NAME……………………………………………………….. INDEX NO……………………...........

SCHOOL ………………………………………………… CANDIDATE'S SIGN…..…………...

CLASS ………………..…ADM NO: ………………..…DATE……………………………....

121/1
MATHEMATICS
JULY/AUGUST, 2016
PAPER 1
TIME: 2½ HOURS

KAMDARA JET 2016

Kenya Certificate of Secondary Education (K.C.S.E.)

INSTRUCTION TO CANDIDATE'S:

- ✓ *Write your name, index number in the spaces provided at the top of this page.*
- ✓ *Sign and write the date of examination in spaces provided above.*
- ✓ *This paper consists of **TWO** sections: **Section I** and **Section II**.*
- ✓ *Answer **ALL** the questions in **Section I** and any **five** questions from Section **II**.*
- ✓ ***Answers and working must be written on the question paper in the spaces provided below each question**.*
- ✓ *Marks may be given for correct working even if the answer is wrong.*
- ✓ ***Non-programmable** silent electronic calculators and **KNEC** Mathematical tables may be used, except where stated otherwise.*

FOR EXAMINER'S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II   **GRAND TOTAL**

17	18	19	20	21	22	23	24	TOTAL

This paper consists in 16 printed pages. Candidates should ensure that all the pages are printed as indicated and that no question is missing.

1. Without using a calculator or a mathematical table evaluate. (3 marks)

$$\frac{\frac{6}{7} \, of \, \frac{14}{3} \div 8 \times \frac{-2}{3}}{-2 \times 3 + \left(14 \div 7\right) \times -3}$$

2. By using substitution $y = 3^x$ or otherwise solve, (4 marks)

$$9^{x+1} - 3^x = 3^{x+3} - 3$$

3. Simplify: $\dfrac{12x^2 - 27}{4 - \left(2x + 1\right)}$ (3 marks)

4. A line L_1 is perpendicular to the line $2x - 3y + 6 = 0$. Find the angle made by line L_1 and x axis. (3 marks)

5. Three – fifths of a certain work is done on the first day. On the second day, $\frac{3}{4}$ of the remainder is completed. If on the third day $\frac{7}{8}$ of what remained is done, what fraction of the work still remains to be done? (3 marks)

**6.** A bank in Kenya buys and sells foreign currency as shown in the table below.

	Buying	**Selling**
1 US dollar	100.87	100.97
1 Sterling pound	147.27	147.43

An American tourist came to Kenya with 15000 US dollars and converted the whole of it into Ksh. He then spent Ksh. 650,000 and converted the remaining money to sterling pounds. Calculate to the nearest pound the amount of money he remained with. (3 marks)

7. Use logarithm tables to evaluate $\dfrac{(0.07284)^2}{\sqrt[3]{0.06195}}$ (4 marks)

8. Under an enlargement scale factor -2, the image of A(2 ,4) is A'(-1 ,-2). Under the same enlargement, the image of D(x ,y) is D'(3, -2). Find the coordinates of the object D. (3 marks)

9. The figure below shows two lines $2x - y = 6$ and $y = \frac{1}{2}x$, intersecting. Calculate the area of shaded regions. (4 marks)
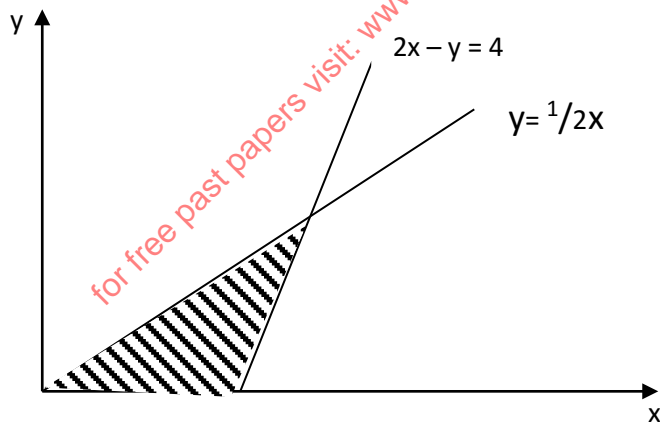
10. The diagram below represents a right pyramid on a square base of side 3cm. The slant edge of the pyramid is 4cm.
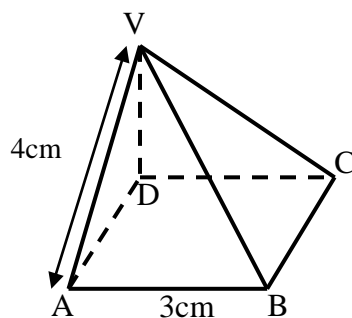
(a) Draw a labeled net of the pyramid. (2 Marks)

(b) On the net drawn, measure the height of a triangular face from the top of the pyramid.(1 Mark)

11. A salesman is paid a salary of Sh. 10,000 per month. He is also paid a commission on sales above Sh. 100,000. In one month he sold goods worth Sh. 500,000. If his total earning that month was Sh. 56,000. Calculate the rate of commission. (3 marks)

12. Solve the following inequality and state the integral solutions. (3 marks)

$$\frac{1}{2}(24 - 4x) > 6\left(3x - \frac{4}{3}\right) \geq -\frac{2}{3}(42 + 3x)$$

13. A regular polygon is such that its exterior angle is one eighth the size of interior angle. Find the number of sides of the polygon. (3 marks)

14. The position vector of P is **OP = 2i – 3j** and M is the mid – point of PQ. Given **OM = i + 4j**, Obtain the vector **PQ.** (3 marks)

15. A liquid spray of mass 384 g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is 0.6g/cm^3, calculate to 2 decimal places the height of liquid in the container (3 marks)

16. Given that sin (2Θ + 30) = Cos (Θ - 60). Find the value of tan Θ to two decimal places.
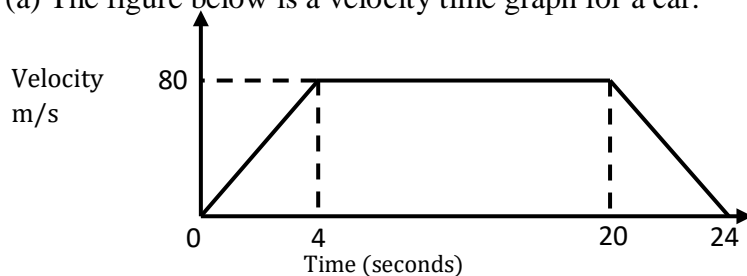
(2 marks)

Answer any FIVE questions only in this section

17. Water flows through a circular pipe of cross-sectional area of $6.16cm^2$ at a uniform speed of 10cm per second. At 6.00 a.m. water starts flowing through the pipe into an empty tank of base area are $3m^2$.

a) What will be the depth of the water at 8.30 a.m.? (5 marks)

b) If the tank is 1.2m high and a hole at the bottom through which water leaks at a rate of $11.6cm^3$ per second. Determine the time at which the tank will be filled. (5 marks)

18. (a) The figure below is a velocity time graph for a car.

Velocity m/s, 80, Time (seconds), 0, 4, 20, 24

   (i) Find the total distance travelled by the car. (2 marks)

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

   (b) A car left Nairobi towards Eldoret at 7.12 a.m. at an average speed of 90km/h. At 8.22 a.m., a bus left Eldoret for Nairobi at an average speed of 72km/hr. The distance between the two towns is 348km. Calculate:
   i) the time when the two vehicles met. (4 marks)

   ii) the distance from Nairobi to the meeting place. (2 marks)

19. Using a ruler and a pair of compass only.

a) Construct a triangle ABC in which AB=8cm, BC=7.5 cm and <ABC = 112.5^0.   (3 marks)

Measure length of AC.   (1 mark)

b)   By shading the required region show the locus of P within triangle ABC such that
   i)   AP ≤ BP
   ii) AP>3   (2 marks)

c)   Construct a normal line from C to meet AB at D.   (1 mark)

d) Locate the locus of R in the same diagram such that the area of the triangle ARB is $\frac{3}{4}$ area
   of triangle ABC.   (3 marks)

20. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top. $O_1O_2 = 4$cm, $O_2B = R = 4.9$cm $O_1A = r = 2.1$cm
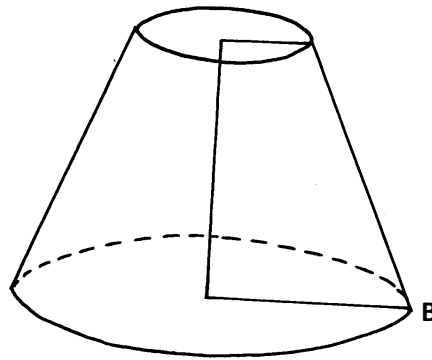

a) Determine the height of the chopped off cone and hence the height of the bigger cone.

(2 marks)

b) Calculate the surface area of the solid. (4marks)

c) Calculate the volume of the solid. (4marks)

21. a) Complete the table given below for the equation $y = -2x^2 + 3x + 3$ for the range $-2 \le x \le 3.5$ by filling in the blank spaces. (2 marks)

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5
y		-6		1						-2		-11

(b)Use the values from the table above to draw the graph of $y = -2x^2 + 3x + 3$. (3 marks)
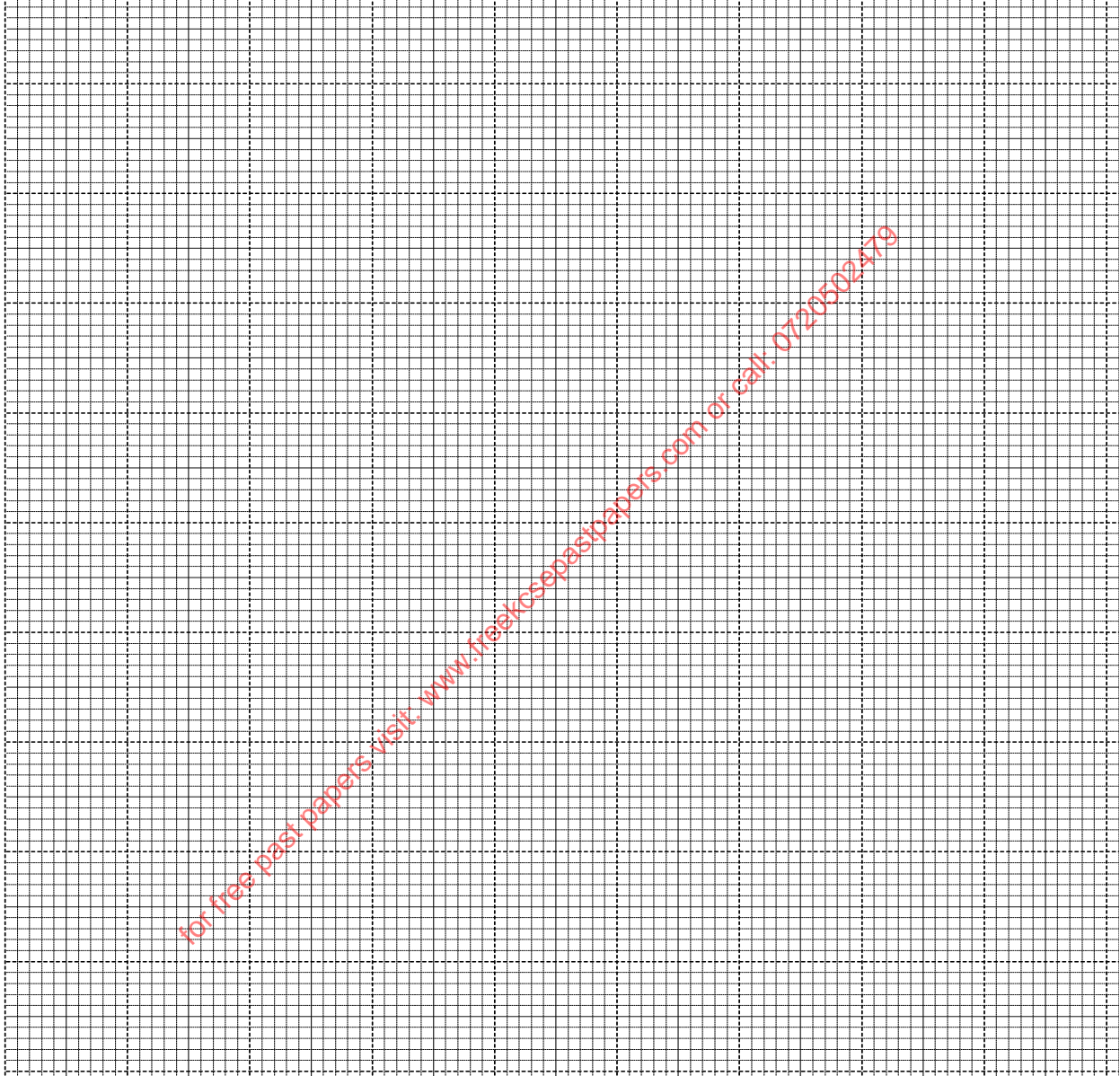
(c)Use your graph to:
  (i) Determine the integral values of x in the graphs range which satisfy the inequality $2x^2 - 3x - 3 \ge 3$. (3 marks)

  (ii) Solve $-2x^2 + 2x + 5 = 0$. (2 marks)

22. Triangle ABC has vertices A(3, 1), B(4, 4) and C(5, 2). The triangle is rotated through 90^0 about (1, 1) to give A'B'C'. Triangle A'B'C' is then reflected on the line $y - x = 0$ onto A''B''C''. triangle A''B''C'' then undergoes enlargement scale factor – 1 through the origin to give A'''B'''C'''.

(a) On the graph paper, draw triangles A'B'C', A''B''C'' and A'''B'''C'''.   (8 marks)

(b) Describe the type of congruence between:

    i)   ΔABC and ΔA'B'C'

    ii) ΔA'B'C' and ΔA''B''C''   (2 marks)

23. The table below shows patients who attend a clinic in one week and were grouped by age as shown in the table below.

Age x years	$0 \le x < 5$	$5 \le x < 15$	$15 \le x < 25$	$25 \le x < 45$	$45 \le x < 75$
Number of patients	14	41	59	70	15

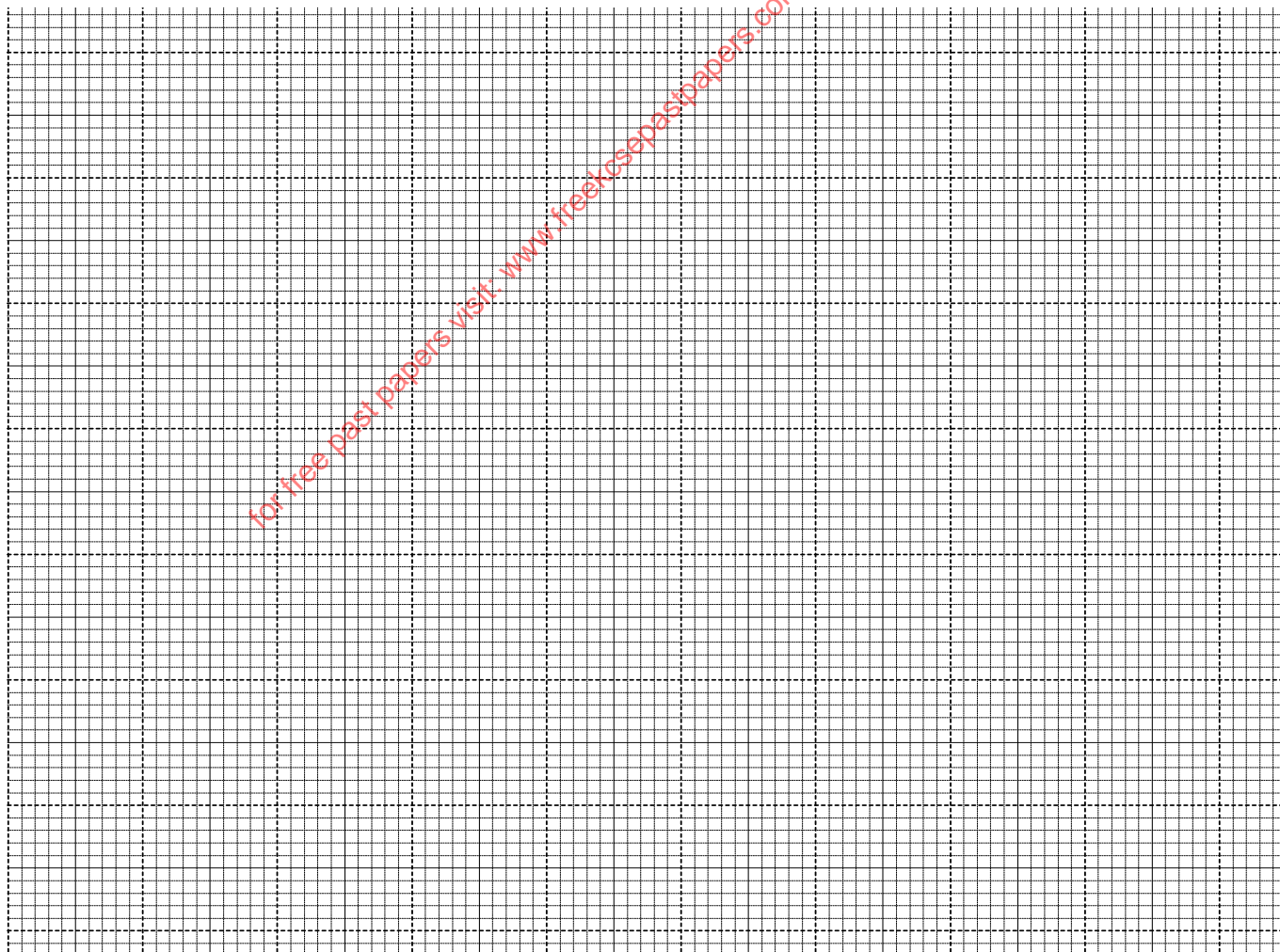(a) Estimate the mean age   (4 mar

(b) On the grid provided draw a histogram to represent the distribution.   (3 marks)
   (Use the scales: 1cm to represent 5 units on the horizontal axis 2 cm to represent 5unit on the vertical axis)
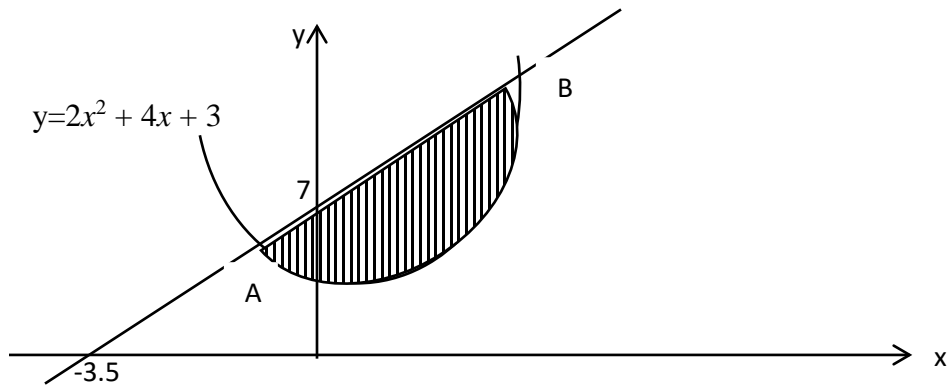
(c) i) State the group in which the median mark lies   (1 mark)

ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal. Using this information estimate the median mark. (2 marks)

24. The figure below shows curve of $y = 2x^2 + 4x + 3$ and a straight line intersecting the curves at A and B.

If the x – intercept is -3.5 and y – intercept as 7, find

a) The Equation of the straight line. (2 marks)

b) The coordinates of A and B. (4 marks)

c) The area of the shaded region. (4 marks)