higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T990**(E)**(J31)T

NATIONAL CERTIFICATE

MATHEMATICS N1

(16030121)

25 July 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. QUESTION 5.1.3 and QUESTION 7.2.3 must be answered on graph paper.
5. Show ALL formulas and intermediate steps and simplify where possible.
6. Round off ALL final answers to THREE decimals (unless indicated otherwise).
7. Questions may be answered in any order, but subsections of questions must be kept together.
8. Questions must be answered in BLUE or BLACK ink. Writing in pencil will not be marked.
9. Work neatly.

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QUESTION 1

1.1 Simplify the following using exponents without using a calculator:

1.1.1 $5 \times \sqrt[3]{8x^6} \times 3x^2$ (2)

1.1.2 $$\sqrt{\frac{4a^2b^4}{9}} \times 3ab^0 \times (4b)^2$$ (4)

1.1.3 $8^{x+3} \times 2^{3x+2} \times 16^{x-1}$ (3)

1.2 Simplify the following logarithms without using a calculator:

1.2.1 $$\frac{\log 4 + \log 2}{\log 16 - \log 2}$$ (4)

1.2.2 $4 \log_3 3^2 + 4 \log_x x$ (3)

[16]

QUESTION 2

2.1 From $6a + 4b + 10$ subtract $8 - 2b - 2a$ (3)

2.2 Add the following: $-5 + 8x - 2y$; $10x + 10y - 5$ (3)

2.3 Determine the product and simplify: $(x - 2)(x^2 + 2x + 4)$ (2)

[8]

QUESTION 3

3.1 Factorise the following expressions fully:

3.1.1 $3x^2 - 27x$ (2)

3.1.2 $x^2(x - 1) - 5x + 5$ (3)

3.2 Simplify: $\frac{(x-4)^2}{5x-20} \times \frac{10}{x-4} \div \frac{2x+2}{x+1}$ (5)

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

$6p^4q^3r^2$

$20p^2q^5r^3$

$9p^6q^4r^5$

(7)

[17]

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QUESTION 4

4.1 Solve for x:

4.1.1 $\frac{x}{3} + 1 = 4$ (2)

4.1.2 $5(x - 1) - (1 - x) = 8$ (4)

4.2 The sum of a number and 5 less than double the number is 34. What is the number? (4)

4.3 Given: $T = a(n - 1)d$

4.3.1 Make n the subject of the formula. (3)

4.3.2 Determine the value of n if: $T = 13,\ a = -5$ and $d = 2$ (2)

[15]

QUESTION 5

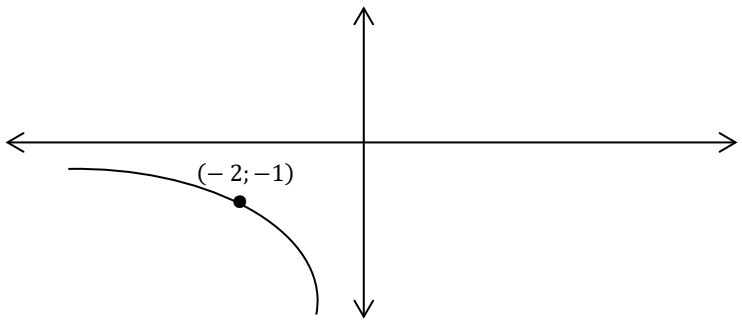
5.1 The standard form of a straight line is: $y = mx + c$

5.1.1 What does m and c represent? (2)

5.1.2 Determine the equation of a line if the gradient is -3 and the y-intercept is 2. (2)

5.1.3 Given: $y = -3x + 2$
Use the table method to draw the graph of $y = -3x + 2$ on graph paper for the domain $-2 < x < 2$. (4)

5.2 The graph given below is in the form $y = \frac{a}{x}$. Determine the value of a.



(2)

5.3 Given: $xy = 5$

5.3.1 What is the graph called that is shown in QUESTION 5.2?

5.3.2 In which quadrants should the graph be drawn?

5.3.3 Explain the relation of the graph.

(3 × 1) (3)

[13]

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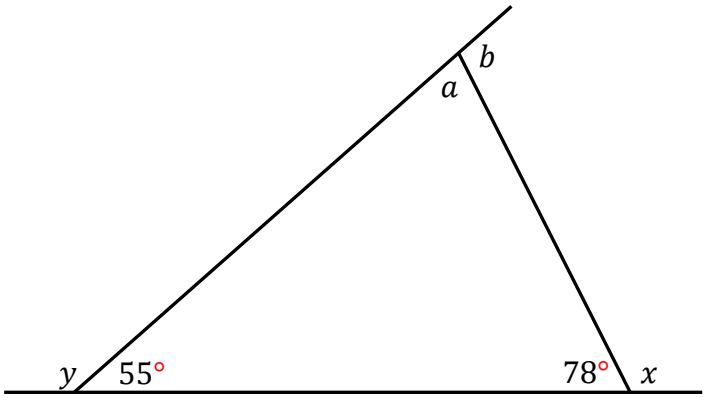
QUESTION 6

6.1 Complete the following sentence by writing only the missing word(s) next to the question number (6.1) in the ANSWER BOOK:

If the co-interior angles are supplementary, then the lines are … (1)

6.2 Study the diagram below.

Calculate the values of a, b, x and y and give a reason for each answer.



(8)
[9]

QUESTION 7

7.1 Given: $A = 75°$ and $B = 15°$
Determine the following using a calculator:

7.1.1 $\cos(A - B)$

7.1.2 $\sin(A + B)$

(2 × 2) (4)

7.2 Given: $y = -2\cos x\,,\ x\epsilon[0°;\ 180°]$

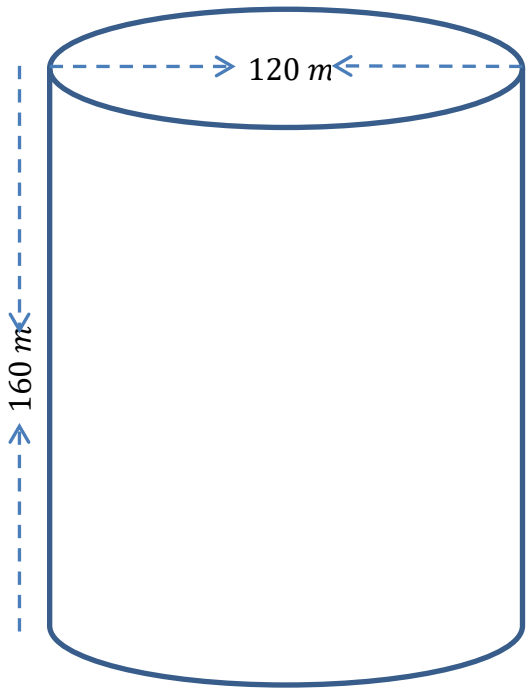
7.2.1 Determine the period of the graph. (1)

7.2.2 Determine the range of the graph. (1)

7.2.3 Draw the graph of $y = -2\cos x\,,\ x\epsilon[0°; 180°]$ on graph paper. Use 30° intervals. (3)
[9]

QUESTION 8

8.1 The diagram below is a cylinder with a height of 160 m and a diameter of 120 m.



8.1.1 Calculate the volume of the cylinder. (2)

8.1.2 Determine the surface area of the cylinder as a sealed unit. (4)

8.2 Calculate the radius of a circle if the area of the circle is 12,567 cm^2. (2)

8.3 A student obtained 22 marks out of 30 for a maths test.

Calculate the percentage. (2)

8.4 81% of a certain number is 84. What is the number? (3)

[13]

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

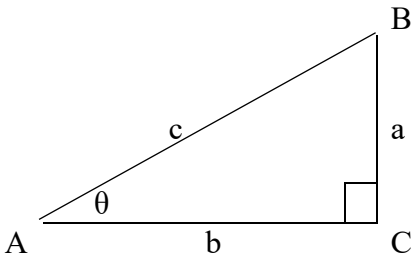
Cylinder:
Volume = $\frac{\pi D^2}{4} \times h$ or $\pi r^2 h$

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:

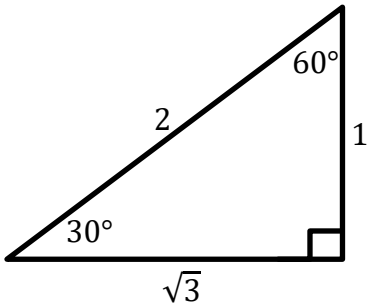


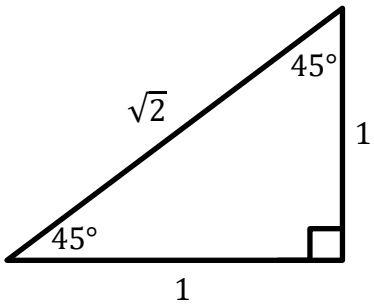
The theorem of Pythagoras:
$c^2 = a^2 + b^2$

Ratios of angle θ:

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

Special angles:





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