



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MATHEMATICS N1

(16030121)

28 July 2023 (X-paper)

09:00–12:00

REQUIREMENTS: Graph paper

Nonprogrammable calculators may be used.

This question paper consists of 8 pages and a formula sheet of 2 pages.

003Q1G2328

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. Keep subsections of questions together.
 5. Start each section on a new page.
 6. Use only a black or a blue pen.
 7. Round off final answers to THREE decimal places (unless indicated differently).
 8. Answer QUESTION 5.1.4, QUESTION 5.2 and QUESTION 7.1 on GRAPH PAPER.
 9. Write neatly and legibly.
-

QUESTION 1

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

$$\frac{a^{-2}b^3 \times a^3b^4}{(a^3b^{-2})^3} \quad (4)$$

- 1.2 Solve for x :

$$\log_4 x = 3 \quad (1)$$

- 1.3 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.3.1–1.3.8) in the ANSWER BOOK.

1.3.1 $\log\left(\frac{x}{y^3}\right) = \log x - 3 \log y$

1.3.2 $\log_a a^a = a^a$

1.3.3 $\frac{\log a}{\log b} = \log a - \log b$

1.3.4 $\log x^a = a \log_{10} x$

1.3.5 $x \log y + 3x \log y = \log y^{4x}$

1.3.6 $x^{2a-3} = \frac{1}{x^{3-2a}}$

1.3.7 $(x+y)^2 = x^2 + y^2$

1.3.8 $(x^2 + y^2)^0 = 1$

1.3.9 $\ln e = 1$

1.3.10 $\log(a+b) = \log a + \log b$

(10 × 1)

(10)
[15]

QUESTION 2

- 2.1 Divide $6x^3 - 8x + 5$ by $2x - 4$ (8)

- 2.2 Remove the brackets and simplify:

$-3x(x+2)4$ (2)

QUESTION 3

3.1 Factorise the following expressions completely:

3.1.1 $\frac{x^2 y}{3} + \frac{7 x y^3}{3}$



(3)

3.1.2 $4x^3 + x^2 + 2(8x + 2)$

(5)

3.2 Simplify the following:

$\frac{x+3}{x} + \frac{x+3}{4}$

(4)

3.3 Determine the following from the algebraic terms:

$30x^3y^2z; 63xy^5z^3$

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 for x :

$7(x-3) = 7 - 2(3x+1)$

(6)

4.2 Manipulate the given formula and make x the subject of the formula:

$r - sx = t$



4.3 Use the answer in QUESTION 4.2 and substitute the following values to calculate the value of x .

(2)

If $r = 15$, $t = -5$ and $s = 4$

4.4 The Earth travels 881 920 512 km in one year to go around the sun once.

4.4.1 If there are 365 days in a year, at what speed does the Earth travel in km/day?

(2)

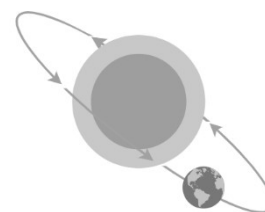
4.4.2 If there are 365 days in a year, at what speed does the Earth travel in km/h?

(2)

4.5 The sum of two consecutive numbers is 31. Find the two numbers.

(3)

[17]



QUESTION 5

5.1 Given:

$$3y - 15 = -2x$$

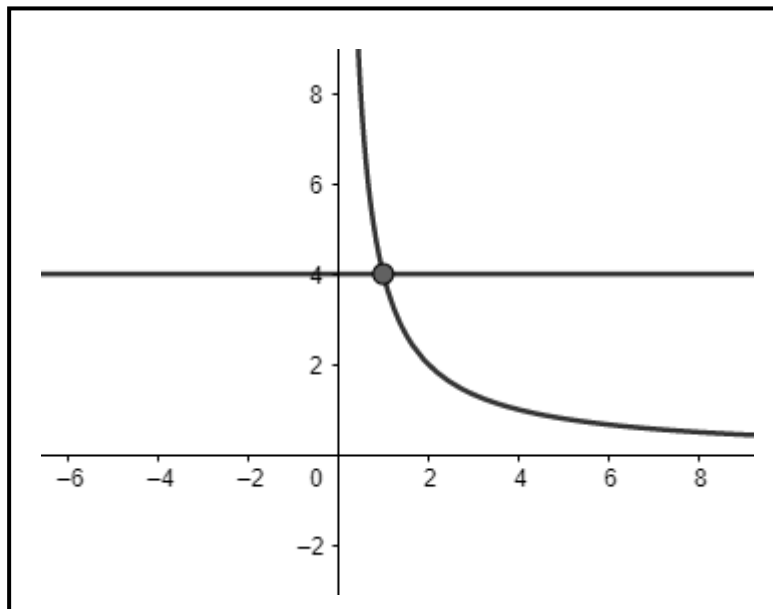
5.1.1 Write the equation in standard form.

5.1.2 Determine the gradient.

5.1.3 Determine the y -intercept.5.1.4 Determine the coordinates of the x -intercept.

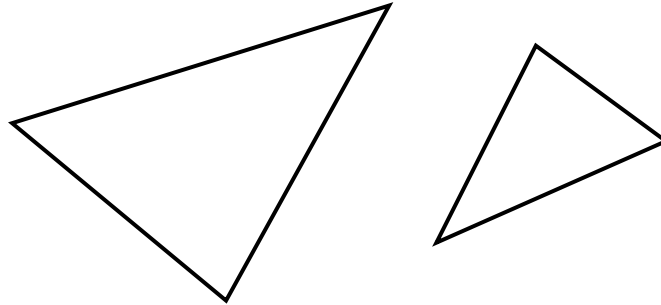
5.1.5 Draw the graph of QUESTION 5.1 on graph paper.

5.2 Given:

5.2.1 Give the name of $f(x)$.5.2.2 Determine the gradient or slope of $g(x)$.5.2.3 Determine the equation of $g(x)$. (3×1) (3)
[12]

QUESTION 6

Given: $\triangle MNO \cong \triangle PQR$, $PQ=2$, $PR=5$, $MO=(x+4)$ and $MN=(x-2)$

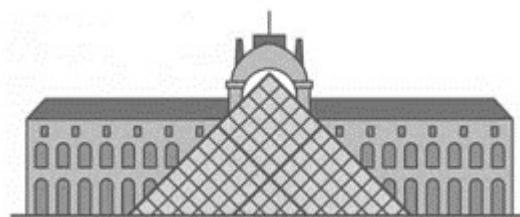
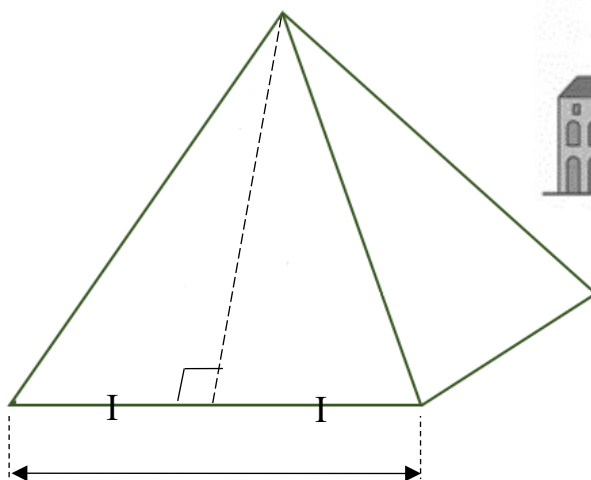


- 6.1 Calculate the value of x . (4)
- 6.2 Calculate the length of side MO . (1)
- 6.3 Calculate the length of side MN . (1)
- 6.4 Name TWO conditions for two triangles to be congruent. (2)
- [8]

QUESTION 7

The Louvre Museum in Paris is one of the world's most famous museums. The most recent addition to the museum has been the construction of the Louvre Pyramid, which functions as the museum's main entrance.

$BD = 35\text{ m}$, $BC = DC$, $AC = 27,8\text{ m}$ and $\hat{C} = 90^\circ$.



- 7.1 Calculate the magnitude of angle $\hat{B}$. (3)



7.2 Calculate the length of side AB.

(3)
[6]

QUESTION 8

The glass pyramid of the Louvre Museum in Paris has the following dimensions:

$BD = 35\text{ m}$, $BC = DC$, $BD = DE$, $AC = 27,8\text{ m}$, $AF = 21,6\text{ m}$, and $\hat{C} = 90^\circ$.

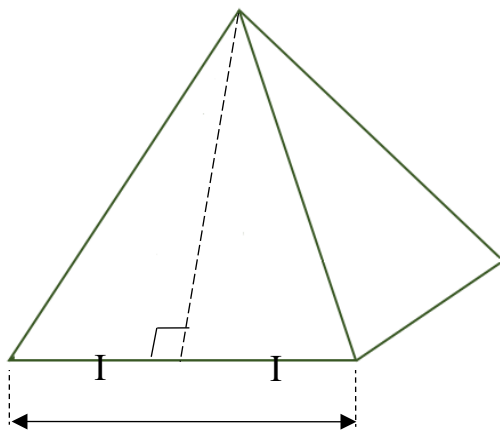


FIGURE 1

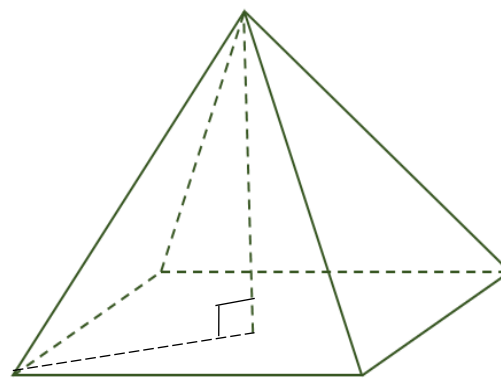


FIGURE 2

(FIGURE 1 and FIGURE 2 are illustrations of the same pyramid.)

- 8.1 If the pyramid has a square base (as shown in FIGURE 2), calculate the volume of the right pyramid. (3)
- 8.2 Calculate the surface area of $\triangle ABD$, therefore the one side of the pyramid. (3)
- 8.3 There are two types of entry tickets to the Louvre Museum:
- Option 1: Louvre Museum timed-entrance ticket and audio-guide @ R463 per person.
 - Option 2: Louvre Museum entrance ticket with 30 minutes guidance to Mona Lisa @ R802 per person.
- Calculate the percentage price increase between Option 1 and Option 2. (3)
- 8.4 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number in (8.4.1–8.4.5) in the ANSWER BOOK.
- 8.4.1 Convert 1625 m to *centimetre*.
- A 1625 000 *cm*
 B 16 250 *cm*
 C 162 500 *cm*
 D 16,25 *cm*

8.4.2 Convert $5,08 \text{ cm}^2$ to mm^2 .

- A 5080 mm^2 .
- B $50,8 \text{ mm}^2$
- C $0,0508 \text{ mm}^2$
- D 508 mm^2

8.4.3 Convert 39 m^3 to cm^3 .

- A $39\,000\,000 \text{ cm}^3$
- B $39\,000 \text{ cm}^3$
- C 3900 cm^3
- D $0,039 \text{ cm}^3$

8.4.4 Convert $7,5 \text{ l}$ to cm^3 .

- A 75 cm^3
- B 750 cm^3
- C 7500 cm^3
- D $75\,000 \text{ cm}^3$

8.4.5 Convert 987 m to km .

- A $0,987 \text{ km}$
- B 9870 km
- C $9,870 \text{ km}$
- D $98,7 \text{ km}$

(5 × 1)

(5)
[14]

TOTAL:

100

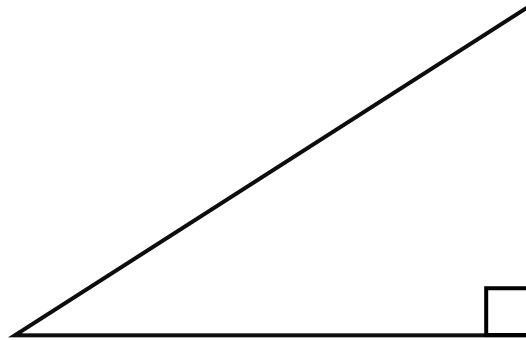
FORMULA SHEET**Rectangle:**Perimeter $2(l+b)$ Area $l \times b$ **Square:**Perimeter $4a$ Area a^2 **Triangle:**Perimeter $a+b+c$ Area $\frac{1}{2}b \times \perp h$ **Circle:**Circumference πD OR $2\pi r$ Area $\frac{\pi D^2}{4}$ OR πr^2 **Parallelogram:**Area $b \times \perp h$ **Trapezium:**Area $\frac{1}{2}(a+b) \times h$ **Annulus:**Area $\pi(R^2 - r^2)$ **Ellipse:**Area $\frac{\pi}{4} \times \text{major axis} \times \text{minor axis}$ **Rectangular prism:**Volume $l \times b \times h$ **Right triangular prism:**Volume $\frac{1}{2}b \times h \times l$ **Right pyramid:**Volume $\frac{1}{3} \times \text{base area} \times h$ **Right cone:**Volume $\frac{\pi D^2}{4} \times \frac{h}{3}$ OR $\frac{\pi r^2 h}{3}$ **Cube:**Volume a^3

Cylinder:

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

Sphere:

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

The right-angled triangle:**The theorem of Pythagoras:**

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

Ratios of angle θ :

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

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

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

Special angles: