THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

ENTRANCE EXAMINATIONS – 2017

MA002 – MATHEMATICS 2

For candidates applying for Applied Science, Surveying, Geographic Information Science, Forestry or Agriculture.

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES

1. Print and sign your name below, and tick a box to indicate the type of course for which you are applying.
2. All answers must be written in this booklet.
3. Show your workings where required.
4. Do not use red ink or pencil to write this exam.
5. **Calculators are NOT allowed in the examination room.**

Surname: _____ First name: _____

Signature: _____ Date: _____ Venue: _____

Tick the type of course for which you are applying.

[ ] Applied Science
[ ] Surveying
[ ] Geographic Information Science (GIS)
[ ] Forestry
[ ] Agriculture

Section A: Answer all questions by writing final answers into the space provided on the right.

Question 1 [3 + 3 + 3 + 3 + 3 + 3 + 3 = 24 Marks] – Workings NOT required.

Simplify, if possible, each of the following expressions. The final answers must be expressed in positive powers, where required.

(a) $\dfrac{81-18x}{9}$ _____

(b) $(4^{-1}t)^{-2}$ _____

(c) $\left(\sqrt{2\frac{1}{4}}\right)$ _____

(d) $\left(r^3n^2\right)^5$ _____

(e) $\left(\sqrt{9^2-8^2-1}\right)-\left(\sqrt{9^2}-\sqrt{8^2}\right)$ _____

(f) $7r^5+3r^4v-9r^3+3r(3r^2-r^3+r^4)$ _____

(g) $(t-4)(4-t)+2t^2$ _____

Question 2 [3 + 3 = 6 Marks] – Workings required.

Completely factorize each of the following mathematical expressions

(a) $y^2-y+1-y$ _____

(b) $28n^2+14mn-4mnr-2m^2r$ _____

Question 3 [3 + 3 + 3 + 3 = 12 Marks] – Workings required.

a) Solve for the unknowns in the following equations.

(i) $8 \div 2^{x-1} = 1$

(ii) $5 = \left(25^{-1}\right)^{t-1}$

b) Make variable n the subject of the formula for

(i) $n^4 = \dfrac{[(1-n)(1+n)]^2}{4}$

(ii) $R\left(1+\dfrac{1}{n}\right)^c = 2$

Question 4 [3 + 3 + 3 = 9 Marks] – Workings required.

Given that a straight line, line L_1 intercepts a quadratic function $y = x^2 + 4x$ at $x_1 = -4$ and $x_2 = 5$.

(a) Find the equation of line L_1.

(b) Find the equation of line L_2 that passes through the point $(1,5)$ and is parallel to line L_1 in (a) above.

(c) Find the equation of line L_3 that is perpendicular to line L_2 in (b) above that intercept the $y-axis$ at 10.

Question 5 [3 + 3 = 6 Marks] – Workings required.

(a) A bus is travelling with 48 passengers. When it arrives at a stop, x passengers get off and 3 gets on. At the next stop, half the passengers get off and 7 get on. There are now 22 passengers on board. Find x.

(b) On a building plan, the length of a 56m long building is 5.8 cm. Another building on the same plan has length 1500mm. What is the actual length of this building?

Question 6 [3 + 3 + 3 + 3 + 3 = 15 Marks] – Workings required.

For the graph of the function $2x^2 + y + 3x - 5 = 0$, answer the following questions;

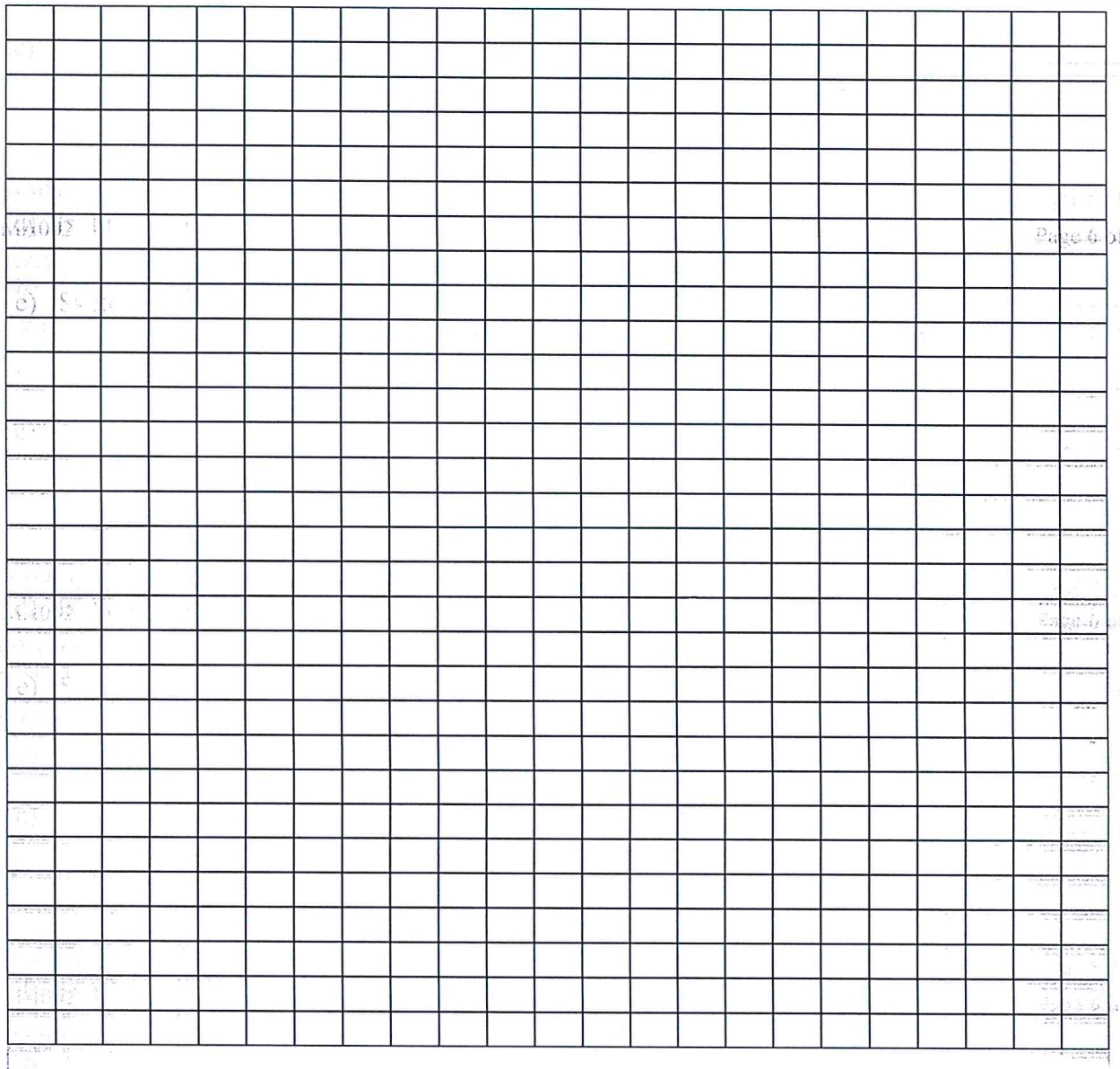
a) What is the $y-$intercept? _____

b) What are the $x-$intercepts? _____

c) What are the coordinates of the turning point? _____

d) Is it a maximum or a minimum-value parabola? _____

e) Sketch the graph of this function, $2x^2 + y + 3x - 5 = 0$.



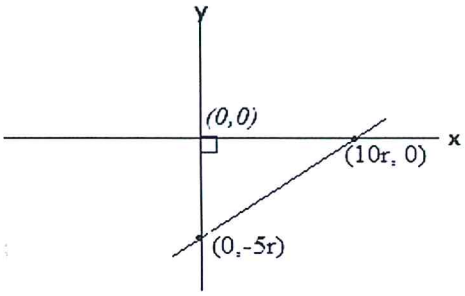
Section B: Multiple Choice Question

For each question, circle the letter of the correct choice (A, B, C, D or E). Each correct answer worth 2 marks.

1. In the $xy-plane$, the points, $P(2,3)$, $Q(-5,2)$, $R(3,-4)$ and $S(13,-4)$ can be connected to form the line segments. Which two segments have the same length?

   (A) QR and PR (B) QR and RS (C) QS and SP (D) PQ and SP

2. Calculate the gradient of the hypotenuse in the diagram shown below



   (A) 2 (B) 10 (C) 5 (D) 1/2

3. A right-angled triangle has the hypotenuse 7cm, and one of the shorter sides 4cm. What is the length of third side?

   (A) 3 (B) $\sqrt{3}$ (C) $\sqrt{33}$ (D) 33

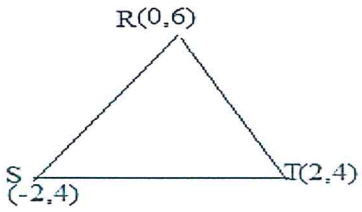
4. What is the volume of a closed box with width 25cm, length 200mm and height 40cm?

   (A) $200{,}000cm^2$ (B) $20{,}000cm^2$ (C) $2{,}000cm^2$ (D) $200cm^2$

5. Rectangle **A** and rectangle **B** are in direct proportion. The length and width of rectangle **A** is 12cm and 5cm respectively. Find the width of rectangle **B** if its length is 20cm.

   (A) 25 cm (B) 10 cm (C) $\frac{25}{3}$ cm (D) $\frac{3}{25}$ cm

6. The points R, S and T forms the vertices of a triangle as shown below. What is the area of this triangle RST?



   (A) 24 (B) 42 (C) 12 (D) 21