

**T930(E)(N17)T
NOVEMBER EXAMINATION
NATIONAL CERTIFICATE
MATHEMATICS N2**

(16030192)

**17 November 2014 (Y-Paper)
13:00–16:00**

Scientific calculators may be used.

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

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. Show ALL formulae, intermediate steps and simplify where possible.
 5. ALL final answers must be rounded off to THREE decimal places (unless indicated otherwise)
 6. Questions may be answered in any order, but subsections of questions must be kept together.
 7. Questions must be answered in BLUE or BLACK ink.
 8. Write neatly and legibly.
-

$$5bx - 15b$$

(7)

1.3 Simplify fully:

$$1.3.1 \quad \frac{2x^2 - 32}{4xb + b} \times \frac{b}{x + 4} \div \frac{8x - 32}{4x + 1}$$

(4)

$$1.3.2 \quad \frac{3x}{x - 3} - \frac{2x}{x^2 - 6x + 9}$$

(5)
[22]

QUESTION 2

2.1 Make x the subject of the formula:

$$F = \frac{1}{a\sqrt{cx}} + v$$

(5)

2.2 Calculate the value(s) of x if $(x + 3)^2 = 25$

(3)

2.3 Solve for x if $3(x - 2) - 2(2x + 1) = 7 - (3x + 2)$

(3)

2.4 Consider FIGURE 1 below. The rectangular garden of 6 metres by 4 metres is surrounded by a path of uniform width. If the area of the path is 56 m^2 , what is its width?

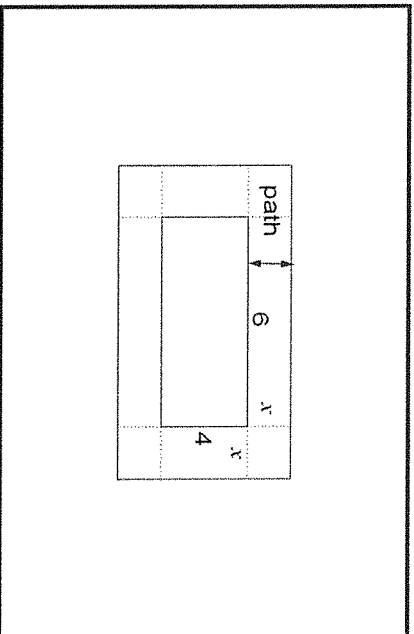


FIGURE 1

(5)

3.2 Simplify :
 $(\log_3 x)(\log_x 9)$

(3)

3.3 Determine the value of x if $\log_3 x = 4$.

(2)

3.4 Simplify : $\frac{4^{x+1} \cdot 2^{2x+2}}{16^{x+1}}$

(3)

3.5 Consider FIGURE 2 below. A conical rain gauge is to be constructed with a radius of 53 cm and slant height of 102 cm.

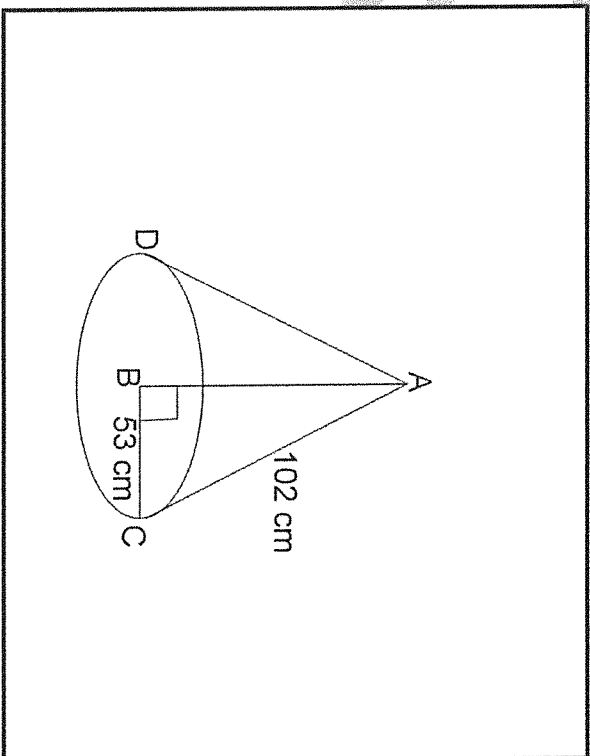


FIGURE 2

3.5.1 Calculate the perpendicular height of the rain gauge. (2)

3.5.2 How many litres of rain water will the rain gauge hold when full? (4)
 [18]

4.2.2 Calculate the angular velocity of the wheel in radians per second.

(3)
[14]

QUESTION 5

5.1 Sketch, on the same system of axes, the graphs of :

$$y = 1 + \sin x \text{ and } y = -2 \cos x \text{ for values of } x \in [0^\circ; 180^\circ]$$

Use intervals of 30° .

(5)

5.2 Given: $\frac{y}{2} = -x + 1$ and $y = -x^2 - 2x + 3$

5.2.1 Sketch the graphs on the same system of axes. Clearly indicate the x -intercepts, the y -intercepts and the turning point.

(6)

5.2.2 Using the graphs, read off the co-ordinates of the points where the TWO graphs in QUESTION 5.2.1 cut each other.

(2)
[13]

QUESTION 6

6.1 Express $\frac{7}{9}$ of a right angle in radians.

(2)

6.2 Evaluate $e^\circ - \log_3 1 + \cos^2 0^\circ + 0, 25 \cos \left(\ln \frac{\pi}{4} \right)$

(2)

6.3 Determine the magnitude of the angle β if $5 \cos \beta = 3$; $\beta \in [0^\circ; 360^\circ]$

(3)

6.4 Simplify the following expression: $\frac{\sin(180^\circ - \theta) \sin(360^\circ - \theta) \cot(180^\circ + \theta)}{\cos(360^\circ - \theta) \tan(180^\circ + \theta)}$

(4)

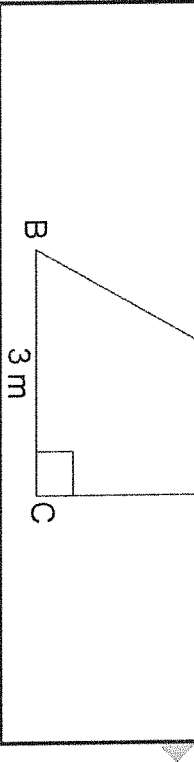


FIGURE 3

(3)
[14]

TOTAL: 100

The prism

Volume = (area of base) $\times$ (perpendicular height)

The cylinder

Volume = $\pi r^2 h$

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

The sphere

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

Degrees and radians

$180^\circ = \pi \text{ rad}$

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

Angular velocity and circumferential velocity

Angular velocity: $\omega = 2\pi n$

Circumferential velocity: $v = \pi D n$

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

Mid-ordinate rule

Area = $\left[\frac{\text{First ordinate} + \text{last ordinate}}{2} + \text{Sum of the ordinates} \right] \times \text{distance between the ordinates}$

Graphs

Straight line: $y = mx + c$

Parabola: $y = ax^2 + bx + c$

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

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

Regular polygons

Angle subtended at centre of circumscribed circle by one side:

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

R = radius of circumscribed circle

x = length of side

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

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