higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MATHEMATICS N1

(16030121)

14 November 2019 (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.

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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. Start each question on a NEW page.
5. Keep subsections of questions together.
6. Use only a black or blue pen.
7. Round off final answers to THREE decimal places (unless indicated otherwise).
8. Answer QUESTION 5.1.3 and QUESTION 7.2 on the GRAPH PAPER provided.
9. Write neatly and legibly.

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QUESTION 1

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

1.1.1 $(x^3)^4 \times (2x)^2$

1.1.2 $\sqrt[3]{-27x^3} \times x^4y^2 \times (x^2y^2)^0$

1.1.3 $\dfrac{a^4b^3 \times a^4b^5 \times 15ab}{5a^8b^7}$

(3 × 3) (9)

1.2 Simplify each of the following logarithms without a calculator:

1.2.1 $\log 100 + 6\log_4 4 - 3\log_2 8$ (4)

1.2.2 $\log 36 + \log 6 - \frac{1}{3}\log 216$ (2)

[15]

QUESTION 2

2.1 Add the following expressions: $4x^2 - 7x - 1$; $2x + 5 + x^2$ (3)

2.2 Subtract $-2x^2 + 4 - 3x$ from $-x^2 - 5x - 3$. (3)

2.3 Determine the product of the following and simplify: $(x + 3)(x - 3)$ (2)

[8]

QUESTION 3

3.1 Factorise each of the following expressions fully:

3.1.1 $8a^3b^4 - 12a^2b^3 - 24ab$ (4)

3.1.2 $ac - 2bc + 3ad - 6bd$ (3)

3.2 Simplify the following:

$$\frac{4x^3 - 8x^2}{5} \times \frac{20x - 40}{(x-2)^2}$$ (4)

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

$6x^3y^2z^3$; $10x^2y^3z^4$; $30xyz$ (6)

[17]

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QUESTION 4

4.1 Solve for x:

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

4.1.2 $x(2x + 3) - 2x^2 + 7 = -2$

(2 × 3) (6)

4.2 The sum of THREE consecutive natural numbers is 54.

Determine these numbers. (5)

4.3 Given: $A = \frac{1}{2}bh$

4.3.1 Make h the subject of the formula.

4.3.2 If $A = 20$ m ^{2} and $b = 5$ m determine the value of h.

(2 × 2) (4)

[15]

QUESTION 5

5.1 The equation of a straight-line graph is given as $y + x = 2$.

5.1.1 Determine the gradient of the graph. (1)

5.1.2 Determine the coordinate of the y-intercept of the graph. (1)

5.1.3 Use the table method to draw the graph of $y + x = 2$ for the domain $x \in [-2; 2]$ on GRAPH PAPER. (5)

5.2 Given: $xy = -9$

5.2.1 Write the equation in standard form. (1)

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

5.2.3 In which quadrants should the graph be drawn? (2)

5.2.4 Explain the relation of the graph. (1)

[12]

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QUESTION 6

6.1 Two parallel lines are cut by a transversal line.

Complete the following sentences by writing the missing word or words next to the question number (6.1.1–6.1.2) in the ANSWER BOOK.

6.1.1 The corresponding angles and the alternative angles are …

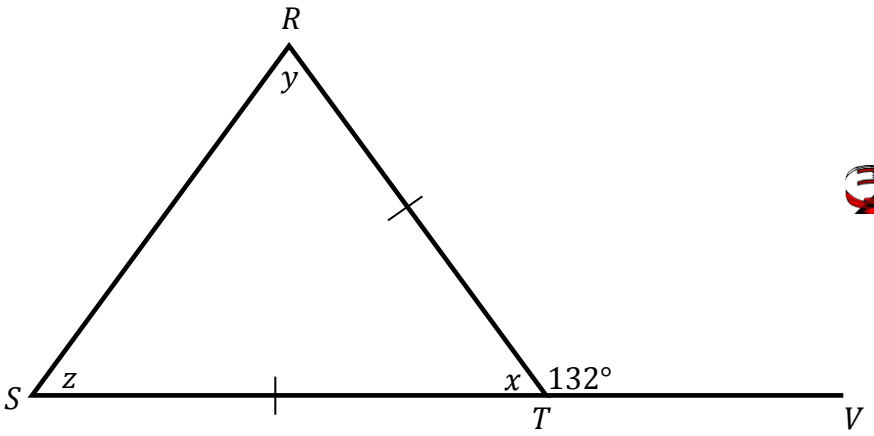
6.1.2 The cointerior angles are …

(2 × 1) (2)

6.2 Complete the following sentence by writing the missing words next to the question number (6.2) in the ANSWER BOOK.

If two sides of a triangle are equal, then the … opposite these sides are … (2)

6.3 Given: ΔRST with $R\hat{T}V = 132°$, $RT = ST$ and line ST produced to V.



Calculate the values of x, y, and z and give reasons for the answers. (6)

[10]

QUESTION 7

7.1 Given: $4\tan\theta - 3 = 0$; $0° \leq \theta \leq 90°$

Determine each of the following without using a calculator:

7.1.1 $\cos\theta$ (4)

7.1.2 $\sin^2\theta - 1$ (3)

HINT: Draw a rectangular triangle.

7.2 Draw the graph of $y = \frac{1}{2}\sin x$, $x\epsilon[0°; 360°]$ on GRAPH PAPER. Use 30° intervals. (3)

[10]

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QUESTION 8

8.1 The area of a triangle is 30 m^2 and the height of the triangle is 6 m.

Calculate the base of the triangle. (2)

8.2 The perimeter of a square is 20 m.

Calculate:

8.2.1 The length of one side of the square

8.2.2 The area of the square

(2 × 2) (4)

8.3 Divide R800 into the ratio 3: 2. (4)

8.4 The price of a car is R450 000 excluding VAT (15%).

How much will the car cost including VAT? (3)

[13]

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 $= \frac{1}{2} b \times \perp h$

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

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

Cube:
Volume $= a^3$

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

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

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

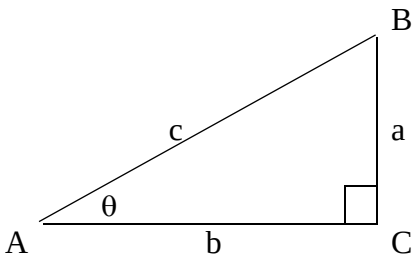
Cylinder:
Volume $= \frac{\pi D^2}{4} \times h$ **OR** $\pi r^2 h$

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

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

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The right-angled triangle:



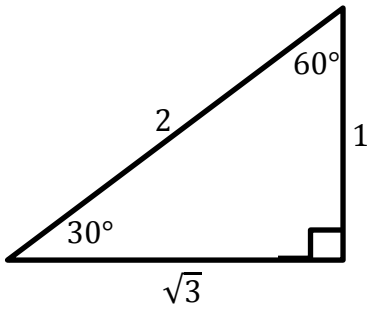
The theorem of Pythagoras:

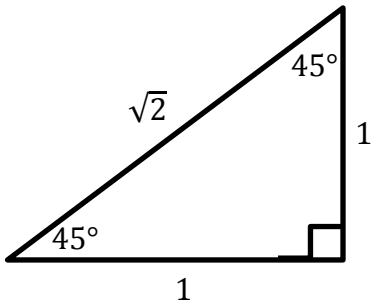
$c^2 = a^2 + b^2$

Ratios of angle θ:

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

Special angles:





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