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& training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA

T1350(E)(N9)T  
NOVEMBER 2011

NATIONAL CERTIFICATE

**MATHEMATICS N1**

(16030121)

**9 November (X-Paper)**  
**09:00 – 12:00**

**REQUIREMENTS: TWO sheets of graph paper**

**Calculators may be used.**

**This question paper consists of 6 pages and a 2-page formula sheet.**

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

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**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.
  2. Read ALL the questions carefully.
  3. Number the answers correctly according to the numbering system used in this question paper.
  4. Show ALL the calculations and steps. Simplify where possible.
  5. ALL the graph work must be done on the graph paper provided.
  6. Final answers must be approximated to the nearest THREE decimal places.
  7. Questions may be answered in any order, but subsections of questions may NOT be separated.
  8. 1 mark = 1%.
  9. Write neatly and legibly.
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## QUESTION 1

Simplify the following without the aid of a calculator:

1.1  $3x^{-2} \times 3x^3 \div 3x$

1.2  $\log_{10} 3 + \log_{10} 300 - \log_{10} 9$

1.3  $\frac{a^4 b^{-2}}{a^3 b^2}$

1.4  $\sqrt{\frac{32a^3}{8a^2}} \times (-2^3)^0$

1.5 Use logarithms with base  $e$  and determine the value of 'x' in the following case:

$$x = \frac{8,24^3 \times \sqrt{1,24}}{0,150}$$

## QUESTION 2

Simplify by first taking away the brackets:

2.1  $(x^2 - 4x - 4)(x - 2)$

2.2 Subtract  $-4a + 6b - 3c$  from  $3c - 2a - 4b$

## QUESTION 3

Simplify the following:

3.1  $\frac{3ab - 3b^2}{4a} \div \frac{2a - 2b}{2ab}$

3.2  $\frac{6x^3 - 12x^5}{6x^3}$

## QUESTION 4

4.1 Factorise the following expressions:

4.1.1  $5x^3y^4 - 10x^2y^2 + 15x^4y^2$

4.1.2  $(2a - 3b)^2 - 2a + 3b$

4.2 Determine the highest common factor (HCF) and the lowest common multiple (LCM) of the following:

$$32x^2y^3; 48x^4y^2z^2; 70x^2y^4z^3$$

## QUESTION 5

5.1 Calculate the value of 'V' in the following equation:

$$V = \Pi r \sqrt{h^2 + r^2}; \text{ if } r = 20 \text{ mm and } h = 30 \text{ mm}$$

5.2 Change the subject of the formula so that the symbol in brackets becomes the new subject:

$$V = \Pi r \sqrt{h^2 + r^2} \quad (h)$$

5.3 The sum of two numbers is 90 and the difference is 40. Find the TWO numbers.

HINT: Let the smaller be 'x'

5.4 A field has a rectangular shape. The length is 10 m longer than 3 times the breadth. If the length is decreased by 50 m and the breadth is increased by 3 m, the length will be twice the breadth.

Determine the length and the breadth.

## QUESTION 6

Given:

- 5.3 Give the name of the graph.
- 5.4 Give the value of the  $y$ -intercept of the straight line graph.
- 5.5 In which quadrant(s) will the other graph be?
- 5.6 Draw the graph of the function  $xy = 2$  for the  $x$ -values of:  
-4; -3; -2; -1; 1; 2; 3; 4

## QUESTION 7

- 7.1 The outer diameter of a pipe is 250 mm, whilst the inner diameter is 200 mm. Calculate the cross sectional area of the pipe.
- 7.2 A wooden rectangular prism is machined to the following specifications:  
Length = 30 cm, width = 20 cm and height = 15 cm  
Determine the volume of the wood contained in the prism.
- 7.3 Calculate the area of a circle if its circumference is 25 m.
- 7.4 A water tank in the form of an open cylinder has a capacity of 4 000 liters. The height of the tank is 5 m.  
Calculate the following:
- 7.4.1 The diameter of the tank
- 7.4.2 The surface area of the closed tank

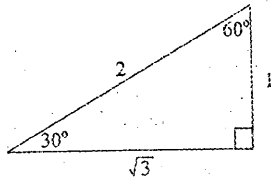
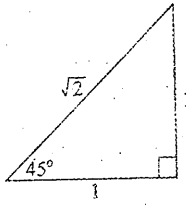
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## QUESTION 8

- 8.1 Determine the value of  $A$  in each of the following cases:
- 8.1.1  $\tan A = \frac{1}{\sqrt{3}}$
- 8.1.2  $\tan 48^\circ 45' = A$

8.2

Given:



Make use of the above triangles to simplify the following expressions (without the aid of a calculator):

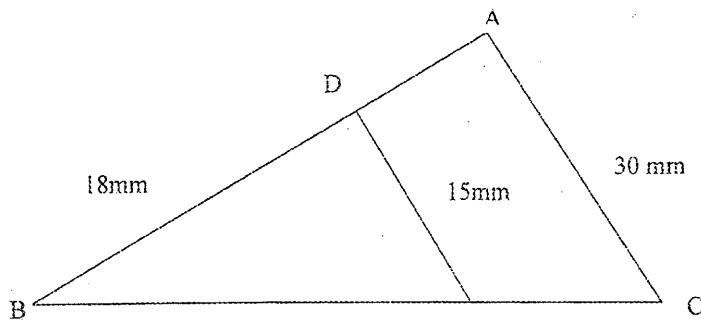
8.2.1  $\sin 30^\circ + \cos 60^\circ$

8.2.2 
$$\frac{3 \tan 45^\circ \times 2 \sin 30^\circ}{3 \cos 60^\circ}$$

### QUESTION 9

In the given figure  $\triangle ABC$  and  $\triangle BDE$  are similar.  $AC = 30$  mm,  $DE = 15$  mm,  $BD = 18$  mm and  $CE = 12$  mm.

Calculate the length of  $AD$ .



**FORMULA SHEET**

This sheet must accompany the question paper.

Rectangle: Perimeter =  $2(l + b)$   
Area =  $l \times b$

Square: Perimeter =  $4a$   
Area =  $a^2$

Triangle: Perimeter =  $a + b + c$   
Area =  $\frac{1}{2}b \times h$

Rectangular prism:  
Volume =  $l \times b \times h$

Right triangular prism:  
Volume =  $\frac{1}{2}b \times h \times l$

Cube: Volume =  $a^3$

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

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

Circle: Circumference =  $\pi D$  or  $2\pi r$   
Area =  $\frac{\pi D^2}{4}$  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:  $A = \pi(R^2 - r^2)$

Reghoek: Omtrek =  $2(l + b)$   
Area =  $l \times b$

Vierkant: Omtrek =  $4a$   
Area =  $a^2$

Driehoek: Omtrek =  $a + b + c$   
Area =  $\frac{1}{2}b \times h$

Reghoekige prisma:  
Volume =  $l \times b \times h$

Regte driehoekige prisma:  
Volume =  $\frac{1}{2}b \times h \times l$

Kubus: Volume =  $a^3$

Regte piramide:  
Volume =  $\frac{1}{3}(\text{basisarea} \times h)$

Ellips:  
Area =  $\frac{\pi}{4}(\text{hoofas} \times \text{neweas})$

Sirkel: Omtrek =  $\pi D$  or  $2\pi r$   
Area =  $\frac{\pi D^2}{4}$  or  $\pi r^2$

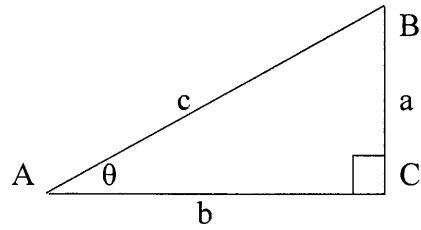
Silinder: Volume =  $\frac{\pi D^2}{4} \times h$  or  $\pi r^2 h$

Keël: 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:

Die reghoekige driehoek:



The theorem of Pythagoras:

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

Die stelling van Pythagoras:

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

Ratios of angle  $\theta$ :

Verhoudings vir hoek  $\theta$ :

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

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

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