higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T990**(E)**(J23)T

NATIONAL CERTIFICATE

MATHEMATICS N1

(16030121)

23 July 2018 (X-Paper)
09:00–12:00

Requirements: ONE graph paper

Non-programmable scientific calculators may be used.

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

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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. 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.
7. Questions must be answered in BLUE or BLACK ink. Writing in pencil will NOT be marked. Graphs can be drawn in pencil.
8. Sketches/graphs must be large, neat and fully labelled.
9. Work neatly.

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QUESTION 1

1.1 Simplify the following without using a calculator and by making use of exponential and/or logarithmic laws:

1.1.1 $a^2b^3 \times a^4b^2$ (2)

1.1.2 $\dfrac{(3x^3y^2)^3 \times (x^4y)^0}{(xy^2)^2}$ (4)

1.1.3 $\sqrt{73-(-3)^2} \times 2y^0 + \log_6 6$ (4)

1.2 Simplify the following logarithms without using a calculator:

1.2.1 $\log 25 + \log 4$ (2)

1.2.2 $\dfrac{\log 8}{\log 7} \times \dfrac{\log 49}{\log 4}$ (3)

[15]

QUESTION 2

2.1 Divide $x^3 - 4 - 4x + x^2$ by $x + 2$ (3)

2.2 Subtract $7x - 8x^2 + 3$ from $3 + x - 2x^2$ (3)

[6]

QUESTION 3

3.1 Factorise the following expressions fully:

3.1.1 $24x - 12yx^2 + 16$ (2)

3.1.2 $5a^2 + b(a^2 + 5) + b^2$ (3)

3.2 Simplify the following:

3.2.1 $\dfrac{x^2}{2} + \dfrac{2x^2}{3} - \dfrac{7x^2}{6}$ (4)

3.2.2 $\dfrac{x^2-4x}{4y} \times \dfrac{4xy}{xy(x-y)} \div \dfrac{x}{y^2-y}$ (5)

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3.3 Determine the lowest common multiple (LCM) and the highest common factor of (HCF) of the following algebraic terms by making use of prime factors:

$5\,m^2n^4l^2$
$15\,mn^3l$
$10\,m^3nl^4$ (6)

[20]

QUESTION 4

4.1 Solve for x:

4.1.1 $5(x-4)=3(x-2)$ (4)

4.1.2 $3(x-5)=12$ (2)

4.2 Sarah is five times as old as Mavis. After four years Sarah will be three times as old as Mavis. Calculate their present ages. (4)

4.3 The volume of a cylinder is: $V=\pi r^2h$

4.3.1 Make r the subject of the formula.

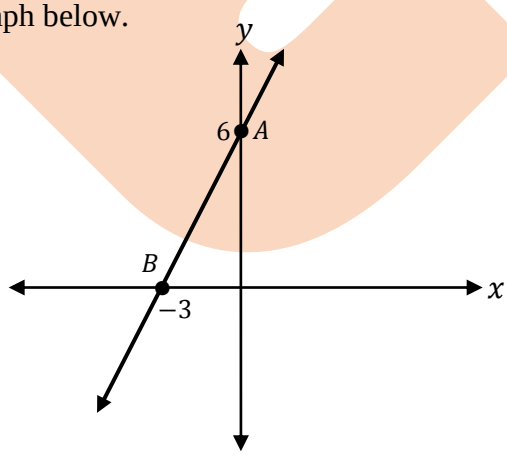
4.3.2 If $V=630\ cm^3$ and $h=5\ cm$, find the value of r.

(2 × 2) (4)

[14]

QUESTION 5

5.1 Study the graph below.



5.1.1 Write down the coordinates of A and B. (2)

5.1.2 Calculate the gradient of the straight line. (1)

5.1.3 Determine the equation of the straight line. [*Write your answer in form: $y=mx+c$] (1)

5.2 Given: $xy = 7$

5.2.1 Complete the table below.

x	-7	-1	1	7
y				

(2)

5.2.2 Draw the graph by making use of the table given in QUESTION 5.2.1. [Use graph paper.] (3)

5.2.3 Determine the relation of the x-values and y-values of the graph. (1)

5.2.4 What is the name of the graph? (1)

[11]

QUESTION 6

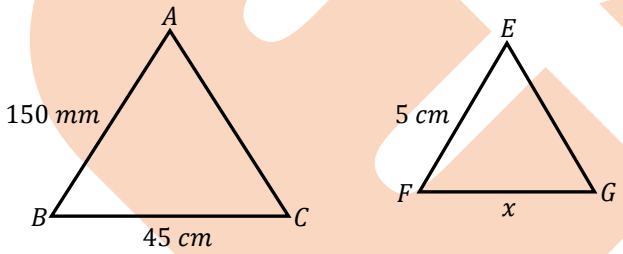
6.1 Define the following:

6.1.1 Isosceles triangle.

6.1.2 Supplementary angles.

(2 × 1) (2)

6.2 Given: $\Delta ABC \text{ III } \Delta EFG$



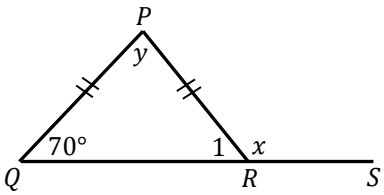
6.2.1 Complete the following:

$$\frac{AB}{EF} = \frac{?}{FG} = \frac{AC}{?}$$

(1)

6.2.2 Solve for x in cm. (2)

6.3 Given: ΔPQR with QR extended to S. Calculate x and y. Give reasons for your answers.

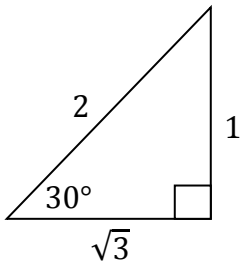


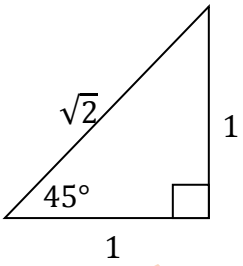
(4)

[9]

QUESTION 7

7.1 Simplify the following without the use of a calculator and by making use of special angles:

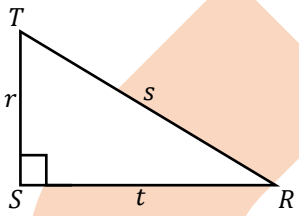




$$\frac{\cos 45° \times \tan^2 30°}{\sin 60°}$$ (4)

7.2 Given: ΔTSR

Write down the following trigonometric ratios in terms of $s; t$ and r:



7.2.1 $\sin \hat{R}$

7.2.2 $\cos \hat{T}$

(2 × 1) (2)

7.3 If $A = 30°$ and $B = 40°$, use a calculator and simplify the following:

7.3.1 $\sin(A + B)$ (2)

7.3.2 $\cos A + \cos B$ (3)

[11]

QUESTION 8

8.1 The price of fuel is $R13{,}88$ per litre, it will increase to $R14{,}30$.

Calculate the percentage increase. (3)

8.2 The area of a right-angled triangle is 8 cm^2 and the base is 3 cm.

Calculate the height of a triangle. (3)

8.3 A rectangular prism has a length of 4 cm; a breadth of 1,5 cm and a height of 2 cm.

8.3.1 Calculate the volume of the prism. (3)

8.3.2 What is the capacity of the prism if 1 $cm^3 = 1\ ml$? (1)

8.3.3 Calculate the surface area of the rectangular prism. (4)

[14]

TOTAL: 100

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MATHEMATICS N1

FORMULA SHEET

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 = $\frac{1}{3}$ (base area × h)

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

Circle:
Circumference = πD or $2\pi r$
Area = $\frac{\pi D^2}{4}$ or πr^2

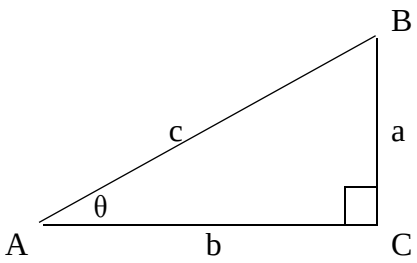
Cylinder:
Volume = $\frac{\pi D^2}{4} \times h$ or $\pi r^2 h$

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

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

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The right-angled triangle:



The theorem of Pythagoras:
$c^2 = a^2 + b^2$

Ratios of angle θ:

$$\sin\theta = \frac{a}{c} \qquad \cos\theta = \frac{b}{c} \qquad \tan\theta = \frac{a}{b}$$

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