higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

MATHEMATICS N2

25 JULY 2014

This marking guideline consists of 8 pages.

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INSTRUCTIONS TO MARKERS

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, intermediate steps and simplification 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.

7. Where a student made errors in copying from the question paper, and the standard of the question is still the same, the student is 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

MARKING INSTRUCTION &NOTES

1.1 1.1.1

$3px-3py-x+y$
$=3p(x-y)-(x-y)$ ✓
$=(x-y)(3p-1)$
✓ ✓

✓taking out a negative 1 as common factor
✓✓factorisation using taking out CF (3)

1.1.2

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

✓find equivalent fractions using LCD
✓✓factorisation using quadratic trinomial (3)

1.1.3

$b(x^2-1)-b(x-1)^2$
$=b(x-1)(x+1)-b(x-1)(x-1)$ ✓
$=b(x-1)[(x+1)-(x-1)]$ ✓
$=2b(x-1)$ ✓

✓factorisation using difference of squares
✓taking out common factor
✓simplification (3)

1.2 1.2.1

$\frac{2}{(x+2)}-\frac{3}{(x-2)}+1$ ✓ ✓
$=\frac{2(x-2)-3(x+2)+(x+2)(x-2)}{(x+2)(x-2)}$
$=\frac{x^2-x-14}{(x+2)(x-2)}$ ✓ ✓
✓✓✓ *one mark per term*

✓✓find equivalent fractions using LCD
✓✓simplification (4)

1.2.2.

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

✓change of division sign to multiplication sign
✓ factorisation using taking out of common factor
✓ factorisation using difference of squares
✓factorisation of trinomial
✓simplification (5)

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1.3 $(a-b)^2(a+b)(\text{m}-1)$

$(a-b)(a+b)^2(m-1)(m+1)$

$(\text{a}-\text{b})^2(\text{a}+\text{b})^3(m+1)$

$HCF=(a-b)(\text{a}+\text{b})$ ✓ ✓

$LCM=(a-b)^2(a+b)^3(m+1)(m-1)$ ✓ ✓

✓✓LCM –subtract half mark for any other incorrect factor
✓✓HCF- subtract half mark for any incorrect factor (4)

[22]

QUESTION 2

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

$4983=d\ (\frac{123+98}{2}+1409)$ ✓ ✓✓✓✓

$4983=d(1519,5)$ ✓

$3,279=d$ ✓

✓

✓substitution
✓✓make d the subject of the formula
✓answer (4)

2.2 $3x^2-10x-5=0$ ✓

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

$x=\frac{-(-10)\pm\sqrt{100-4(3)(-5)}}{2(3)}$ ✓ ✓ *rmula, substitution*

$x=\frac{10\pm\sqrt{160}}{6}$

$x=3,775$ or $x=-0,442$

✓ ✓

✓rewrite quadratic equation to standard form
✓ use correct values in the place of a,b,c in the quadratic formula
✓✓ solutions (4)

2.3 $x^2-25x=-24$

$x^2-25x+24=0$

$(x-24)(x-1)=0$ ✓✓✓ *standard form, factors, one mark both answers*

$x=24\ or\ x=1$ ✓

✓ ✓

✓ factorisation
✓✓ solutions (3)

2.4

$$A=\frac{1}{\sqrt{1-B^2}}$$

$$\sqrt{1-B^2}=\frac{1}{A}$$ ✓

$$1-B^2=\frac{1}{A^2}$$ ✓

$$B^2=1-\frac{1}{A^2}$$ ✓

$$B=\pm\sqrt{1-\frac{1}{A^2}}$$ ✓

✓get rid of square root
✓✓manipulate 'B'
✓Final answer

(4)

2.5

$$(x)^2+(50)^2=(x+10)^2$$

$$x^2+2500=x^2+20x+100$$ ✓

$$20x-2400=0$$ ✓

$$x=120$$

$$x+10=130$$

lenght of the one side is 120 *cm* ✓

and the lenght of the hypotenuse is 130 *cm*

✓✓✓*one mark per manipulation* ✓

✓✓credit applicable steps used by students to show how the answer was determined

✓✓ answers

(4)
[19]

QUESTION 3

3.1 3.1.1

$$w=2\pi n$$ ✓

$$n=\frac{\omega}{2\pi}=\frac{54,13}{2\pi}$$ ✓

$$n=8,615\ rev/\sec$$ ✓

$$n=8,615\times 60=516,903\ rev/\min$$ ✓

✓✓✓*formula, substitution, answer*

✓formula
✓substitution
✓calculation
✓converting to r/min

(4)

3.1.2

$$\upsilon=\pi Dn$$ ✓

$$\upsilon=\pi(0,18)8,613$$ ✓✓✓*formula, change to meters, answer*

$$\upsilon=4,872m/\sec$$ ✓ ✓ ✓

✓formula
✓✓substitution of correct values
✓calculation

(4)

3.2

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

$$D=6,5+\frac{32^2}{4(6,5)}$$ ✓

$$D=45,885\ cm$$ ✓

✓✓substitution
✓calculation

(3)

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3.3 $V = \pi r^2 h$

$V = \pi(12,5)^2(40)$ ✓✓✓ *formula, RADIUS, answer*

$V = 19634,954cm^3$ ✓

✓substitution
✓calculation

✓

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(3)^3$ ✓ ✓ *formula, substitution, answer*

$V = 113,097cm^3$ ✓

✓substitution
✓calculation
✓division
✓ answer

**Wrong formula-NO marks allocated*

Total numbers of spheres $= \frac{19634,954}{113,097}$ ✓

$= 173,612$

Can cast 173 lead spheres ✓ ✓

(6)
[17]

QUESTION 4

4.1 $x = \frac{(44,6)^4}{\sqrt[3]{798}}$

$\log x = 4\log 44,6 - \frac{1}{3}\log 798$ ✓ ✓

$\log x = 6,597 - 0,967$

$\log x = 5,63$

$x = 426579,519$ *or* $427533,352$ ✓ ✓

✓use log rule to simplify a power raised to another power
✓applying log rule to simplify cube root
✓✓simplification and answers

Or

$x = \frac{(44,6)^4}{\sqrt[3]{798}}$

$\ln x = 4\ln 44,6 - \frac{1}{3}\ln 798$

$\ln x = 15,191 - 2,227$

$\ln x = 12,964$

$x = e^{12,964}$

$x = 426769,784$ *or* $426584,565$

✓✓✓ *expand, values, answer*

Alternative answer

(4)

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4.2
$$\frac{\log_x 243 \times \log_x 64}{\log_x 32 \times \log_x 81}$$
$$= \frac{\log_x 3^5 \times \log_x 2^6}{\log_x 2^5 \times \log_x 3^4} \quad ✓ \; ✓ \; ✓$$
$$= \frac{3}{2} \quad ✓$$

✓ use log rule to simplify a power by raising it to another power
✓simplification of multiplication and division of logs
✓simplification (3)

4.3 4.3.1
$$3^{2x-1}.9^{x-3} = 27^x$$
$$3^{2x-1}.3^{2x-6} = 3^{3x} \quad ✓$$
$$3^{4x-7} = 3^{3x} \quad ✓✓✓✓ \textit{like bases, simplify, equate}$$
$$4x - 7 = 3x \quad ✓$$
$$x = 7 \quad ✓$$

✓ writing 9 and 27 as power with base 3
✓equating like powers
✓solution (3)

4.3.2
$$\log_x\left(\frac{1}{64}\right) = 3$$
$$x^3 = \frac{1}{64} \quad ✓$$
$$x^3 = 2^{-6}$$
$$\left(x^3\right)^{\frac{1}{3}} = \left(2^{-6}\right)^{\frac{1}{3}} \quad ✓$$
$$x = 2^{-2} = \frac{1}{4} \quad ✓$$

✓applying definition of logs
✓simplification by equating like powers
✓solution (3)
[13]

QUESTION 5

5.1
$$\frac{\sin(180^o - \theta).\cos(360^o - \theta)}{\tan(180^o - \theta)}$$
$$= \frac{\sin\theta.\cos\theta}{-\tan\theta} \quad ✓ \quad ✓ \; ✓✓✓✓ \textit{mark per expression, identity}$$
$$= \frac{\sin\theta.\cos\theta}{-\frac{\sin\theta}{\cos\theta}} \quad ✓ \quad ✓$$
$$= -\cos^2\theta$$

✓✓applying trigonometric identities to simplify denominator and numerator
✓use quotient identities to simplify denominator
✓simplification (4)

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5.2 $2\sin^2\left(\frac{\pi}{6}\right)+\cos 90^0-\sqrt[3]{(\sec 60^0-1,5)}$

$=2\left(\frac{1}{2}\right)^2+0-0,7937$

$=-0,294$ ✓ ✓

✓✓Calculation with calculator rounded off to 3 decimal places as indicated in the instruction. Subtract a half mark if not.

(2)

5.3 $\frac{\pi}{32}=\frac{180^0}{32}=5^0\ 37,5'$ ✓

✓

✓conversion to degrees
✓conversion to degrees and minutes

(2)

5.4 $5\tan\theta+8=0$

$\tan\theta=-\frac{8}{5}=-1,6$ ✓

$\theta=180^0-58^0=122^0$ ✓

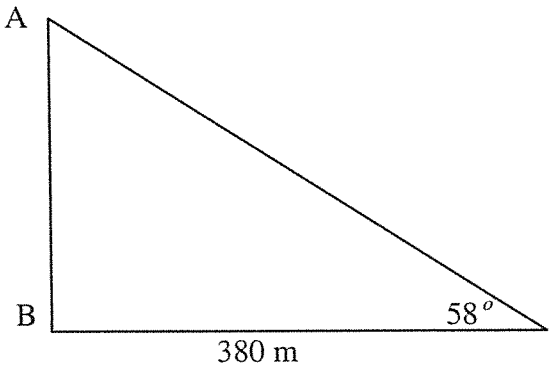
$or\ \theta=360^0-58^0=302^0$

Solution set $=\{122^0;\ 302^0\}$ ✓

✓manipulation
✓✓ solutions

(3)

5.5



$\tan 58^o=\frac{AB}{380}$ ✓

$AB=380\tan 58^o$

$AB=608,127m$ ✓

✓✓✓✓*two mark. ✓ the equation, calculation, answer*

✓ trigonometric equation and correct substitution
✓simplification
✓solution

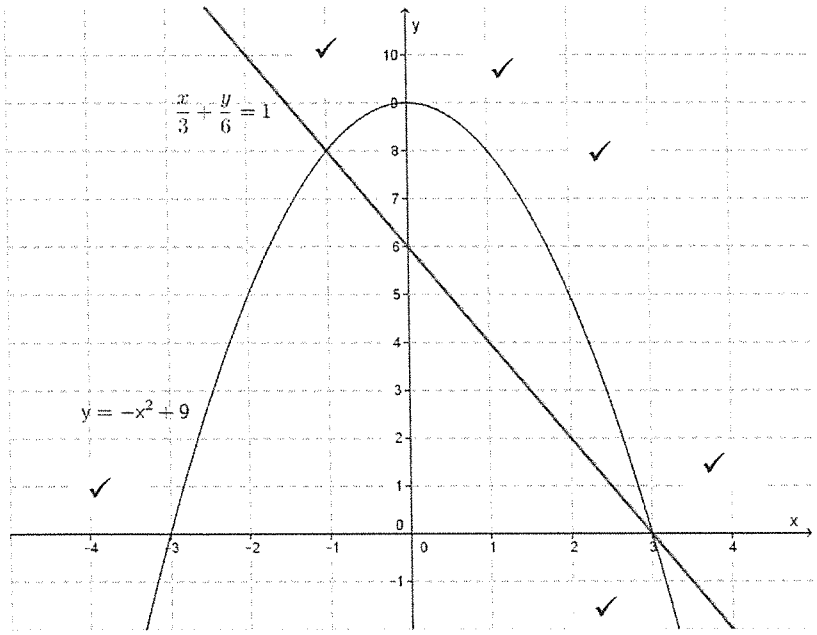
(3)

[14]

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QUESTION 6

6.1 6.1.1
6.1.2



Straight line:
✓x-intercept at 3
✓y-intercept at 6 (2)

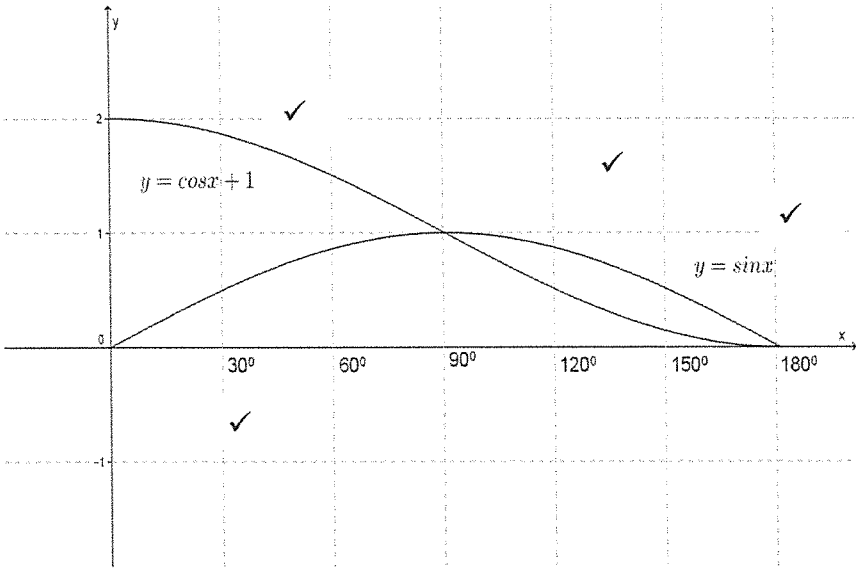
Parabola
✓shape
✓✓x-intercepts at 3 and -3
✓✓y-intercept= turning point (0,9)

(5)

6.2 (3;0) and (-1;8)✓✓ ✓✓ *Follow up from the student's graph*

✓✓Follow up from the student's graph (2)

6.3.1



y=cos x +1
✓x-intercept at 180°
✓y-intercept at 2

y=sin x
✓x-intercept at 180°✓
y-intercept of 0

(4)

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6.3.2	6.3.2.1	$x = 180^0 \surd$ $x = 90^0 \surd$	✓ Follow up from the student's graph (1)
6.3.2	6.3.2.2	$x = 90^0$ ✓	✓ Follow up from the student's graph (1)

[15]

TOTAL: 100

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