higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# NATIONAL CERTIFICATE

# MATHEMATICS N1

(16030121)

**23 July 2021 (X-paper)**
**09:00–12:00**

**REQUIREMENTS: Graph paper**

**Nonprogrammable calculators may be used.**

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

009Q1G2123

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# 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 according to the numbering system used in this question paper.
4. Keep subsections of questions together.
5. Start each question on a new page.
6. Use only a black or blue pen.
7. Round off final answers to THREE decimal places (unless indicated otherwise).
8. Answer QUESTION 5.3 on GRAPH PAPER.
9. Write neatly and legibly.

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## QUESTION 1

1.1 Simplify each of the following, without a calculator, by using exponential laws:

1.1.1 $(b^3)^{a+c} \times (b^3)^{-a-c}$ (4)

1.1.2 $x^3y^2 \div yx^2 \times \frac{xy}{2}$ (3)

1.2 Simplify, without a calculator, by using logarithmic laws:

$-5 \log_5 \frac{1}{25}$ (4)

1.3 Solve for $x$ without using a calculator:

$\log_5(5x - 15) = 2$ (4)

**[15]**

## QUESTION 2

2.1 Divide $26x - 24 + 8x^3 + 35x^2$ by $x + 2$. (7)

2.2 From $7x^2 - 3xy + 9y^2$ subtract $-17xy - 3x^2 + 13y^2$. (3)

2.3 Remove the brackets and simplify:

$3(x + 1)(x - 2)$ (3)

**[13]**

## QUESTION 3

3.1 Fully factorise the following expressions:

3.1.1 $7a + 14 - 2b - ab$ (3)

3.1.2 $9x^3y^4z^2 - 18x^2y^3z - 36xy^2$ (4)

3.2 Simplify the following:

$\frac{3}{4x^2} + \frac{1}{x} - \frac{5}{8x}$ (5)

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3.3 Determine the following from the algebraic terms:

$30x^7y^2z^5;\ 105x^3y^4z$

3.3.1 The prime factors of each term

3.3.2 The lowest common multiple (LCM)

3.3.3 The highest common factor (HCF)

(3 × 2) (6)

**[18]**

**QUESTION 4**

4.1 Solve the following linear equation:

$12(y-3)-3(y-9)=-5(y+6)$ (5)

4.2 Manipulate the given formula to make $y$ the subject of the formula:

$ax+y^2=c$ (2)

4.3 Use the answer in QUESTION 4.2 and substitute the following values to calculate $y$:

If $x=33$ and $a=-2$ determine the value of $y$. (2)

4.4 At what speed did you travel if it took you 8 hours to cover 9 000 km? (3)

4.5 The difference between 15 times a number and 3000 is zero.

What is the number? (4)

**[16]**

**QUESTION 5**

5.1 Given:

$\frac{x}{-2}+\frac{y}{3}=1$

5.1.1 Write the equation in standard form. (2)

5.1.2 Determine the gradient. (1)

5.1.3 Determine the $y$-intercept. (1)

5.2 Given:

$xy=-3$

5.2.1 Write the equation in standard form. (1)

5.2.2 In which quadrants is the graph drawn? (2)

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

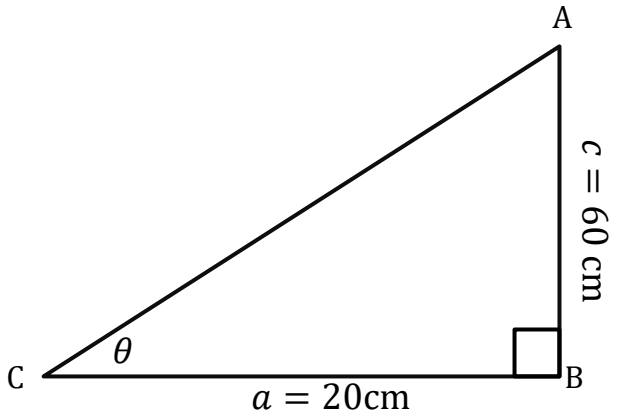
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5.3 Use the table method to draw the graph of $2y = -4x + 8$ for the domain $-4 < x \leq 2$ on GRAPH PAPER. All values at the points of intersection with the system of axes must be shown. (5)
**[13]**

**QUESTION 6**

6.1 Name TWO conditions for two triangles to be congruent. (2)

6.2 Find the length of AC if AB = 60 cm and BC = 20 cm.

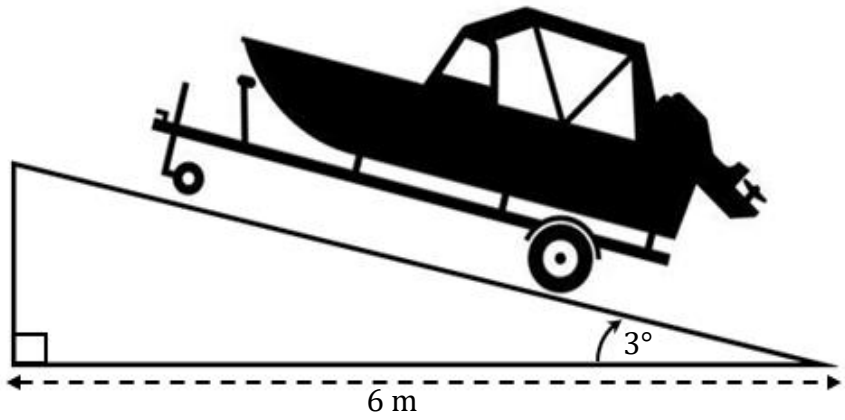



(3)

6.3 Name the properties of an isosceles triangle. (2)
**[7]**

**QUESTION 7**

7.1 A straight boat ramp is being designed to cover a horizontal distance of 6 m with an angle of elevation of 3°. Find the length of the boat ramp.




(4)

7.2 Simplify, without a calculator, by using special angles:

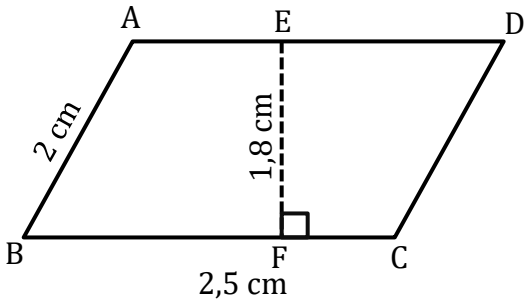
$$\frac{\cos 30°}{\sin 60°}$$

(3)
**[7]**

**QUESTION 8**

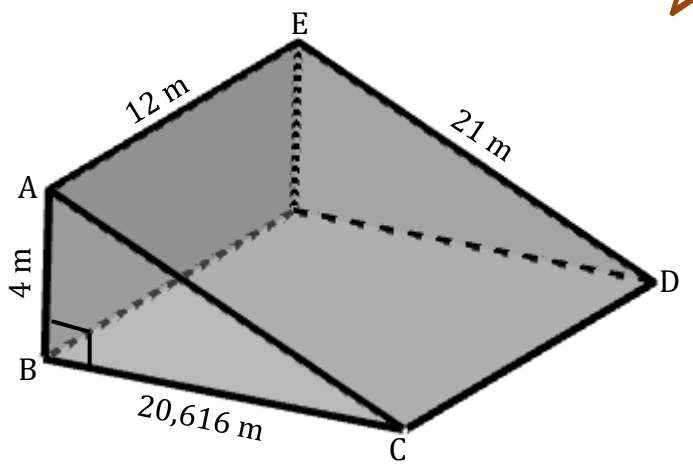
8.1 Given: AB = 2 cm, BC = 2,5 cm and EF = 1,8 cm.

Calculate the area of the parallelogram.




(2)

8.2 The illustration shows a right triangular prism with the following measurements: AB = 4 m, BC = 20,616 m, AE = 12 m, ED = 21 m and $\hat{B} = 90°$




8.2.1 Calculate the perimeter of Δ ABC.

8.2.2 Calculate the area of rectangle ACDE.

8.2.3 Calculate the volume of the prism.

(3 × 2) (6)

8.3 Thabo wants to buy a cell phone. At the beginning of the month the phone cost R12 588,00. When Thabo finally got his salary at the end of the month, the cell phone was on sale for R10 999,00.

What percentage of money did Thabo save? (3)

**[11]**

**TOTAL: 100**

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**FORMULA SHEET**

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

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

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

**Circle:**
Circumference $= \pi D$ **OR** $2\pi r$
Area $= \frac{\pi D^2}{4}$ **OR** $\pi r^2$

**Parallelogram:**
Area $= b \times\perp h$

**Trapezium:**
Area $= \frac{1}{2}(a + b) \times h$

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

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

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

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

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

**Right cone:**
Volume $= \frac{\pi D^2}{4} \times \frac{h}{3}$ **OR** $\frac{\pi r^2 h}{3}$

**Cube:**
Volume $= a^3$

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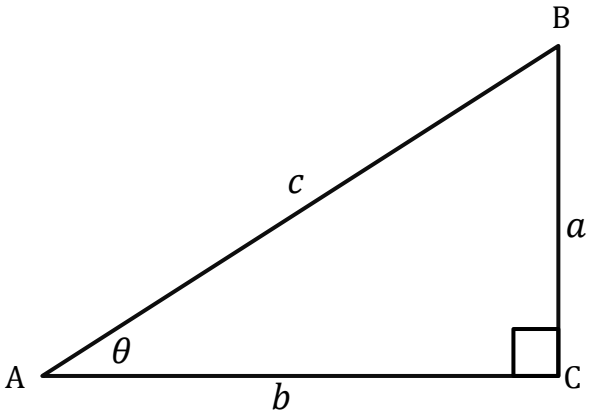
**Cylinder:**

Volume $= \frac{\pi D^2}{4} \times h$ **OR** $\pi r^2 h$

**Sphere:**

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

**The right-angled triangle:**



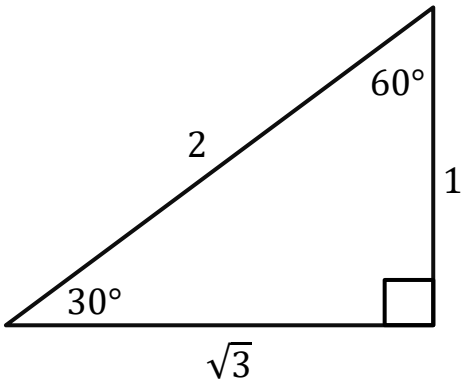

**The theorem of Pythagoras:**

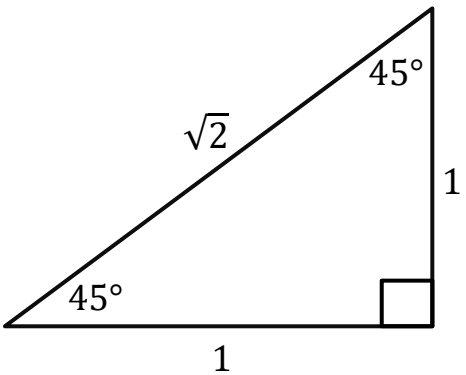
$c^2 = a^2 + b^2$

**Ratios of angle $\theta$:**

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

**Special angles:**




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