Name .... **Index No.** ....

121/1   Candidate's Signature ....

MATHEMATICS

Paper 1   Date ....

July 2018

Time: 2½ Hours

FORM 4 END OF TERM 2 EXAM

MATHEMATICS
Paper 1
July 2018
Time: 2½ Hours

INSTRUCTIONS TO CANDIDATES

1.   Write your name and index number in spaces provided above.
2.   This paper consists of two sections; Section I and Section II
3.   Answer **all** the questions in section I and only **Five** questions in section II
4.   All answers and working must be written on the question paper in the spaces
     provided below each question.
5.   Show all the steps in your calculations giving your answers at each stage in the
     spaces below each question.
6.   Marks may be given for correct working even if the answer is wrong.
7.   Non-programmable electronic calculators and KNEC Mathematical tables may be used except
     where stated otherwise.

SECTION I

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

SECTION II

Question	17	18	19	20	21	22	23	24	Total
Marks									

GRAND TOTAL	

1. Without using a calculator or mathematical tables simplify. (3 marks)

$$\frac{36 - 8x - 4 - 15 \div -3}{3x = 3 + -8 (6 - (-2))}$$

2. Simplify completely : (3 marks)
$$\frac{3x^2 - 5xy - 2y^2}{y^2 - 9x^2}$$

3. Find the value of x in the following equation:

$64^{x + 1} + 8^{2x} = 1040$ (4 marks)

4. The image of A(5, 5) under an enlargement scale factor -2 is A^1(8, 7). Find the coordinates of the centre of enlargement. (3 marks)

5. Thirty two men working at the rate of 9 hours a day can complete a piece of work in 7 days. How many more men working at the rate of 8 hours a day would complete the same work in 6 days. (3 marks)

6. In the figure below triangle DEC is similar to triangle DAB and EC is parallel to AB. Given that DE : DA is 3 : 5, find the ratio of the area of triangle DEC to that of trapezium ABCE. (4 marks)
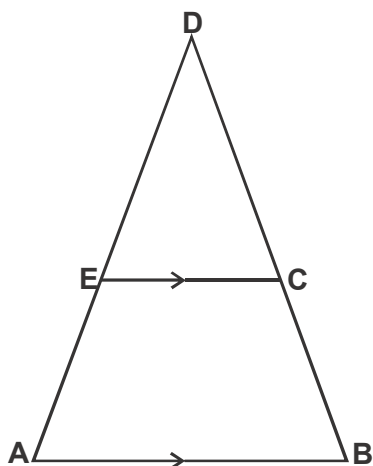
7. Find the inequalities that define the region R shown in the figure below. (3 marks)
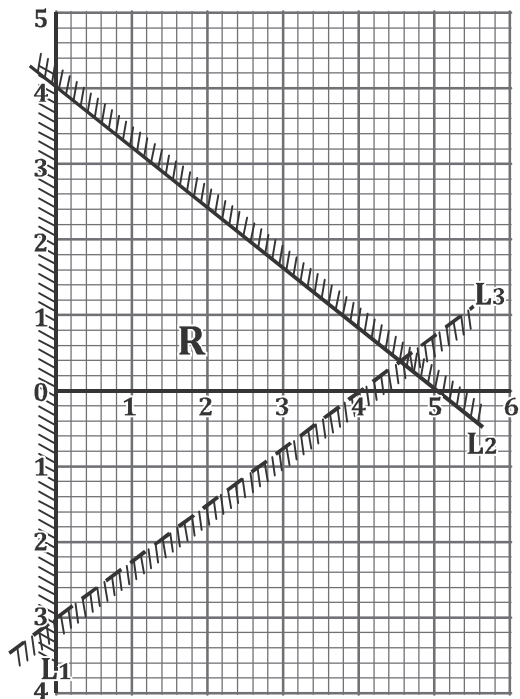
8. Four interior angles of a hexagon are 100°, 140°, 125° and 105°. The fifth interior angle is four times the sixth angle. Find the fifth angle. (3 marks)

9. Given that $\sin \theta = \frac{2}{3}$ and θ is an acute angle, find without using tables or calculator.

a) $\tan \theta$ (1 mark)

b) $\cos (90 - \theta)$ (2 marks)

10. The currency exchange rates of a given bank are as follows.

Currency	Buying (Ksh.)	Selling (Ksh)
1 Sterling pound	145.80	146.20
1 US dollar	100.80	101.00

A tourist arrived in Kenya with 7000 US dollars which he converted to Kenya shillings upon arrival. He spent Ksh.332790 and converted the remaining pounds. How many pounds did he receive ?

                                                                        (3 marks)

11. Two lines L_1 and L_2 are such that both pass through the point A (x, x). Given that L_1 has a gradient of 3 and also passes through B(6, 8), find :

a) the value of x   (2 marks)

b) the equation of L_2 if it also passes through point C(2x, 3x) in the form $y = mx + c$.   (2 marks)

12. Divide the line below into three equal parts. (2 marks)

├───┤
A   **B**

13. Given that $\underset{\sim}{O}P = 3\underset{\sim}{i} - 2\underset{\sim}{j}$ and $\underset{\sim}{O}Q = 8\underset{\sim}{i} - 5\underset{\sim}{j}$, find |PQ| to 3 significant figures. (3 marks)

14. Use the tables of reciprocals and square roots to evaluate :

$$\frac{0.1}{0.0351} + \sqrt{0.498}$$ (3 marks)

**15.** Use logarithms to evaluate :   (4 marks)

$$\sqrt{\frac{(0.08294)^2 \, x \, (39.24)^3}{8458}}$$

16. A tailor bought a pair of trousers at sh.1600. He marked the price such that after allowing his discount of 20% he would still make a profit of 30% on the cost price. Determine the price at which the pair of trousers was marked.   (2 marks)

17. The figure below represents a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.
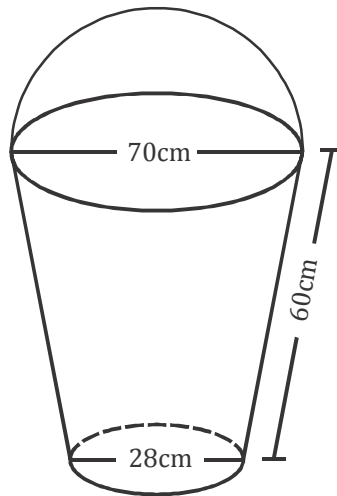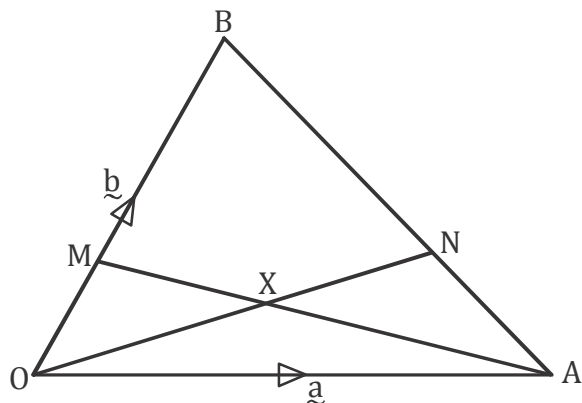

Calculate, taking $\pi = {}^{22}/_7$

a) the area of the hemispherical surface. (4 marks)

b) the surface area of the curved surface (4 marks)

c) the total surface area of the model. (2 marks)

18. The diagram below shows triangle OAB in which OM : MB = 1 : 3 and AN : NB = 1 : 2. The lines ON and AM meet at X. OA = a and $OB = b$.

a) Express the following vectors in terms of a and b.

i) AB   (1 mark)

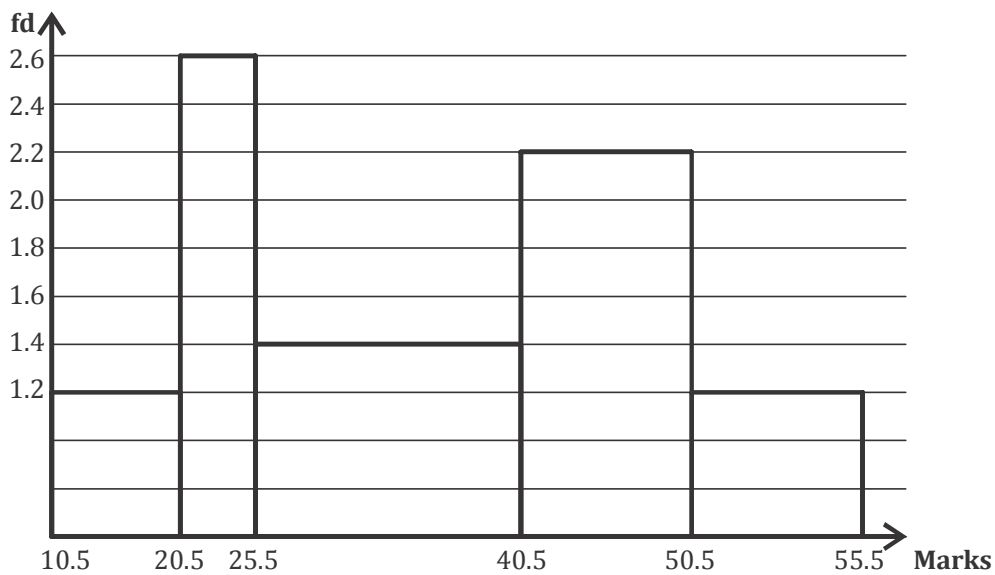ii) AM   (1 mark)

iii) ON   (1 mark)

b) You have also been given that OX = hON and AX = kAM. Express OX in two ways and hence find the values of h and k.   (5 marks)

c) Show that A, X and M are collinear.   (2 marks)

19. The diagram below shows a histogram representing marks obtained in a Maths test by a Form one class of Kangema high school.

a) Develop a frequency distribution table for the data. (4 marks)

b) State the modal frequency. (1 mark)

c) Estimate the mean using an assumed mean of 33. (5 marks)

10

20. John bought 3 brands of tea A, B and C. The cost price of the brands were sh.25, sh.30 and sh.45 per kilogram respectively. He mixed the brands in the ratio of 5 : 2 : 1 respectively. After selling the mixture he made a profit of 20%.

a) How much profit did he make per kilogram of the mixture. (4 marks)

b) After one year, the cost price of each brand was increased by 12%.

i) For how much did he sell one kilogram of the mixture to make 20% profit. (3 marks)

ii) What would have been his percentage profit if he sold one kilogram of the mixture at sh.40.25. (3 marks)

21. Three boats; X, Y and Z are such that Y is 500km on a bearing of 030° from X. Boat Z is 750km from Y and on a bearing of 140° from Y.

a) Draw a sketch of the positions of the three boats.

**b)** Using your sketch or otherwise, calculate :

i) the distance of Z from X

ii) the bearing of X from Z

iii) the shortest distance from X to the direct route between Y and Z.

c) Boat S is sighted 900km due East of Y. Calculate the distance of S from Z.

22. The figure below shows a velocity-time graph of journey of a car. The car starts from rest and accelerates at $2\frac{3}{4}$ m/s^2 for t seconds until its is 22m/s.
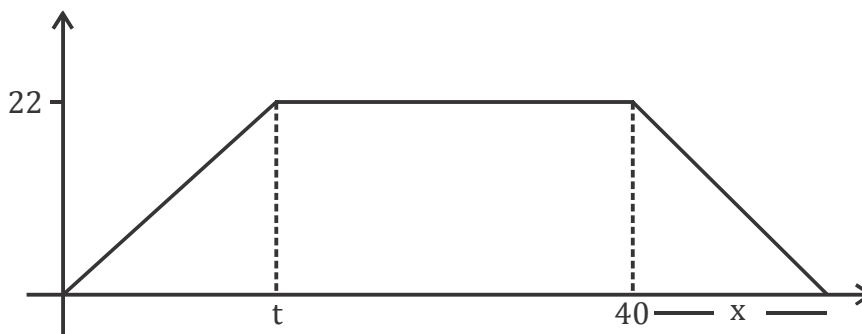
Brakes are applied bringing it uniformly to rest. The total journey is 847m long.

a) the value of t, the acceleration time   (2 marks)

b) the distance travelled during the first t seconds.   (2 marks)

c) the value of x, the deceleration time   (4 marks)

d) the rate of deceleration   (2 marks)

23. The transformation T and S are defined as follows :
   T = reflection on the line y = x
   S = positive quarter turn about the origin

The points A(3, 7), B(3, 4) and C(-1, 4) are the vertices of triangle ABC whose image under T is triangle $A^1B^1C^1$

a) On the grid provided, draw triangle ABC and its image $A^1B^1C^1$ under transformation T. (3 marks)
   (Graph paper provided on page 15)

b) State the coordinates of $A^1B^1C^1$ (1 mark)

c) Draw triangle $A^{11}B^{11}C^{11}$ the image of $A^1B^1C^1$ under transformation S. (2 marks)

d) State the coordinates of $A^{11}B^{11}C^{11}$ (1 mark)

e) Find a single matrix transformation that maps ABC onto $A^{11}B^{11}C^{11}$ (3 marks)
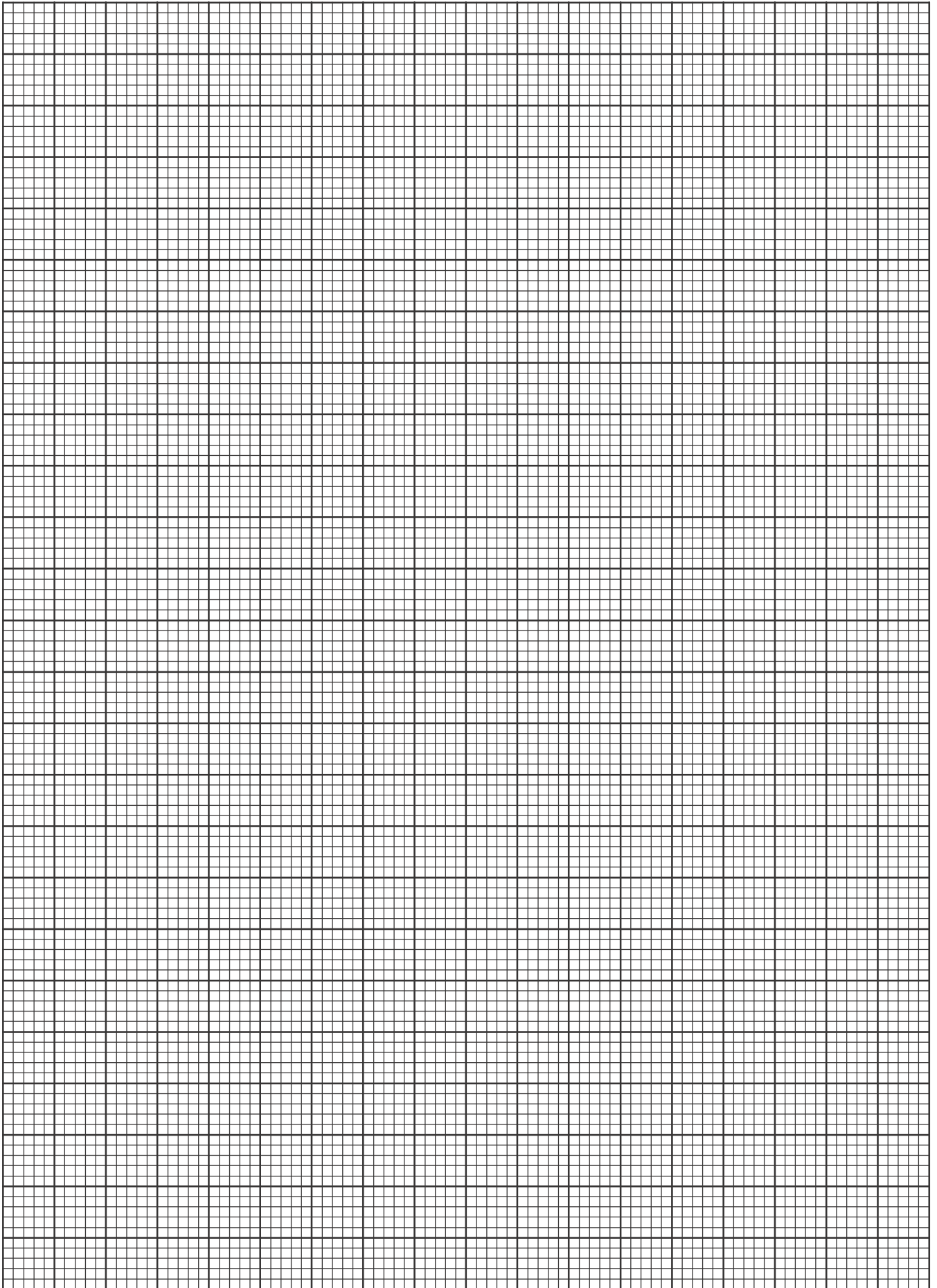
24. A straight line L_1 which passes through A(-1, 2) has a gradient of $-\frac{1}{2}$. Another straight line L_2 passes through the points B(2, -3) and C(4, 6). Determine :

a) the equation of L_1 in the form $y = mx + c$ (2 marks)

b) the equation of L_2 in the form $y = mx + c$ (2 marks)

c) the coordinates of the point of intersection of lines L_1 and L_3 (2 marks)

d) the equation of a line through c and parallel to L_1 in the form $y = mx + c$ (2 marks)

e) the equation of the line passing through D(-2, -2) and perpendicular to L_2 in the form $y = mx + c$ (2 marks)