

121/1

STRATHMORE MOCKS

MATHEMATICS

PAPER ONE

2½ HOURS

INSTRUCTIONS TO CANDIDATES

Write your name, index number in the spaces provided on top of the page.

The paper contains two sections: section one and section two.

Answer all questions in section 1 and any five in section 2.

Non programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.

Marks will be given for correct working even if the answer is wrong.

For examiner's use only

Section 1

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

Section 11

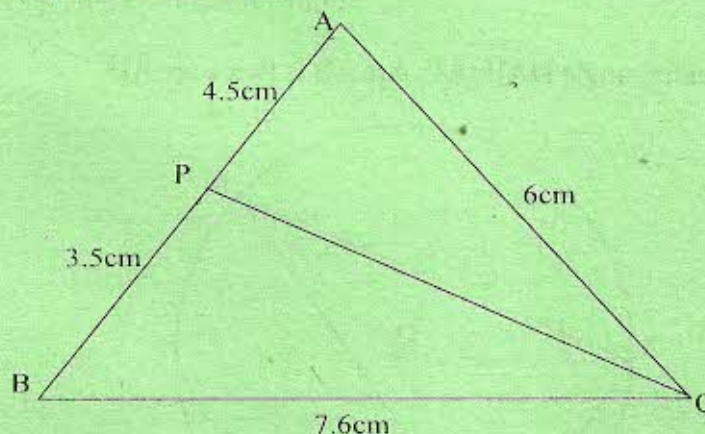
17	18	19	20	21	22	23	24

GRAND TOTAL

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1. A certain fraction given as $\frac{3125}{10907}$ is multiplied to another fraction $\frac{a}{b}$ such that the final result gives a perfect cube. Determine the values of a and b if they represent the least possible integers. (3 marks)
2. Simplify the expression given by $\frac{4}{x-3} - \frac{1}{x+2} - \frac{x+7}{x^2-x-6}$ (3 marks)
3. Given that $\cos 2(\theta - \frac{7}{5})^\circ = \sin \frac{1}{3}(\theta + 25)^\circ$ calculate the exact value of θ . (2 marks)
4. Find the value of n if 11 a.m. is midway between n a.m. and (n^2+4) p.m same day. (3 marks)
5. A straight line L_1 passes through a point M which is the mid - point of AB where $A(-1, -3)$ and $B(-3, 5)$. L_1 is perpendicular to the line L_2 whose equation is $y + 5 = 0$. Calculate the distance of point M from the line L_2 . (2 marks)
6. Given that $\log 0.69 = -0.16$ and that $\log 89 = 1.95$, evaluate the exact value of $\frac{\log(6.9^2 \times 0.0089)}{11.1}$ without using tables or calculators. (3 marks)
7. In the figure alongside, calculate the ratios

$$\frac{AP}{AC}, \frac{AC}{AB}$$



Hence complete the statement:

$\triangle ABC$ is similar to.....

(1 mark)

Hence find the length of CP

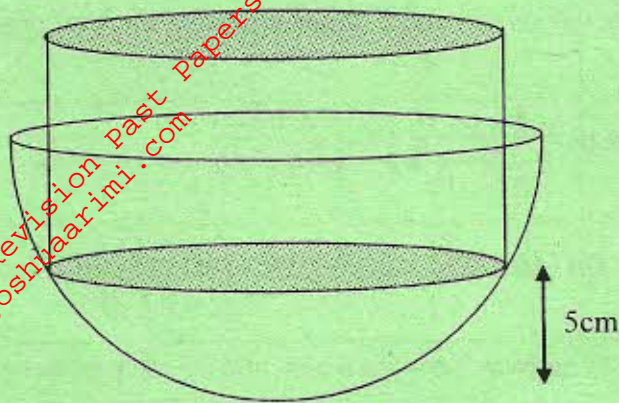
(2 marks)

8. Calculate the values of x and a in the equation given below

(4 marks)

$$24^{x-1} \times 243^{x-1} = 2^a \times 3^{3a-6}$$

9. A solid cylinder is inserted inside a hemispherical bowl such that half its vertical height goes inside. The hemispherical bowl, internal diameter 20cm has its lowest point being 5cm from the base of the cylinder. Calculate surface area of the cylinder leaving your answer in terms of π . (3 marks)

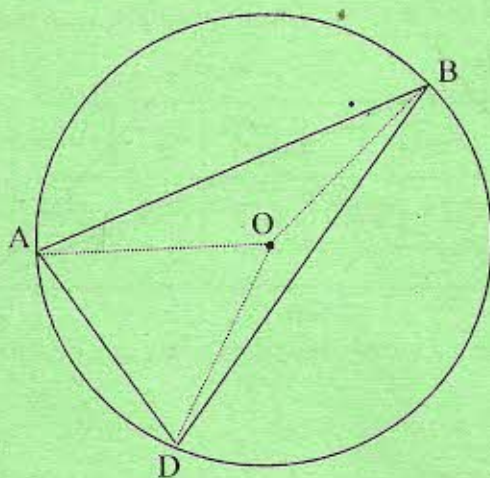


10. Using a pair of compasses and ruler only construct a triangle ABC in which $AB=6\text{cm}$, $\angle CAB=75^\circ$ and $BC=8\text{cm}$. (2 marks)

Without any measurement, divide the line AB into 7 equal parts and hence locate a point X such that $AX:XB = 4:3$ (2 marks)

11. Water flowing at a rate of 2m/sec through two pipes of diameter 3cm and 5cm respectively deliver water to a 6 – cm diameter pipe. Calculate the speed of flow in the 6 – cm pipe if all are kept full. Give your answer in m/sec. (3 marks)

12. In the circle O is the centre, angle $DAB=88^\circ$. Arc AB is twice arc AD. Calculate angle AOB. (2 marks)



13. Without using a calculator, determine the perimeter of a rhombus whose diagonals are 6.624 cm and 10.52cm. (Mathematical tables can be used). (3 marks)

14. A line AB, 8m long is divided into 2 parts, AC and CB such that $AC:CB = 3:5$. A further point D divides CB in the ratio $n:1$. If $AD:DB = 19:5$, find the value of n . (3 marks)

15. A train 88m long moving at x km/h overtakes a second train moving at 56km/h in the same direction.

- a) Given that the first train takes 13.2 seconds to pass a passenger in the second train .

Calculate the speed of the first train.

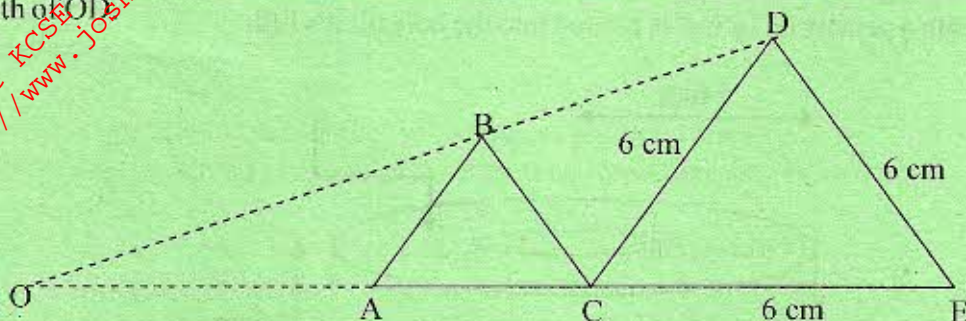
(2 marks)

- b) Calculate the length of the second train if it passes the other one completely in $22\frac{1}{2}$ seconds.

(2 marks)

16. The figure below (not drawn to scale), shows an equilateral triangle CDE of side 6cm which is an enlargement of triangle ABC under a scale factor of 3. If O is the centre of enlargement, calculate the length of OD.

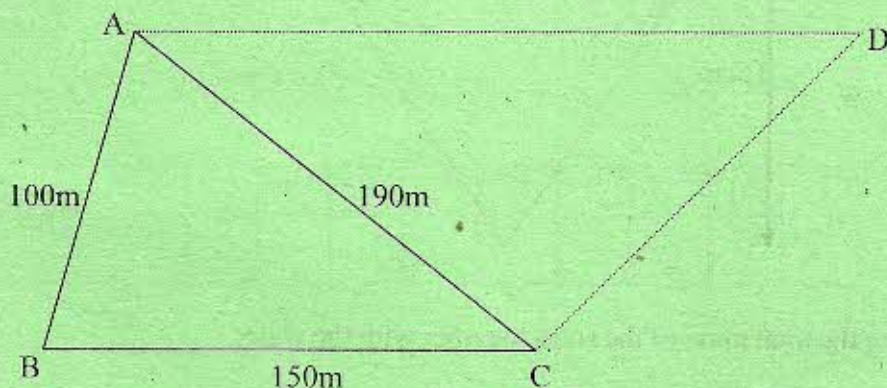
(4 marks)



SECTION II answer ANY 5 questions in this section

(50 marks)

17. A triangular piece of land ABC has sides AB=100m, BC=150m and AC=190m.



- a) Calculate the area of the triangular piece of land ABC

(2 marks)

- b) Calculate the value of angle ACB.

(3 marks)

- c) A new piece of land ABCD is a trapezium with $AD \parallel BC$ whose area is three times that of triangle ABC, calculate the perimeter of ABCD.

(5 marks)

18. From the top A of a building 125m above a street, the angle of elevation of the top B of a second building on the opposite side is $18^{\circ}36'$ and the angle of depression of the base of the second building from A is $39^{\circ}48'$

- a) Calculate the width of the street.

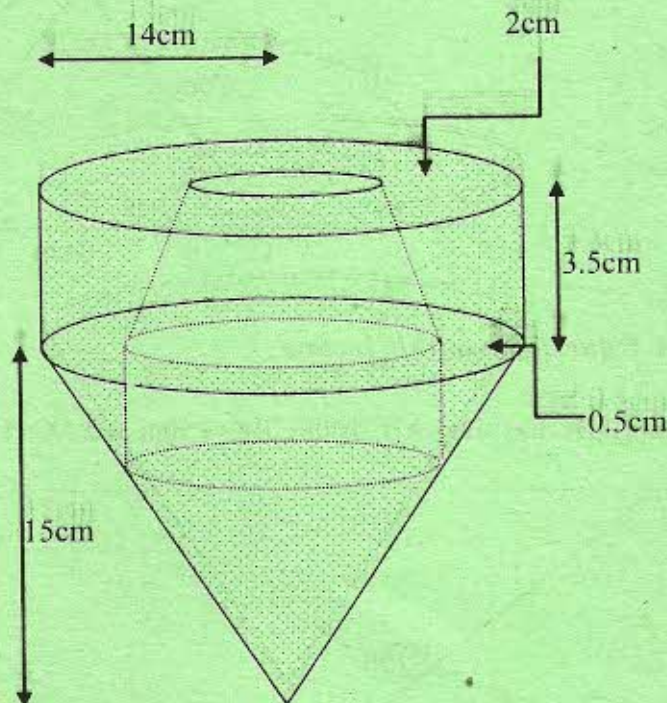
(3 marks)

- b) Calculate the height of the wall on the opposite side.

(2 marks)

- c) A taut extension string connects points A and B. A bird spots an insect sitting at a point X on the string. X is three quarter way from A. The bird's landing at X causes vertical sag of 50cm on X. Calculate the depression of X from B after the sag. (5 marks)

19. The figure below shows an iron solid of uniform density of 7.2g/cm^3 . It is composed of a cylindrical solid of a radius of 14cm and a height of 3.5cm attached to a cone of same radius with a vertical height of 15cm. A hole in the form of a frustum and a cylinder is drilled symmetrically from the solid such that the top and bottom circles in the original cylinder have a uniform thickness of 2cm and 0.5cm respectively. The frustum hole has a vertical height equal in length with the original cylinder and the cylindrical hole extends just to touch the edge of the cone.



Calculate the total mass of the solid together with the water. (10 marks)

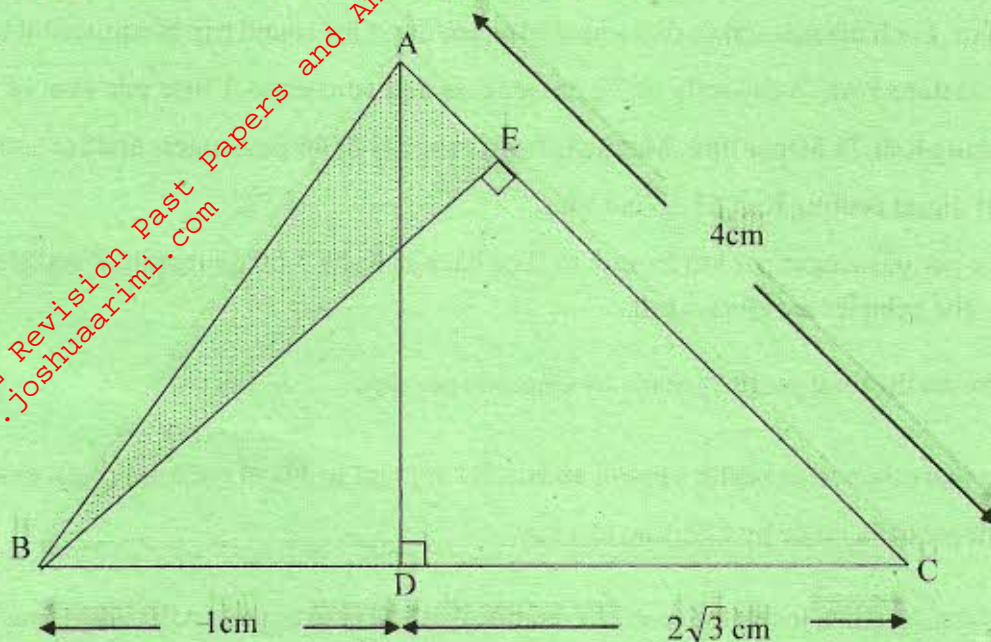
20. A stadium can fully maximize on profits if 72,000 people are accommodated. Each row of seats in a row accommodates the same number of people. On a certain day, 25 rows were defective and it was therefore decided that each of the remaining rows would have to squeeze in 40 more people for the stadium to have the maximum number of people.

Calculate

- how many people each row of seats holds? (6 marks)
- the number of rows in the stadium (1 mark)

- From the total tickets sale; if $\frac{1}{8}$ is used on repairs of the defective rows and $\frac{1}{7}$ of the remainder on other expenses, Kshs. 4,320,000 is left. Calculate the value of each ticket. (3 marks)

21. In the figure below $AC = 4\text{cm}$, $DC = 2\sqrt{3}\text{cm}$, $BD = 1\text{cm}$.



Without using tables or calculators:

- Determine the value of angle EBC (3 marks)
- Calculate the area of the shaded triangle leaving your answer in simplified surd form. (4 marks)
- Determine in simplified surd form the ratio of $\tan \hat{BAE}$ (3 marks)

22. The number of passengers on a certain regular weekday train service of 50 occasions was

165	141	163	153	130	158	119	187	185	209
177	147	166	154	159	178	187	139	180	143
160	185	153	168	189	173	127	179	163	182
171	146	174	149	126	156	155	174	154	150
210	162	138	117	198	164	125	142	182	218

- Reduce this data to a grouped frequency table with a class intervals of 10 passengers starting with 110 -etc (3 marks)

Use the data in your frequency table to

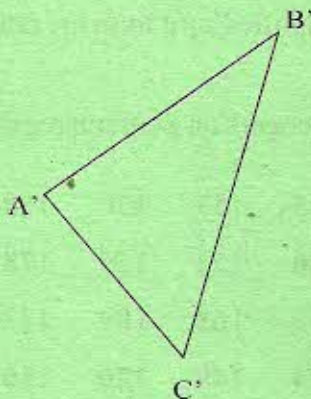
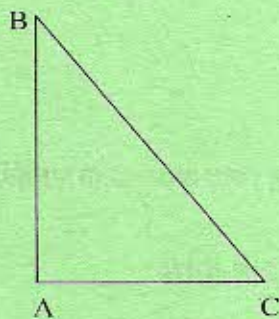
- Estimate the mean number of passengers on a particular occasion (3 marks)
- Estimate the range of marks of the middle 80% of the class. (4 marks)

23. Cherono owns two types of 'matatus' that ferry passengers from town A to B or back. A and B are 125km apart. Each matatu makes two round trips per day. One round trip is equivalent to 250 km of travel. Matatu P has a capacity of 29 passengers and consumes 1 litre per 4km of a type of petrol costing Ksh.78.80 per litre. Matatu Q has a capacity of 46 passengers and consumes 1 litre per 5km of diesel costing Ksh.65.65 per litre.

The charge per passenger per km from A to B or back is Kshs.5.50 on matatu P and shs.4.25 on matatu Q. The vehicles are always full.

- Determine the total profit % made by Cherono per day. (7 marks)
- Given that other costs besides petrol and diesel amount to 5% of the total costs, evaluate the overall profit % made by Cherono in a day. (3marks)

24. a) Using construction, locate the centre of rotation that will map triangle ABC onto triangle A'B'C' in the figure below. Fully describe this transformation. (4 marks)



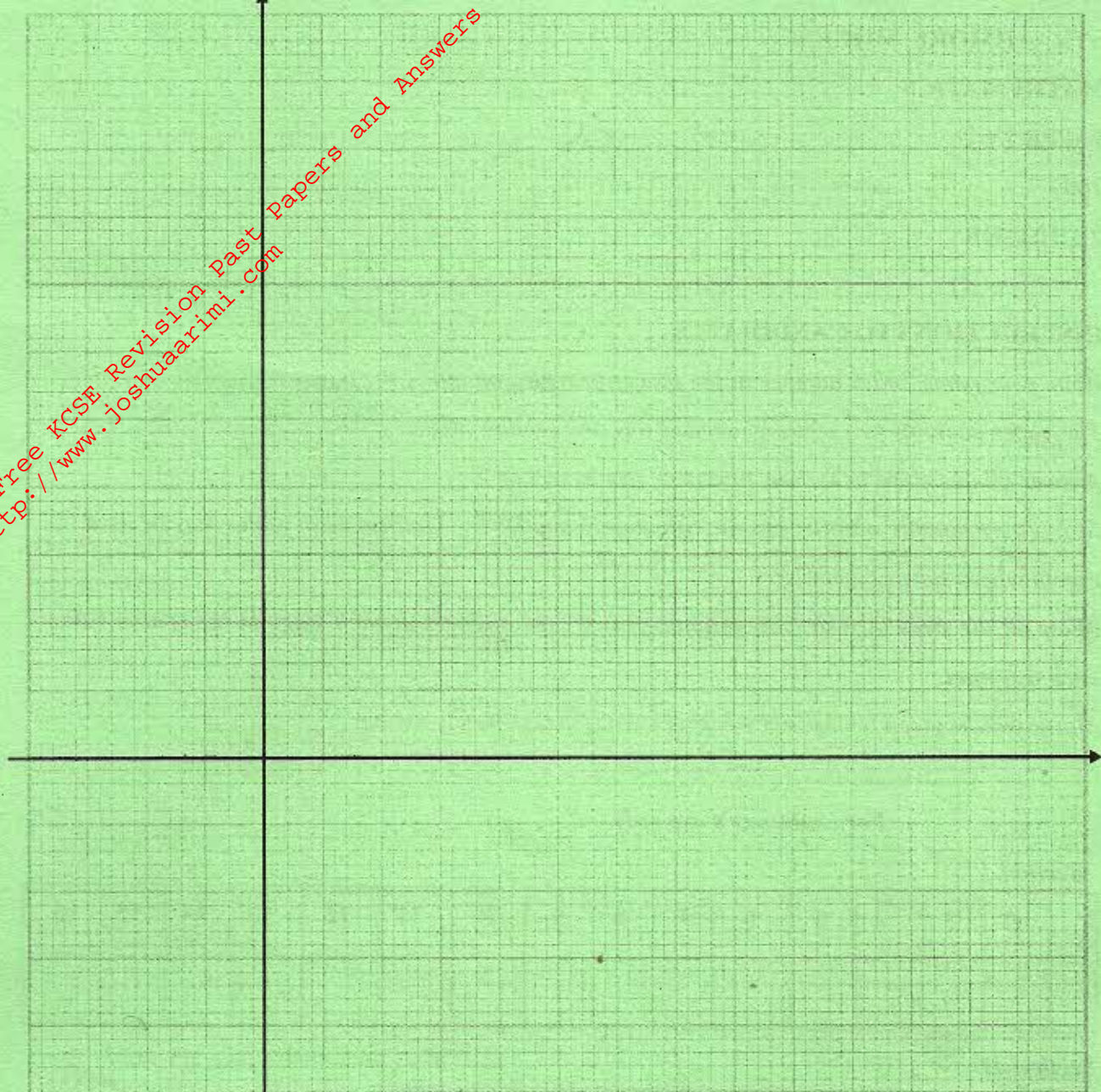
- Draw a triangle with vertices at $A(-2,6)$, $B(2,3)$ and $C(-2,2)$ on the grid provided in the next page. (1 mark)

On the same axes draw the following images:

A'B'C' is the image of ABC under a reflection in the line $x = -1$ (1 mark)

A''B''C'' is the image of A'B'C' under an enlargement with centre at (1,1) and a scale factor of -1 (1 mark)

A'''B'''C''' is the image A''B''C'' of under 180° rotation about B'' (1 mark)



- i) Describe a single transformation that will map triangle $A''B''C''$ to $A'B'C'$ (1 mark)
- ii) Fully describe the symmetry of figure $A''C''A'''C'''$ (1 mark)