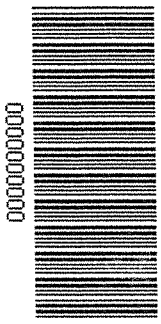
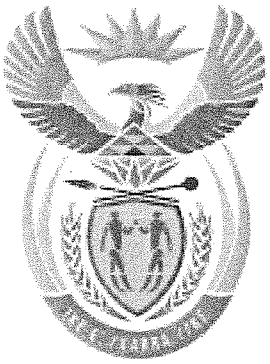




higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T920(E)(J25)T
AUGUST EXAMINATION

NATIONAL CERTIFICATE

MATHEMATICS N2
(16030192)

25 July 2014 (Y-Paper)
13:00–16:00

REQUIREMENTS: Graph paper

Scientific calculators may be used.

This question paper consists of 6 pages and 1 formula sheet of 2 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MATHEMATICS N2
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. Questions may be answered in any order, but subsections of questions must be kept together.
5. Show ALL formulae, intermediate steps and simplify where possible.
6. ALL final answers must be rounded off to THREE decimal places (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.
9. Write neatly and legibly.

QUESTION 1

1.1 Determine the factors of the following expressions:

1.1.1 $3px-3py-x+y$ (3)

1.1.2 $\frac{2}{x^2}+1-x^2$ (3)

1.1.3 $b(x^2-1)-b(x-1)^2$ (3)

1.2 Simplify:

1.2.1 $\frac{2}{(x+2)}-\frac{3}{(x-2)}+1$ (4)

1.2.2 $\frac{8x-4}{4x^2-1}\div\frac{2x+2}{2x^2+3x+1}$ (5)

1.3 Find the lowest common multiple (LCM) and the highest common factor (HCF) of the following:

$(a-b)^2(a+b)(\mathrm{m}-1)$
$(a-b)(a+b)^2(m-1)(\mathrm{m}+1)$
$(a-b)^2(a+b)^3(m+1)$ (4)

[22]

QUESTION 2

2.1 An irregular metal sheet has an area of 4983 m^2. Ordinates used to calculate the area are:

123; 234; 309; 289; 277; 189; 111 and 98.

Use the mid-ordinate rule to calculate the common distance between the ordinates. (4)

2.2 Solve the following equation by using the quadratic formula:
$3x^2=10x+5$ (4)

2.3 Solve for x:
$x^2-25x=-24$ (3)

2.4 Make 'B' the subject of the formula :
$A=\frac{1}{\sqrt{1-B^2}}$ (4)

2.5 The length of the hypotenuse of a right angled-triangle is 10 cm more than the length of the longer of the other two sides.

Calculate the lengths of hypotenuse and the other unknown side if the length of the shortest side is 50 cm. (4)
[19]

QUESTION 3

3.1 A pulley has an angular velocity of 54,13 radians per second. Calculate:

3.1.1 The number of revolutions of the pulley per minute; (4)

3.1.2 The circumferential velocity of the pulley in meters per second if the diameter of the pulley is 18 cm. (4)

3.2 A fitter needs to order a metal disc for a machine. He does not know the diameter of the disc. The segment of the circular disc has a height of 6,5 cm and a chord length of 32 cm. Calculate the diameter of the disc in cm. (3)

3.3 A lead cylinder with a diameter of 25 cm and a height of 40 cm is melted. The lead is used to cast lead spheres with a radius of 3 cm each.

Calculate how many spheres can be casted from the available lead. (6)
[17]

QUESTION 4

4.1 Use logarithms to find the value of the following:

$$x = \frac{(44,6)^4}{\sqrt[3]{798}}$$

Show ALL the steps. Answers only are NOT acceptable. (4)

4.2 Calculate the value of $\dfrac{\log_x 243 \times \log_x 64}{\log_x 32 \times \log_x 81}$ (3)

4.3 Solve for 'x' :

4.3.1 $3^{2x-1}.9^{x-3} = 27^x$ (3)

4.3.2 $\log_x\left(\dfrac{1}{64}\right) = 3$ (3)
[13]

QUESTION 5

5.1 Simplify the following expression:

$$\frac{\sin(180^o-\theta).\cos(360^o-\theta)}{\tan(180^o-\theta)}$$

(4)

5.2 Determine the value of the following with the use of a calculator:

$$2\sin^2\left(\frac{\pi}{6}\right)+\cos 90^0-\sqrt[3]{(\sec 60^0-1{,}5)}$$

(2)

5.3 Convert $\frac{\pi}{32}$ from radians to degrees and minutes.

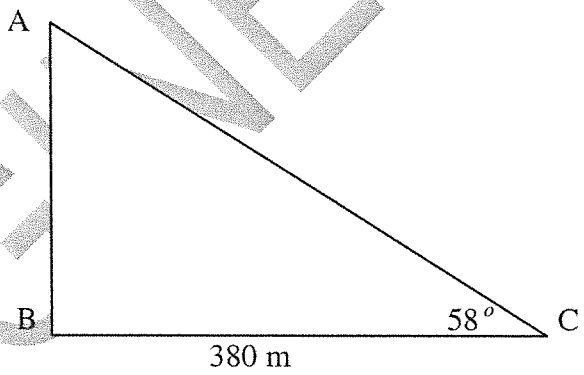
(2)

5.4 Determine all the values of θ in the following equation if $\theta\in[0^o;360^o]$:

$5\tan\theta+8=0$

(3)

5.5 AB is a vertical cliff. C is a point 380 m from the cliff. The angle of elevation to the top of the cliff is 58^o. Calculate the height of the cliff.



(3)
[14]

QUESTION 6

6.1 Draw, on graph paper and on the same system of axis, the graph of each of the following functions

6.1.1 $\frac{x}{3}+\frac{y}{6}=1$

(2)

6.1.2 $y=-x^2+9$

Clearly indicate the x-intercept(s), the y-intercept and the turning point.

(5)

6.2 Read from the graphs the co-ordinates of the points where the TWO graphs in QUESTION 6.1 cut each other. (2)

6.3 6.3.1 Draw on graph paper and on the same system of axis the graphs of the following:

$y = \cos x + 1$ and $y = \sin x$ for $x \in [0^o; 180^o]$
Use intervals of 30°. (4)

6.3.2 From the graphs in QUESTION 6.3.1 find the values of x satisfying the following equations:

6.3.2.1 $\cos x + 1 = \sin x$ (1)

6.3.2.2 $\sin x - 1 = 0$ (1)
[15]

TOTAL: 100

MATHEMATICS N2

FORMULA SHEET

Any applicable formula may be used

The right cone

Volume = $\frac{1}{3}\pi r^2 h$

Surface area $= \pi r\sqrt{h^2 + r^2} + \pi r^2$

$= \pi r\ell + \pi r^2$

The right pyramid

Volume $= \frac{1}{3}$(area of base)×(perpendicular height)

The prism

Volume = (area of base) × (perpendicular height)

The cylinder

Volume = $\pi r^2 h$

Surface area = $2\pi r^2 + 2\pi rh$

The sphere

$V = \frac{4}{3}\pi r^3$; $A = 4\pi r^2$

Degrees and radians

180° = π rad

Sector: $\theta = \frac{\text{arc}}{\text{radius}}$; $A = \frac{1}{2}r^2\theta$

Angular velocity and circumferential velocity

Angular velocity: $w = 2\pi n$

Circumferential velocity: $v = \pi Dn$

n = rotation frequency (r/s = revolution per second)

Mid-ordinate rule

Area = (distance between ordinates) × (sum of mid-ordinates)

$= \left[\frac{\text{First ordinate} + \text{Last ordinate}}{2} + \text{Sum of other ordinates}\right]$ multiply by the distance between the ordinates.

Graphs

Straight line: $y = mx + c$ Parabola: $y = ax^2 + bx + c$

Axis of symmetry: $x = \frac{-b}{2a}$

Roots: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Trigonometry

$90° < \theta < 180°$ $\sin \theta = \sin (180° - \theta)$ $\cos \theta = -\cos (180° - \theta)$

$\tan \theta = -\tan (180° - \theta)$

Segments of circles

Chord length = x Height of segment = h Diameter of circle = D

$D = h + \frac{x^2}{4h}$

Regular polygons

Angle subtended at centre of circumscribed circle by one side:

$\theta = \frac{360°}{\text{number of sides}}$

R = radius of circumscribed circle
x = length of side

$x = 2R \sin \frac{\theta}{2}$

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