THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

ENTRANCE EXAMINATIONS – 2020

MA002 – SCIENCE MATHEMATICS

For candidates applying for Applied Sciences, Surveying, Geographic Information Sciences, Forestry and 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 allowed in the examination room.

Surname: _____ Given Name: _____

Signature: _____ Date: _____

Tick the type of course for which you are applying.

[ ] Applied Sciences
[ ] Surveying
[ ] Geographic Information Sciences
[ ] Forestry
[ ] Agriculture

Section A: Multiple Choice Questions

Circle the correct choice for each question. Each question worth 2 marks.

1. Two lengths are in the ratio $5:3$. If the first length is 50m, what is the total length?
   (a) 150 m (b) 250 m (c) 60 m (d) 80 m

2. 54 is a multiple of
   (a) 3 (b) 4 (c) 5 (d) 7

3. The value of x for the equation $\frac{5}{2x+5}=\frac{4}{x+2}$ is
   (a) -10 (b) -3 (c) $-\frac{3}{10}$ (d) $\frac{3}{10}$

4. Which one of the following is an irrational?
   (a) $\sqrt{0.0009}$ (b) $\sqrt{0.09}$ (c) $\sqrt{0.9}$ (d) $\sqrt{9}$

5. How may doses of 5 millilitres can be obtained from a medicine bottle holding half a litre?
   (a) 10 (b) 50 (c) 100 (d) 1000

6. Williri buys office machinery which costs K8,000. The depreciation is calculated at an annual rate of 15%. What will be the value of the machinery at the end of 7 years?
   (a) K2,565 (b) K2,560 (c) K2,650 (d) K2,655

7. If a cone has a base diameter of 6 cm and a vertical height of 8 cm, then, its volume in cubic centimeters would be
   (a) 8π (b) 24π (c) 72π (d) 96π

8. The scale of a map is $1:20{,}000$. What area in square metres does 3 cm^2 represent?
   (a) 60,000 (b) 120,000 (c) 6,000 (d) 12,000

9. The correct value for c if the straight line $y=mx+c$ passes through the points $(3,4)$ and $(7,10)$ is
   (a) 0.5 (b) 5 (c) -5 (d) -0.5

10. If $\log(y)=-2$, then y is equal to
    (a) -100 (b) -0.01 (c) 0.1 (d) 0.01

11. Polu, Wemu and Tepou share a sum of money in the ration 7:5:14. If Wemu receives K18 less than Tepou, then Tepou would receive

(a) K28 (b) K14 (c) K10 (d) K52

12. 4 integers that are written in the order of size, starting with the smallest integer are represented by *a*, *b*, *c* and *d*. If the mean of *a*, *b*, *c* and *d* is 15 while the sum of *a*, *b* and *c* is 39, find the value of *d*.

(b) 11 (b) 9 (c) 23 (d) 21

13. Over a period of 6 months, a colony of rabbits increase in number by 25% and then by a further 30%. If there were originally 200 rabbits in the colony, how many were there at the end?

(a) 235 (b) 325 (c) 225 (d) 315

14. The minimum value of the curve $y = 3x^2 + 2x - 3$.

(a) $-1\frac{1}{3}$ (b) $-\frac{1}{3}$ (c) $-2\frac{1}{3}$ (d) $-3\frac{1}{3}$

15. An isosceles triangle has equal sides of 6cm long and a base of 4cm long. Calculate the area of a triangle to the nearest units.

(a) 8 cm^2 (b) 9 cm^2 (c) 10 cm^2 (d) 11 cm^2

Section B: Workings Required

Show workings for each question. Each question worth 3 marks.

1. Make f the subject of the formula for the expression $\frac{D}{d} = \sqrt{\frac{f+p}{f-p}}$.

2. Next year, Kambiri will receive a rising amount to one-eight of her weekly wage. Kambiri's weekly wage will then be K180. What is Kambiri's present weekly wage?

3. Yareporoi has a 6 kg sack of rice and some empty bags. She fills each bag with 475 grams of rice from the sack. How many bags can Yareporoi completely fill with rice?

4. If 3 kg of potatoes and 2 kg of apples cost a total of K7.33 while 4 kg of potatoes cost K3.80. Calculate the cost of 1 kg of apples.

5. If f is a function of $f(x)=\frac{3x-5}{x+2}$,

   (a) Write down the expression for $f^{-1}(x)$.

   (b) Find the value of $f^{-1}(2)$.

6. If $A=\{2,4,6,8,10\}$, $B=\{1,2,3,4,5\}$ and $C=\{2,5,6,8\}$; determine $A\cap(B\cap C)$.

7. A soccer player is 12 metres from one goal post and 15 metres from the other. The goal mouth is 8 metres wide. If he "shoots" for goal along the ground, within what angle must he direct the ball in order to have a chance of scoring?

8. A rectangular room is 2 meters longer than its width. If the perimeter of the room is 24 meters, calculate its width.

9. 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?

10. Yoarene puts 9 marbles of the uniform size numbered 1, 2, 3, 4, 5, 6, 7, 8 and 9 into a bag. If he decides to draw a marble once, what is the probability of drawing a marble that is having the number greater than 5?

11. Find the equation of the straight line which passes through the point of intersection of $5x-y-3=0$ and $2x-y=0$ and which is perpendicular to the straight line $4x+3y-2=0$.