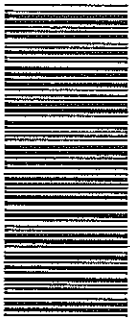


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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T930(E)(A6)T
AUGUST EXAMINATION
NATIONAL CERTIFICATE
MATHEMATICS N1

(16030121)

6 August 2015 (Y-Paper)
13:00–16:00

REQUIREMENT: Graph paper

Scientific calculators may be used.

This question paper consists of 7 pages and 1 formula sheet of 2 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
MATHEMATICS N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
 2. Read ALL the questions carefully.
 3. Number the answers according to the numbering system used in this question paper.
 4. Round answers off to three decimal numbers (where applicable).
 5. Write neatly and legibly.
-

QUESTION 1

- 1.1 1.1.1 250 km /h equals ... m/s. (2)
- 1.1.2 The reciprocal of 20 is ... (1)
- 1.1.3 Express 370 mm as a percentage of 1,225 m. (2)
- 1.2 Given: $7x^{-3} - 4x - 7$
- 1.2.1 ... is the exponent of x .
- 1.2.2 7 is the ... of x^{-3} .
- 1.2.3 ... is the variable.
- 1.2.4 ... is the constant term.
- 1.2.5 The number of terms is ... (5 x 1) (5)
- [10]**

QUESTION 2

- 2.1 Simplify the following by only making use of exponential laws:
- $$5(a^0 b^0)^8 \times \sqrt[5]{\frac{243a^{15}}{d^5}}$$
- (4)
- 2.2 Subtract $14a - 24b + 8c$ from $12b - 4a - 10c$. (3)
- 2.3 Simplify: $8a^6 \times 4a^2 \div 16a^{-4}$ (3)
- 2.4 Divide $d^3 + 12d^2 + 14d + 5$ by $d + 1$.
Then indicate the quotient and remainder. (7)
- 2.5 Remove the brackets and simplify the following :
 $(y - 3)(y^2 - 3y - 10)$ (5)
- [22]**

QUESTION 3

3.1 Show the prime factors of each of the following expressions:

$$12a^3bc$$

$$30a^2bc$$

$$81ab^2c$$

Now determine the highest common factor (HCF) and the lowest common multiple (LCM) of the expressions.

(7)

3.2 Simplify the following logarithms without the use of a calculator. Show ALL the steps.

$$\log_5 25 - 3\log_{10} 100 - \log_3 9 + \log_2 32$$

(5)

3.3 Simplify the fraction:

$$\frac{4}{3a} + \frac{1}{2b^2} - \frac{8}{5ab}$$

(4)

3.4 Simplify the following:

$$\frac{xy - x^2y^2}{xy} \div \frac{4 - 4xy}{20}$$

(4)

[20]

QUESTION 4

4.1 Solve for x :

$$11 + 5x + 5 = 6(10 - x)$$

(4)

4.2 The sum of THREE successive uneven numbers is 21. Determine the THREE numbers.

Let the first number be x .

(5)

4.3 $V = \frac{1}{2}\pi r^2 h$ is the formula used to calculate the volume of a cone.

Manipulate the formula to make r the subject of the formula.

(3)

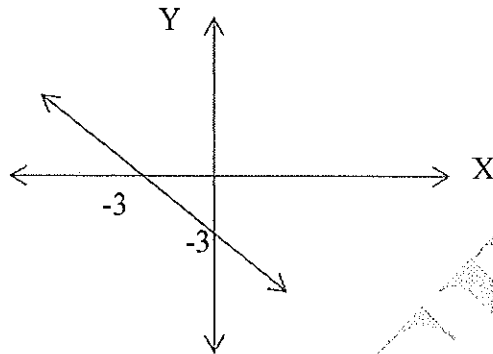
4.4 Calculate the value of r in QUESTION 4.3 if $V = 9$ and $h = 5$.

(2)

[14]

QUESTION 5

- 5.1 Sketch the graph $[(x; y) (y = 2x + 1)]$ by using a table of values.
Use values of x ranging from -2 to 1
Use a scale of 1 cm = 1 unit on both axis. Indicate the x and y axis. (6)
- 5.2 Give the name of the graph you have sketched in QUESTION 5.1. (1)
- 5.3 Given : The graph of $y = mx + c$

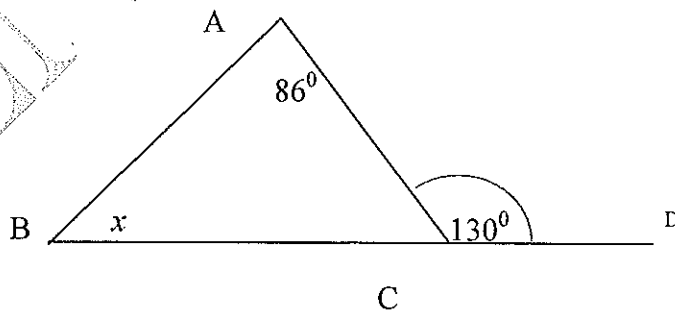


- 5.3.1 Give the coordinate of the y -intercept of the graph.
- 5.3.2 Give the slope of the graph.
- 5.3.3 Does this graph have a positive or a negative slope?

(3 x 1) (3)
[10]

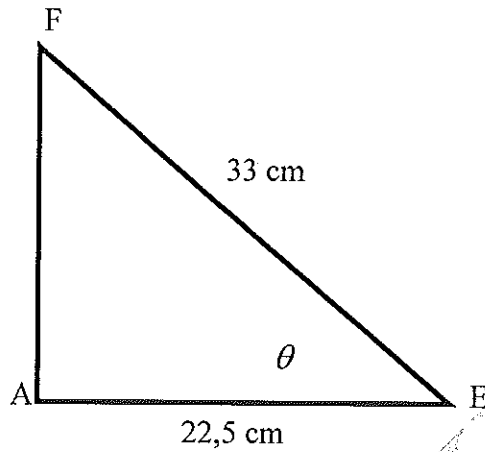
QUESTION 6

- 6.1 Determine the size of the interior angle x if the exterior angle $\hat{C} = 130^\circ$.



(2)

6.2 In the given figure below $\hat{A} = 90^\circ$; $AE = 22,5 \text{ cm}$; $EF = 33 \text{ cm}$.

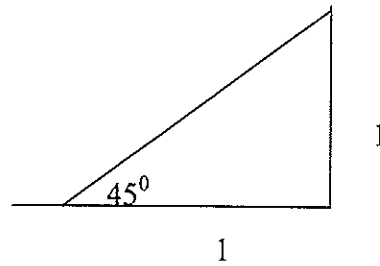
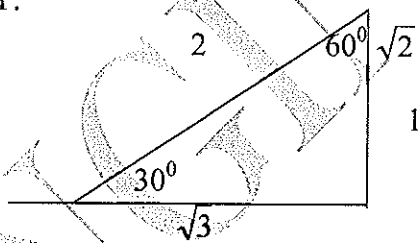


6.2.1 Calculate the length of side AF. (4)

6.2.2 Give the value of $(\cos \theta)(\sin \theta)$. (3)

6.3 Prove that $\sqrt{2} \cdot \cos 45^\circ (\sin 60^\circ)^2 = \frac{3}{4}$ by making use of special angles. Do NOT use a calculator.

HINT:



(4)
[13]

QUESTION 7

7.1 A floor has to be covered with tiles.

7.1.1 Calculate the area in metres of a tile with dimensions 415 mm × 390 mm.

7.1.2 Calculate the area of the floor measuring 4,5 m by 5,5 m.

7.1.3 Hence, calculate how many tiles you will need to tile the floor.

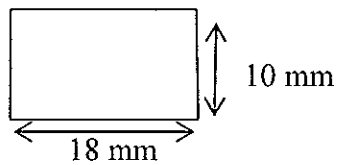
(3 x 2)

(6)

7.2 The price of Sasko bread is R7,80c and it is increased by 8%. Calculate the new price.

(3)

7.3 Calculate the area of the following:



(2)

[11]

TOTAL: 100

MATHEMATICS N1**FORMULA SHEET**

This sheet must accompany the question paper.

Rectangle: Perimeter = $2(l + b)$

$$\text{Area} = l \times b$$

Square: Perimeter = $4a$

$$\text{Area} = a^2$$

Triangle: Perimeter = $a + b + c$

$$\text{Area} = \frac{1}{2}b \times h$$

Rectangular prism:

$$\text{Volume} = l \times b \times h$$

Right triangular prism:

$$\text{Volume} = \frac{1}{2}b \times h \times l$$

Cube: Volume = a^3

Right pyramid:

$$\text{Volume} = \frac{1}{3}(\text{base area} \times h)$$

Ellipse:

$$\text{Area} = \frac{\pi}{4}(\text{major axis} \times \text{minor axis})$$

Circle: Circumference = πD or $2\pi r$

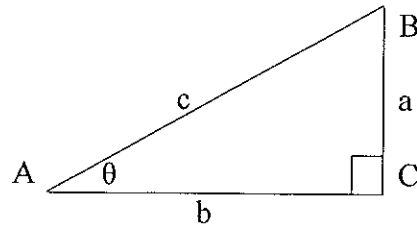
$$\text{Area} = \frac{\pi D^2}{4} \text{ or } \pi r^2$$

Cylinder: Volume = $\frac{\pi D^2}{4} \times h$ or $\pi r^2 h$

Cone: Volume = $\frac{\pi D^2}{4} \times \frac{h}{3}$ or $\frac{\pi r^2 h}{3}$

Annulus: $A = \pi(R^2 - r^2)$

The right-angled triangle:



The theorem of Pythagoras:

$$c^2 = a^2 + b^2$$

Ratios of angle θ :

$$\sin\theta = \frac{a}{c}$$

$$\cos\theta = \frac{b}{c}$$

$$\tan\theta = \frac{a}{b}$$



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MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

MATHEMATICS N1

6 AUGUST 2015

This marking guideline consists of 7 pages.

- (1) Do not allocate marks for QUESTION 5.3.3 (1mark) and 6.3 (4 marks)**
- (2) The total (100) to be reduced by 5 marks to 95 for all candidates**
- (3) Mark all candidates out of a total of 95 marks**
- (4) Convert the mark achieved out of 95 to a percentage**
- (5) Record the percentage achieved on the mark sheet**

Question paper to be marked out of 95 instead of 100

QUESTION 1

- 1.1 1.1.1 69,444 m/s ✓✓ (2)
- 1.1.2 $\frac{1}{20}$ ✓ (1)
- 1.1.3 30,204% ✓✓ (2)
- 1.2 1.2.1 1 ; -3 ✓ any one exponent
- 1.2.2 Coefficient ✓
- 1.2.3 x ✓
- 1.2.4 -7 ✓
- 1.2.5 3 ✓
- (5 x 1) (5)
[10]

QUESTION 2

2.1

$$\begin{aligned}
 & 5(a^0 b^0)^8 \times \sqrt[5]{\frac{243a^{15}}{a^5}} \\
 & \quad \sqrt{} \\
 & = 5(1)^0 \times (3^5 a^{15-5})^{\frac{1}{5}} \quad \checkmark \\
 & = 5 \times 3a^2 \quad \checkmark \\
 & = 15a^2 \quad \checkmark
 \end{aligned}$$

(4)

2.2

$$\frac{12b - 4a - 10c}{36b - 18a - 18c} \quad \checkmark \checkmark \checkmark$$

(3)

OR

$$\frac{-4a + 12b - 10c}{-18a + 36b - 18c} \quad \checkmark \checkmark \checkmark \quad (\text{ONE mark per term})$$

2.3

$$\begin{aligned}
 & 8a^6 \times 4a^2 \div 16a^{-4} \\
 & = 32a^8 \div 16a^{-4} \quad \checkmark \\
 & = 2a^{8-(-)4} \quad \checkmark \\
 & = 2a^{12} \quad \checkmark
 \end{aligned}$$

(3)

2.4 $d^2 + 11d + 3$ ✓✓✓ (ONE mark per term)

$$\begin{array}{r}
 d+1 \overline{) \begin{array}{l} d^3 + 12d^2 + 14d + 5 \\ \underline{d^3 + d^2} \\ 11d^2 + 14d \\ \underline{11d^2 + 11d} \\ 3d + 5 \\ \underline{3d + 3} \\ 2 \end{array} \\
 \end{array}$$

Quotient: $(d^2 + 11d + 3)$

Remainder: 2

(7)

2.5 $(y-3)(y^2 - 3y - 10)$
 $= y^3 - 3y^2 - 10y - 3y^2 + 9y + 30$ (1st 3 correct terms ✓✓✓ ; last 3 correct terms ✓✓✓)
 $= y^3 - 6y^2 - y + 30$ ✓

(5)
[22]

QUESTION 3

3.1 $12a^3bc = 3 \times 2^2 \times a^3bc$ ✓
 $30a^2bc = 2 \times 3 \times 5 \times a^2bc$ ✓
 $81abc = 3^4 ab^2c$ ✓ (ONE mark per term)

$LCM = 3^4 \times 2^2 \times 5$ ✓✓ (ONE mark for the value, one mark for the variables)
 $= 1620a^3b^2c$

$HCF = 3abc$ ✓✓ (ONE mark for the value, one mark for the variables) (7)

3.2 $\log_5 25 - 3\log_{10} 100 - \log_3 9 + \log_2 32$
 $= \log_5 5^2 - 3\log_{10} 10^2 - \log_3 3^2 + \log_2 2^5$ ✓✓
 $= 2(1) - 3(2)(1) - 2(1) + 5$ ✓✓
 $= 2 - 6 - 2 + 5$
 $= -1$ ✓ (5)

3.3 $\frac{4}{3a} + \frac{1}{2b^2} - \frac{8}{5ab}$
 $\frac{40b^2 + 15a - 48b}{30ab^2}$ ✓✓✓✓ ONE mark for each correct term of the numerator
 ONE mark for the LCD (4)

$$\begin{aligned}
 3.4 \quad & \frac{xy - x^2y^2}{xy} \div \frac{4 - 4xy}{20} \\
 & = \frac{xy - x^2y^2}{xy} \times \frac{20}{4 - 4xy} \checkmark \quad \text{division becomes multiplication \& fraction turns} \\
 & = \frac{xy(1 - xy)}{xy} \times \frac{20}{4(1 - xy)} \checkmark \checkmark \quad \text{for factorisation} \\
 & = 5 \checkmark
 \end{aligned}$$

(4)

[20]**QUESTION 4**

$$\begin{aligned}
 4.1 \quad & 11 + 5x + 5 = 6(10 - x) \\
 & 16 + 5x = 60 - 6x \checkmark \\
 & 5x + 6x = 60 - 16 \checkmark \\
 & \frac{11x}{11} = \frac{44}{11} \checkmark \\
 & x = 4 \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 4.2 \quad & x + x + 2 + x + 4 = 21 \checkmark \checkmark \quad \text{ONE mark for the uneven numbers /} \\
 & 3x + 6 = 21 \quad \text{ONE mark for the addition sign and equal to 21} \\
 & 3x = 21 - 6 \\
 & 3x = 15 \checkmark \\
 & x = 5 \checkmark
 \end{aligned}$$

The three numbers are:

$$5, 7 \text{ and } 9 \checkmark \quad \text{If only the three numbers are given, give one mark only} \quad (5)$$

$$\begin{aligned}
 4.3 \quad & V = \frac{1}{2} \pi r^2 h \\
 & 2V = \pi r^2 h \checkmark \\
 & \frac{2V}{\pi h} = r^2 \checkmark \\
 & \therefore r = \sqrt{\frac{2V}{\pi h}} \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 4.4 \quad & r = \sqrt{\frac{2V}{\pi h}} \\
 & r = \sqrt{\frac{2(9)}{\pi(5)}} \checkmark \\
 & = 1,071 \checkmark
 \end{aligned}$$

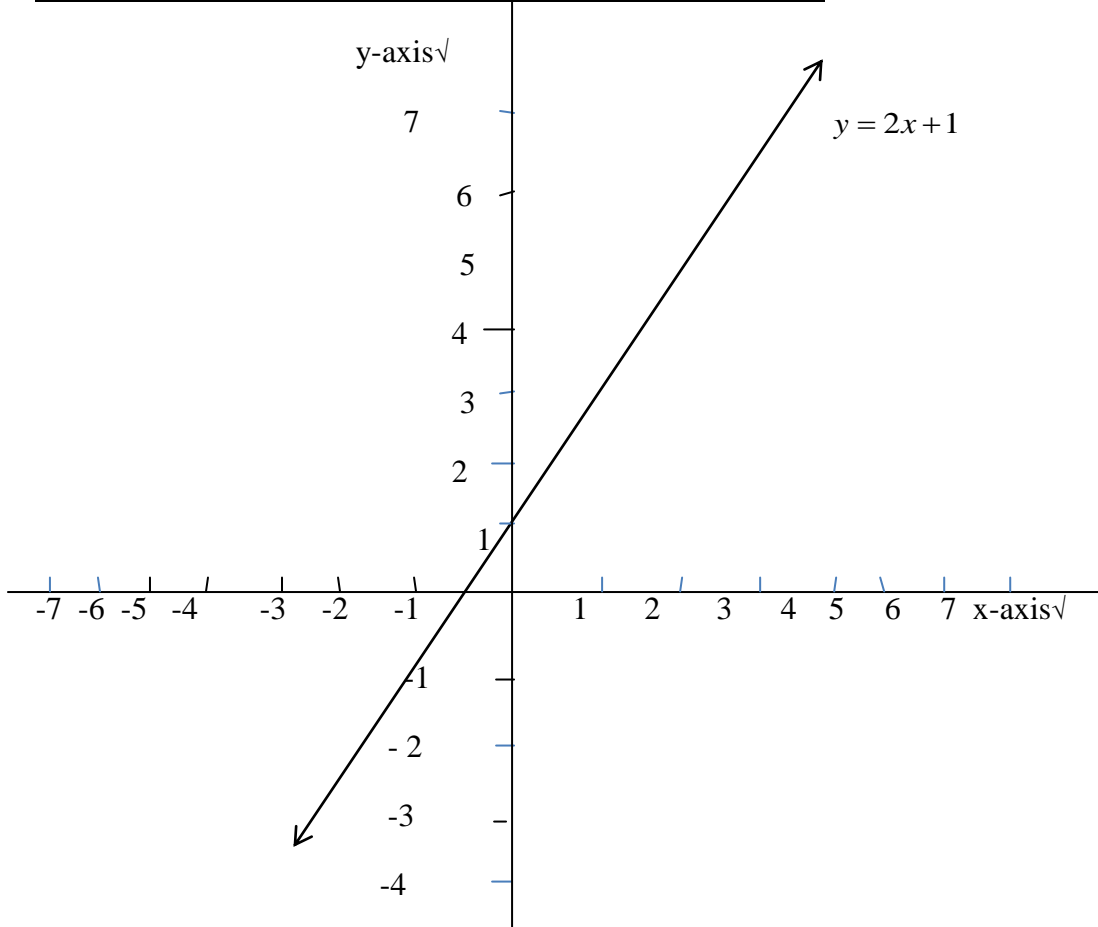
(2)

[14]

QUESTION 5

5.1

x	-2	-1	0	1
y	-3	-1	1	3



2 marks for calculating each of the coordinates correctly ✓✓ in the table

x -intercept between 0 and -1 ✓

✓ ONE mark for straight line graph

✓ ONE mark for 1 as y intercept

✓ labelling both axes

(6)

5.2 Straight line ✓

(1)

5.3 5.3.1 (0;-3)✓

5.3.2 $m = -1$ ✓

5.3.3

(2 x 1) (2)

[9]

QUESTION 6

6.1

$$\hat{A} + \hat{B} = 130^\circ$$

$$86^\circ + x = 130^\circ \checkmark$$

$$x = 130^\circ - 86^\circ$$

$$= 44^\circ \checkmark$$

OR

$$C + 130^\circ = 180^\circ$$

$$\mathbf{C = 50^\circ} \checkmark$$

$$86^\circ + 50^\circ + x = 180^\circ$$

$$\mathbf{x = 44^\circ} \checkmark \quad (2)$$

6.2

6.2.1

$$AF^2 + AE^2 = EF^2$$

$$AF^2 + 22,5^2 = 33^2 \checkmark \checkmark \quad \text{for substitution}$$

$$AF^2 = 582,75 \checkmark$$

$$AF = 24,14 \checkmark \quad (4)$$

6.2.2

$$\left(\frac{22,5}{33}\right)\left(\frac{24,14}{33}\right) \checkmark \checkmark$$

$$= \frac{543,15}{1089}$$

$$= \mathbf{0,499} \checkmark \quad \text{2 marks for substitution on step 1}$$

OR answer only 3 marks (3)

6.3

[9]

