,}8\times 54{,}6} \quad ✓$$
$$\therefore \log x=\log\frac{13{,}4^5\times\sqrt{265}}{12{,}8\times 54{,}6}$$
$$\therefore \log x=\log 13{,}4^5-\log 265^{\frac{1}{2}} \quad ✓ \quad ✓ \quad -\log 54{,}6$$
$$\therefore \log x=5\log 13{,}4-\frac{1}{2}\log 265-\log 12{,}8-\log 54{,}6 \quad ✓$$
$$\therefore \log x=4{,}003$$
$$\therefore x=10^{4{,}003}$$
$$\therefore x=10\,069{,}317 \quad ✓$$ (5)

Show ALL the steps. Answers only are not acceptable.

Without rounding off:

$$\log x=4{,}002744313 \quad ✓$$
$$\therefore x=10^{4{,}002744313}$$
$$\therefore x=10\,063{,}390 \quad ✓$$

3.4 $\dfrac{\log_x 9+\log_x 81-\log_x 3}{\log_x 2187}=\dfrac{5}{7}$ ✓

$LHS=\dfrac{\log_x 9+\log_x 81-\log_x 3}{\log_x 2187}$

$=\dfrac{\log_x 3^2+\log_x 3^4-\log_x 3}{\log_x 3^7}$ ✓ ✓

$=\dfrac{2\log_x 3+4\log_x 3-\log_x 3}{7\log_x 3}$

$=\dfrac{5\log_x 3}{7\log_x 3}$

$=\dfrac{5}{7}=RHS$ ✓

(4)
[16]

QUESTION 4

4.1 4.1.1 The angular velocity of the pulley in radians per second.

$w=2\pi n$ ✓

$w=2\pi(\dfrac{3500}{60})$ ✓

$w=366{,}519 rad/s$ ✓

(3)

4.1.2 $V=\pi Dn$

$2015=\pi D(\dfrac{3500}{60})$ ✓✓

$10{,}995=D$

$D=10{,}955\ cm$ ✓

(3)

4.2 4.2.1 $\theta=\dfrac{s}{r}$ ✓

$\theta=\dfrac{22{,}5}{24}$ ✓ where $s=22{,}5$cm and $r=24$ cm ✓

$\theta=0{,}938$ rad or $53{,}743^o$ ✓

Final round off:

$\theta=0{,}9375$ rad or $53{,}715^o$ ✓

(3)

4.2.2 $A = \frac{1}{2}r^2\theta$

$= \frac{1}{2}(24)^2(0,938)$ ✓

$= 270,144\ \text{cm}^2$ ✓

or

$= \frac{1}{2}(24)^2(0,9375)$ ✓

$= 270\ \text{cm}^2$ ✓

(2)

4.3 4.3.1 $AD^2 = AB^2 - BD^2$

$= (13,2)^2 - (8)^2$ ✓

$= 110,24$

$AD = 10,5\ \text{cm}$ ✓

(2)

4.3.2 $V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi(8)^2(10,5)$ ✓

$= 703,717\ \text{cm}^3$ ✓

$= 703,717\ \text{m}\ell$ ✓

or $703,7167544\ \text{cm}^3$ ✓

$= 703,7167544\ \text{m}\ell$ ✓

Follow up with height of 4.3

(3)

4.4 ✓ ✓ ✓

$A = [\frac{0+0}{2} + 12 + 13 + 21 + 24 + 23 + 18] \times 0,8$

$= 88,8\text{cm}^2$ ✓

or $A = 8880\text{mm}^2$ ✓

(4)

[20]

QUESTION 5

5.1 5.1.1 $\cos\theta = \frac{128}{134,5}$ ✓

$\cos\theta = 0,952$ ✓

$\theta = 17,824^o$ ✓

*without rounding off : $\theta = 17,885^o$ ✓

(3)

5.1.2

$AC^2 = 134,5^2 - 128^2$ ✓ or

✓

$AC^2 = 1706,25$

$AC = 41,307$

✓

$\sin 17.824 = \frac{opp}{134,5}$ ✓

$134.5.\sin 17,824^o = 41,17$

✓

or

In ΔABC

$\tan\theta = \frac{AC}{128}$ ✓

$\therefore AC = 128\tan\theta$ ✓

$\therefore AC = 128\tan 17,885^o$ ✓

$\therefore AC = 41,306$ cm

or

In ΔABC

$\sin\theta = \frac{AC}{134,5}$ ✓

$\therefore AC = 134,5\sin\theta$ ✓

$\therefore AC = 134,5\sin 17,885^o$

$\therefore AC = 41,306$ cm ✓

Or

In ΔABC

$\tan\theta = \frac{AC}{128}$ ✓

$\therefore AC = 128\tan\theta$

$\therefore AC = 128\tan 17,824^o$ ✓

$\therefore AC = 41,155$ cm

✓

(3)

5.1.3

$\sin\beta = \frac{41,307}{56,9}$

$\beta = \sin^{-1} 0,726$ ✓

$\beta = 46,552^o$ ✓

$\beta = 0,812 radians$ ✓

Or

$(or \beta = 46,549^o$

$\beta = 0,812 radians)$

✓

$\beta = 46,326^o$ ✓

$\therefore \beta = 0,808$ rad ✓

or

$\beta = 46,348^o$ ✓

$\therefore \beta = 0,809$ rad ✓

(3)

5.2 $3,5\tan A + 7 = 0; \quad A \in [0^o; 360^o]$

$\tan A = -2$

$A = 180 - 63,435 = 116,565$ ✓

$A = 360 - 63,435 = 296,565$ ✓

(3)

5.3

$$\tan 57^\circ = \frac{AC}{25} \quad \checkmark \checkmark$$

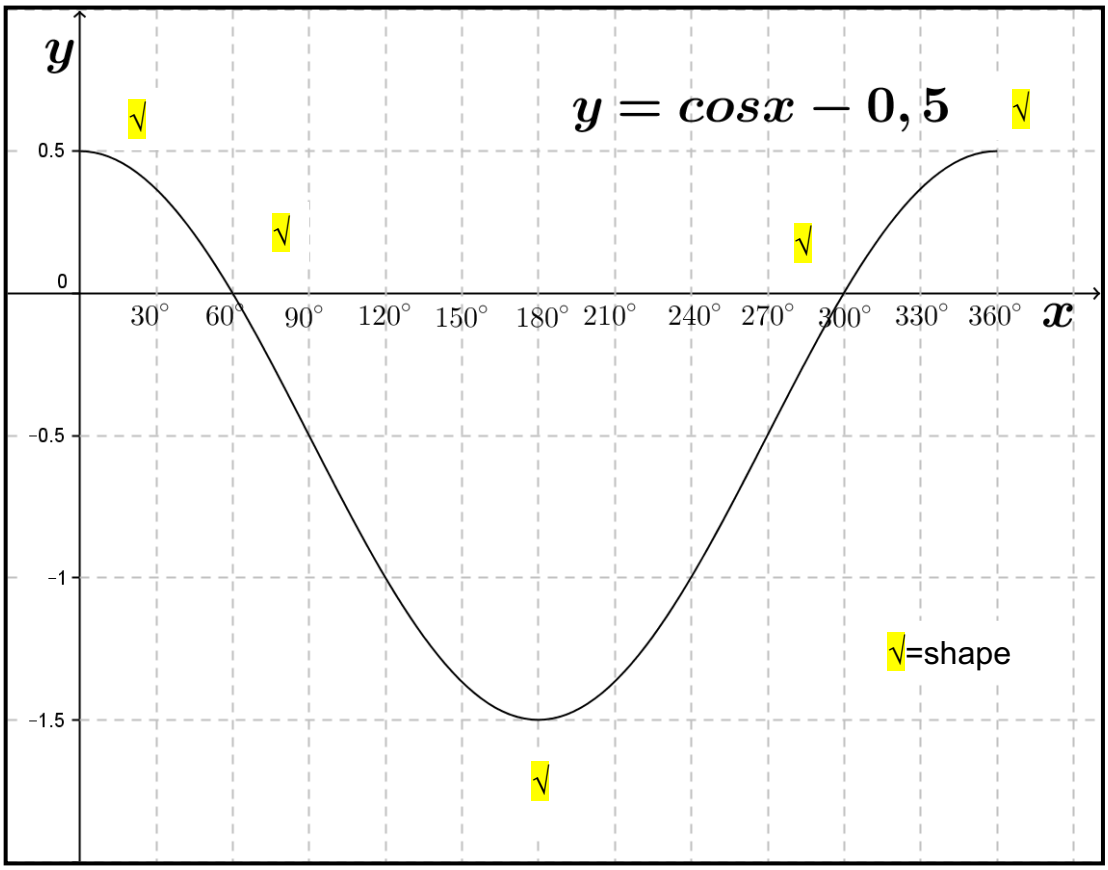
$$\therefore AC = 25\tan 57^\circ \quad \checkmark$$

$$\therefore AC = 38,497\text{m} \quad \checkmark$$

(4)
[16]

QUESTION 6

6.1 $y = \cos x - \frac{1}{2}$ for $0^o \le x \le 360^o$



shape	x-intercepts	y-intercept	turning points
½ mark(√)	60°,300° ½ mark& ½ mark √ √	0,5 ½ mark √	(180°,-1,5) ½ mark√ (360°, 0,5) ½ mark√

6 x ½ marks=3 marks (3)

6.2 6.2.1 $x^2 - 4x - 5 = 0$

$(x+1)(x-5) = 0$

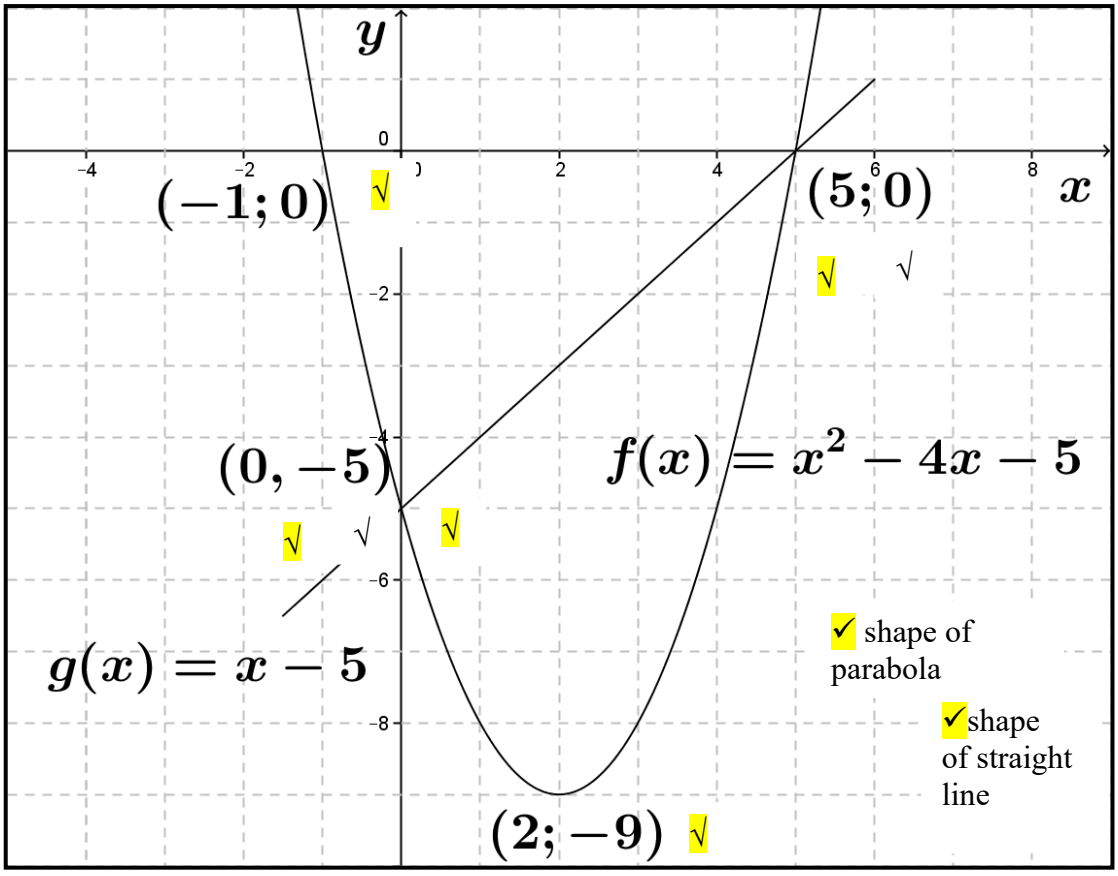
$x = -1$ or $x = 5$

✓ ✓ (2)

6.2.2 let $x = 0$ ✓
$y = -5$ (1)

6.2.3 $x = \frac{-b}{2a}$
$= \frac{-(-4)}{2}$
$= 2$ ✓ (1)

6.2.4 If $x = 2$ then
$y = (2)^2 - 4(2) - 5$
$= -9$
therefore, TP is $(2; -9)$ ✓ ✓ (2)



TP- ½ mark √
x-intercepts(½mark & ½ mark) ✓
Y-intercept(½ mark)
Shape (1 mark) √ ✓ (3)

√ √

6.3 x-intercept ½ mark
y-intercept ½ mark √
shape 1 mark ✓ (2)

6.4 (0;–5) ✓ and (5;0) ✓ (2)
[16]

TOTAL: 100

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