

GATUNDU FORM 4 EVALUATION EXAM

121/1

MATHEMATICS

PAPER I

JULY/AUGUST 2015

TIME: 2 ½ HOURS

SECTION I **ANSWER ALL QUESTIONS**

1. Without using Logarithms tables or a calculator evaluate.

$$\sqrt{\frac{384.16 \times 0.0625}{96.04}}$$

(3 marks)

2. Simplify completely

$$\frac{2x^2 - 98}{3x^2 - 16x - 35} \div \frac{x + 7}{3x + 4}$$

(4 marks)

3. Solve the following inequality and show your solution on a number line.

$$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$$

(3 marks)

4. Rose bought a golden necklace for ksh.6000 and sold it to Betty at a loss of 30%. Betty later sold it at a profit of 20%. What was Betty's selling price.

(2 marks)

5. If $x = \frac{2}{3}$ is a root of $6x^2 + kx - 2 = 0$, find the value of k and the other root.

(4 marks)

6. Tap A takes 4 minutes to fill a tank and tap B takes 6 minutes to empty the tank. If the tank has a capacity of 3000 litres find the volume of the tank after 2 minutes when both taps are open.

(3 marks)

7. From a viewing tower 30 metres above the ground, the angle of depression of an object on the ground is 30° and the angle of elevation of an aircraft vertically above the object is 42° . Calculate the height of the aircraft above the ground.

(3 marks)

8. Find the equation of the perpendicular bisector of line AB where A is (3, 9) and B(7,5) giving your answer in the form $ax + by + c = 0$ (3 marks)

9. Solve the simultaneous equations. (4 marks)

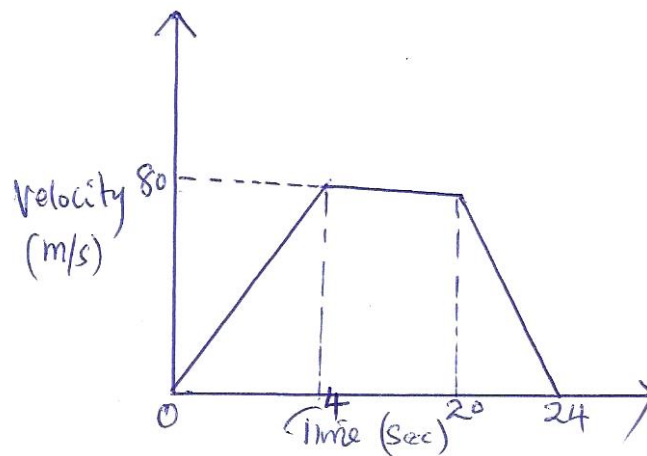
$$\begin{aligned} xy &= 4 \\ x + y &= 5 \end{aligned}$$

10. Vectors A and B are $2\mathbf{i} + 5\mathbf{j}$ and $8\mathbf{i} - 7\mathbf{j}$ respectively. Find the coordinates of M which divide AB in the ratio 1:2. (3 marks)

11. Ruto is 12 years old. In three years time he will be $\frac{1}{3}$ of his father's present age. How old was his father 12 years ago. (3 marks)

12. Given $a:b = 6:7$ and $b:c = 14:17$ find $a:b:c$. (2 marks)

13. The figure below is a velocity time graph for a car.



a) Find the total distance traveled by the car. (2 marks)

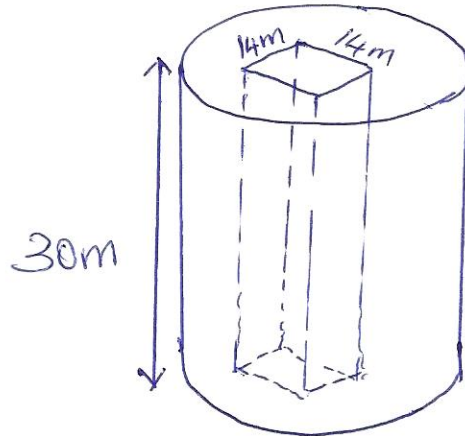
b) Calculate the deceleration of the car. (2 marks)

14. Two sides of a triangular piece of land are 21km and 32km long. If its area is 240km^2 , find the obtuse angle between the sides. (3 marks)

15. Evaluate using square root, reciprocal and square tables only. (3 marks)

$$\left(\sqrt{\frac{1}{\sqrt{16}}} \right)^2 - \frac{1}{\sqrt{16}}$$

16. A cylinder of diameter 28m was drilled right through it as shown below. Calculate its surface area.



SECTION II

ANSWER ANY 5 QUESTIONS FROM THIS SECTION

17. A bus left Makindu at 11.45 a.m and traveled towards Mombasa at an average speed of 80km/h. A Nissan Matatu left Makindu at 1.15 p.m on the same day and traveled along the same road at an average speed of 120km/hr. The distance between Makindu and Mombasa is 400km.

- a) Determine the time of the day the Nissan overtook the bus. (5 marks)
- b) Both vehicles continue towards Mombasa at their original speeds. Find how long the Matatu had to wait at Mombasa before the bus arrived. (5 marks)

18. Given that $y = 7 + 3x - x^2$, complete the table below

x	-3	-2	-1	0	1	2	3	4	5	6
y	-11			7						-11

- b) On the grid provided and using a suitable scale draw the graph of $y=7 + 3x - x^2$. (3 marks)
- c) On the same grid draw a straight line using the graph to solve $x^2 - 4x - 3 = 0$ (3 marks)
- d) Determine the coordinates of the turning point of the curve. (2 marks)

19. From a reservoir, water flows through a cylindrical pipe of diameter 0.2m at a rate of 0.35m/s.

- a) Determine the number of litres of water discharged from the reservoir in one hour. (4 marks)
- b) The water flows from the reservoir for 18 hours per day for 25 days per month and serves a population of 2500 families. Determine the average consumption of water per family per month giving your answer to nearest 100 litres. (4 marks)
- c) The water is charged at the rate of sh.450 per 100 litres. Calculate the average water bill per family per month. (2 marks)
20. A room is constructed such that its external length and breadth are 7.5m and 5.3m respectively. The thickness of the wall is 15cm and its height is 3.3 metres. A total space of 5m^2 is left for doors and windows on the walls.
- a) Calculate the volume of:
- (i) the materials needed to construct the walls without the doors and windows. (4 marks)
 - (ii) the materials needed to construct the walls with doors and windows. (2 marks)
- b) The blocks used in constructing the walls are 450mm by 200mm by 150mm. 0.225m^3 of cement is used to join the blocks. Calculate the number of blocks. Calculate the number of blocks needed to construct the room. (4 marks)
21. Every Sunday, Chalo drives a distance of 80km on a bearing of 074° to pick up his brother Ben to go to church. The church is 75km from Ben's house on a bearing of $S50^\circ E$. After church they drive a distance of 100km on a bearing of 260° to check on their father before Chalo drives to Ben's home to drop him off then proceeds to his house.
- a) Using a scale of 1cm represent 10km show the relative positions of these places. (4 marks)
- b) Use your diagram to determine
- (i) The true bearing of Charo's
 - (ii) The compass of bearing of the father's home from Ben's home (1 marks)
 - (iii) The shortest distance between Ben's home and father's home. (2 marks)
 - (iv) The total distance Charo travels' every Sunday. (2 marks)

22. The following measurement were recorded in a field book using XY as the baseline. $XY = 400\text{m}$.

	Y	
C60	340	
	300	1200
	240	160E
	220	160F
B100	140	
A120	80	
	X	

- a) Using a scale of 1:4000 draw an accurate map of the farm. (4 marks)
- b) Determine the actual area of the farm in hectares. (4 marks)
- c) If the farm is on sale at sh.80,000 per hectare find how much the farm costs. (2 marks)

23. A tailor bought a number of suits at a cost of sh.57,000 from Ken-suit wholesalers. Had he bought the same number of suits from Umoja wholesalers it would have costed him sh.480 less per suit. This would have enabled him to buy 4 extra suits for the same amount of money.

- a) Find the number of suits the tailor bought. (6 marks)
- b) The tailor later sold each suit for sh.720 more than he had paid for it. Determine the percentage profit he made. (4 marks)

24. A particle P moves in a straight line such that t seconds after passing a fixed point Q, it's velocity is given by the equation $2t^3 - 10t + 12$ find:

- a) The values of t when p is instantaneously at rest. (2 marks)
- b) An expression for the distance moved by P after t seconds. (2 marks)
- c) The total distance traveled by P in the first 3 seconds after passing point O. (3 marks)
- d) The distance of P from O when acceleration is zero. (3 marks)

GATUNDU FORM 4 EVALUATION EXAM

121/2

MATHEMATICS

PAPER II

JULY/AUGUST 2015

TIME: 2 ½ HOURS

SECTION I (50 MARKS) ANSWER ALL QUESTIONS

1. Use mathematical tables to evaluate.

(4 marks)

$$3 \sqrt{\frac{4\cos 60^\circ \times 0.1324^2}{5\log 7}}$$

2. Solve for x in the equation

(3 marks)

$$\sin(4x - 10)^\circ - \cos(x + 60)^\circ = 0$$

3. A radio cassette is offered for sale at shs 8,000 or a deposit of shs. 1,000 and 15 monthly repayments of shs 840. Find the rate of interest compounded monthly that is being charged under hire purchase terms.

(4 marks)

4. A colony of insects was found to have 250 insects at the beginning. Thereafter the number of insects doubled every 2 days. Find how many insects there were after 16 days.

(3 marks)

5. Under a shear with x-axis invariant a square with vertices A(1,0), B(3,0), C(3,2) and D(1,2) is mapped onto a parallelogram with vertices A¹(1,0) B¹(3,0), C¹(7,2) and D¹(5,2). Find the shear matrix.

(3 marks)

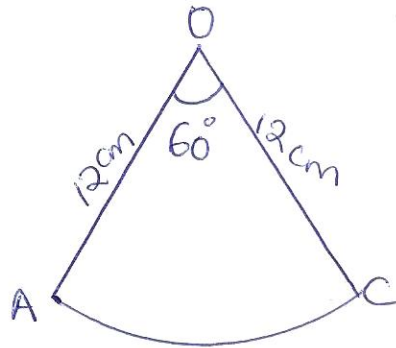
6. Using a ruler and a pair of compasses only construct a triangle PQR in which QR is 6.6cm, P=3.8cm and PQ = 5.6cm. Locate point x inside triangle PQR which is equidistant from P and R such that angle PXR = 90°.

(3 marks)

7. Find the variance and standard deviation of 3, 5, 7, 9, 11

(3 marks)

8. P and Q are two points such that $\mathbf{OP} = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ and $\mathbf{OQ} = 4\mathbf{i} + 5\mathbf{j} - 3\mathbf{k}$. M is a point that divides PQ externally in the ratio 3:2. Find the co-ordinates of M. (3 marks)
9. The sector below has a radius of 12cm and an angle $\text{AOC} = 60^\circ$ is folded to form a cone. Find the volume of the cone formed. (4 marks)



10. Find the equation of the normal to the tangent of the curve $y = x^3 - 3x^2 + 2x + 1$ at the point where $x = 3$. Leave your answer in the form $y = mx + c$. (3 marks)

11. Without using mathematical tables or calculator; evaluate:

$$\frac{\cos 135^\circ - \sin 30^\circ}{\sin 135^\circ + \sin 30^\circ}$$

(3 marks)

12. Find the midpoint of the straight line joining A (2,1) and D (6,5). (2 marks)

13. The equation of a circle centre (h, k) is $2x^2 + 2y - 8x + 5y + 10 = 0$. Find the values of h and k. (3 marks)

14. Make y the subject of the formula given

$$H = \sqrt{\frac{t}{q-y^2}}$$

(3 marks)

15. If $\frac{1}{a-2} - \frac{1}{a+2} = \frac{c}{a^2-b}$ for all values of a, evaluate c and b. (3 marks)

16. X and Y are two variables such that Y is partly constant and partly varies inversely as the square of X. If $Y = 3$ when $X = 2$ and $Y = 5$ when $X = 1$, find Y when $X = 4$.

(3 marks)

SECTION II**ANSWER ONLY FIVE QUESTIONS IN THIS SECTION**

17. The table below shows the number of students who scored marks in mathematics test.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	3	6	10	10	12	17	15	16	7	4

- a) Draw a cumulative frequency graph for the data. (4 marks)
- b) Use the graph to estimate the median mark. (2 marks)
- c) If students who score over 40 marks pass the tests estimate the percentage of the students
- i) who passed (2 marks)
- ii) who failed (2 marks)

18. In a geometrical progression, the sum of the second and third terms is 6; and the sum of the third and fourth terms is -12. Find:

- a) (i) The first term (3 marks)
- (ii) The common ration (3 marks)
- b) The sum of number of consecutive terms of an arithmetical progression is $-19\frac{1}{2}$; the first term is $16\frac{1}{2}$; and the common difference is -3. Find the number of terms. (4 marks)

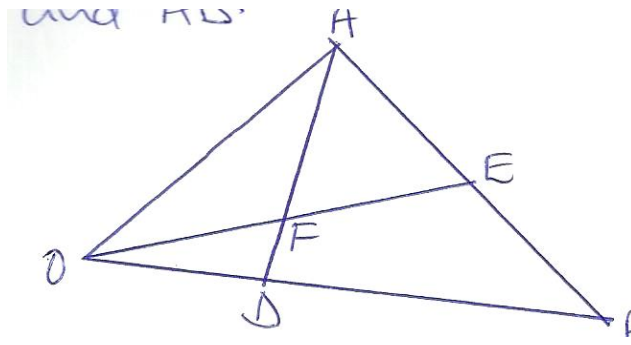
19. a) PQRS is a quadrilateral with vertices p(1, 4) Q(2, 1), R(2, 3) and S(6, 4). On the grid provided plot the quadrilateral (1 mark)

b) Draw $P^1Q^1R^1S^1$ the image of PQRS under a positive quarter turn about the origin and write down its co-ordinates. (3 marks)

c) Draw $P^{11}Q^{11}R^{11}S^{11}$ the image of $P_1Q_1R_1S_1$ under the transformation whose matrix is $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ and write down its co-ordinates. (3 marks)

- d) Determine the matrix T of a single transformation that maps PQRS onto P¹¹Q¹¹R¹¹S¹¹ (3 marks)

20. In the figure below, E is the midpoint of AB, OD:DB=2:3 and F is the point of intersection of OE and AD.



- a) Given that $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$, express in terms of a and b
- i) \vec{OE} (1 mark)
 - ii) \vec{AD} (1 mark)
- b) Given further that $\vec{AF} = t\vec{AD}$ and $\vec{OF} = s\vec{OE}$ where s and t are scalars, find the values of s and t. (5 marks)
- c) Show that O, F and E are collinear. (3 marks)

21. The position of two towns P and Q are given to the nearest degrees as P(45°N, 110°W) And Q (45°N, 70°E) Take $\pi = 3.142$, Radius of the earth R = 6370km. Find

- a) The distance between the two towns along the parallel of latitude in km. (3 marks)
- b) The distance between the towns along a parallel of latitude in nautical miles. (3 marks)
- c) A plane flew from P to Q taking the shortest distance possible. It took the plane 15 hours to move from P and Q. Calculate it's speed in knots (4 marks)

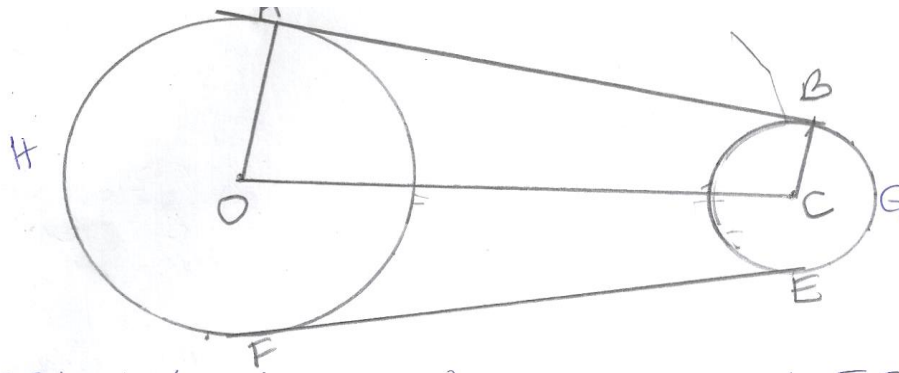
22. Complete the table below

(2 marks)

X°	-180°	-150°	-120°	-90°	-60°	-30°	0°	30°	60°	90°	120°	150°	180°
$Y=\sin(x+30)^\circ$			-1				0.50				0.50		
$Y=2\cos(x+30)^\circ$			0				1.73				-1.73		

- b) On the same axes draw the graphs of $y= \sin(x+30)^\circ$ and $y= 2\cos(x+30)^\circ$. (5 marks)
- c) Use your graphs to solve the equation $2\cos(x+30)^\circ - \sin(x+30)^\circ = 0$ (2 marks)
- d) State the amplitude of each wave. (1 mark)

23. Two wheels have radii 20cm and 30cm. Their centres are 70cm apart. A belt, passes tightly round the wheels as shown below.



- a) Calculate the length of AB and FE . (3 marks)
 - b) Evaluate the angles AOC and BCO. (3 marks)
 - c) Calculate the total length of the belt A B G E F H A (4 marks)
24. Given the equations: $y = 4 - x^2$ and $y = x^2 - 2x$;
- a) Find the co-ordinates of the points where the two curves meet. (2 marks)
 - b) Find the co-ordinates of points where $y=4 - x^2$ meet:
 - (i) The x-axis. (1 mark)
 - (ii) The y-axis (1 mark)
 - c) Find the co-ordinates of the points where $y=x^2 - 2x$ meet;
 - (i) The x-axis (1 mark)
 - (ii) The y-axis (1 mark)

- d) Sketch the two curves above on the same axes (1 mark)
- e) Find the area enclosed between the curves $y=4-x^2$ and $y=x^2 - 2x$. (3 marks)