THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

ENTRANCE EXAMINATIONS – 2021

MA002 – SCIENCE MATHEMATICS

For candidates applying for Applied Sciences, Surveying, Geographic Information Systems, 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: _____ First name: _____

Signature: _____ Date: _____ Venue: _____

Tick the type of course for which you are applying.

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

Section A: Multiple Choice Questions
Circle the correct choice. Each question worth 2 marks.

1. Which of the following is a prime number?
   A. 15 B. 27 C. 39 D. 41

2. 54 is a multiple of
   A. 3 B. 4 C. 5 D. 7

3. Find x if $2^{x+2} = 16^{x-7}$.
   A. 8 B. 9 C. 10 D. 11

4. A car travels 60 km at an average speed of 30 km/h and for 120 km at an average speed of 40 km/h. For the entire journey, its average speed is
   A. 30 km/h B. 32 km/h C. 34 km/h D. 36 km/h

5. For a function $f(x) = \frac{4x+5}{x+2}$, evaluate $f^{-1}(3)$.
   A. -2 B. -1 C. 1 D. 2

6. A triangle has sides 39.3 cm and 41.5 cm. If the angle between them is 41.5 degrees, its area would be
   A. 640.2 cm^2 B. 580.6 cm^2 C. 550.6 cm^2 D. 540.4 cm^2

7. If a train is travelling at a speed of 30 km/h. How long would it take to travel 500 m?
   A. 2 mins B. 3/50 hrs C. 1 min D. 0.5 hrs

8. If a die is rolled twice, the probability of obtaining a 3 and a 4 in any order would be
   A. 1/6 B. 1/18 C. 1/36 D. 1/9

9. A cylinder is $\frac{1}{4}$ full of water. After 60 mls of water is added, the cylinder is $\frac{2}{3}$ full. Then, the total volume of the cylinder is.
   A. 144 mls B. 411 mls C. 104 mls D. 134 mls

10. From a place 400 meters north of X, Williri walks eastwards to a place Y which is 800 meters from X. What is the bearing of X from Y?
   A. 270^o B. 240^o C. 210^o D. 180^o

11. Kambiri bought a used car by making a 15% deposit of K6,000. How much does he still have to pay?
   A. K30,000 B. K34,000 C: K40,000 D: K44,000

12. If $y = 5 \times \sqrt[3]{x^2}$, then $\frac{dy}{dx}$ is equal to

A. $\frac{15\sqrt{x}}{2}$ B. $\frac{15}{2\sqrt{x}}$ C. $\frac{10}{3 \times \sqrt[3]{x}}$ D. $\frac{10 \times \sqrt[3]{x}}{3}$

13. How long will it take an investment to double at 10% p.a. compounded yearly?

A. $\frac{\log(2)}{\log(1.1)}$ periods B. $\frac{2}{\log(1.1)}$ periods C. $\frac{\log(1.1)}{\log(2)}$ periods D. $\frac{\log(1.1)}{2}$ periods

14. Yarea Kambiri left his fortune to his 3 sons, 4 daughters and his wife. Each son received twice as much as each daughter. His wife received K6,000, which was a quarter of the money. How much did each son receive?

A. K1,800 B. K2,400 C. K3,600 D. K4,200

15. $\frac{6ab}{c} \times \frac{ad}{2b} \div \frac{4bc}{8cd^2}$ in its simplest term is

A. $\frac{6a^3d^3}{bc}$ B. $\frac{6a^2d^3}{bc}$ C. $\frac{6ad^3}{bc}$ D. $\frac{6a^2d^2}{bc}$

16. A car travels 6 km on two litres of petrol. How far will the car travel on 5 litres?

A. 3 km B. 6 km C. 12 km D. 15 km

17. What is the actual distance in metres between two points that are 6.3 cm apart on a map whose scale is 1:1000 is

A. 6, 300 B. 630 C. 63 D. 6.3

18. The range of the data set {11, 32, 17, 41, 19, 8, 63, 28} is

A. 17 B. 63 C. 8 D. 55

19. If a card is drawn at random from a standard pack of 52 playing cards, the probability that it is a Jack OR a Diamond is

A. 0.25 B. 0.31 C. 0.02 D. 0.75

20. Jacob's base salary for 80 hours is K720. Overtime is paid for at time-and-a-half. If he is paid K828 in a certain pay period, how many overtime hours did he work?

A. 9 hours B. 8 hours C. 7 hours D. 6 hours

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

A. $y + 5x + 20 = 0$ B. $y - 5x + 20 = 0$ C. $y + 5x - 20 = 0$ D. $y - 5x - 20 = 0$

22. 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

23. Kambiri is 3 years older than Yoarene while Tondono is one year older than Williri. If Williri is 2 years younger than Kambiri, calculate the actual age of Eddy if Kambiri's age is 29.

A. 25 B. 26 C. 27 D. 28

24. Solve the expression $4x^{-2}(3+5y^{-2})+2y(7x^2+1)+y^{-1}(4x^{-1}-3)$ when $x=1$ and $y=-1$

A. 5 B. 10 C. 15 D. 20

25. An isosceles triangle has equal sides of 6cm long and a base of 4cm long. Calculate the area of a triangle

A. 10.32 B. 11.32 C. 12.32 D. 13.32

Section B: Short Answer Questions

Write your final answer clearly by showing your workings. 5 marks each.

1. Given the equation $2^{5x-1}=\frac{1}{8^{x(x-1)}}$, solve for x.

2. Given that a straight line, line L_1 intercepts a quadratic function $y=x^2+4x$ at $x_1=-4$ and $x_2=5$. Find the equation of line L_2 that passes through the point $(1,5)$ and is parallel to line L_1 in (a) above.

3. For the graph of the function $2x^2+y+3x-5=0$, what are the coordinates of the turning points

4. **B** is a point due east of **A** on the coast. **C** is another point on the coast and is 6 km due south of **A**. The distance **BC** is 7 km. Calculate the bearing of **C** from **B**.

5. Given the equations $2x-y+z=2,$
$-x+2y+2z=7,$
$x+3y-z=10.$

Solve for x, y and z.

6. Find the area above the $x-axis$, bounded by the curve $y=1-x^2$.

7. a, b, c and d are 4 integers written in order of size, starting with the smallest integer. If the mean of a, b, c and d is 15 while the sum of a, b and c is 39:
(a) Find the value of d.

(b) Given also that the range of a, b, c and d is 10, work out the median of a, b, c and d.