**ALLIANCE HIGH SCHOOL**
Mathematics department
**From 4 Opener Exam**
Term 1 2016
Time: $2\frac{1}{2}$ Hrs                    (100 marks)
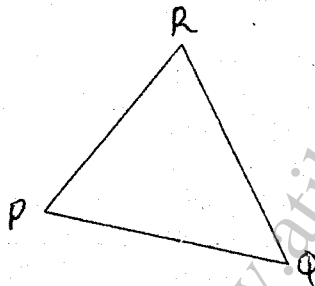
Name: _____ Class_____ Adm. No. _____

1. Simplify:

$$\frac{2x-4y}{4} - \frac{x-y}{3}$$                    (3mks)

2. Construct the image $P^1Q^1R^1$ of the object PQR below through a rotation of $-60^0$ using centre C
                    (3mks)



3. 5 tractors can plough 60 acres by working 8hours everyday for 12 days. How many days will 6 tractors working 5 hours a day take to plough 72 acres when working at half the rate?
                    (4mks)

4. simplify $\dfrac{(3a+b)(a-b)-2a(b-a)}{ax-bx-ay+by}$                    (4mks)

5. A flower garden is in the form of the trapezium shown in the figure below.
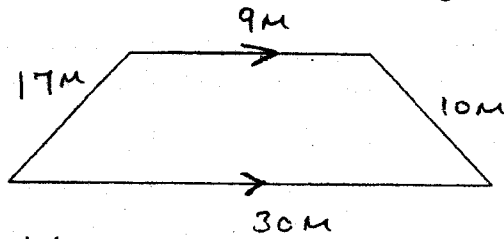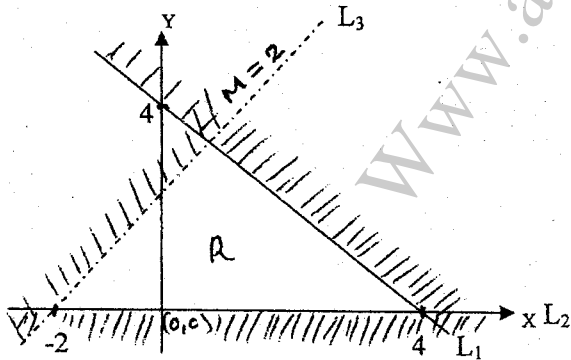


Find the area of the garden in hectares. (4mks)

6. Determine the smallest number x such that 720x is a perfect cube (2mks)

7. Write down the three inequalities that define the region marked R in the figure below. The gradient of line $L_3$ is 2 (5mks)

8. A certain two-digit number is equivalent to five times the sum of the digits. The number is found to be 9 less than the number formed when the digits are reversed. Find the number.

(4mks)

9. Find the value of k such that the expression $9x^2 + 4 - 2kx$ is a perfect square.

(3mks)

10. A trader has three grades of coffee; A, B, and C. Grade A costs Shs.140 per kg, grade B costs Shs.160 per kg and grade C costs Shs.256 per kg. The trader mixes grade A and B in the ratio 5:3 to make a brand of coffee which he sells at Shs.180 per kg. Calculate the percentage profit he makes. (3mks)

11. Calculate the percentage error made in using 0.73 as an estimate of 11/15. Give your answer to 2 decimal places. (3mks)

12. Make **b** the subject:

$$X = \frac{-10ab^2 + 15a^2b}{3a^2 + 2b^2 - 5ab}$$

(4mks)

13. In the figure below, O is the centre of the circle. The tangent P meets AB produced at Q. Given that PQ is 12cm and BQ is 8cm, find the radius of the circle. (3mks)
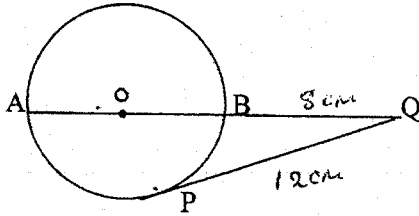


14. Find the radius and the centre of the circle whose equation is;
$2x^2 + 2y^2 - 8x + 12y - 72 = 0$ (4mks)

15. Mr. Kabutha bought a new car for Shs.900,000 which depreciated at a constant rate of 8.5% p.a. After sometime, he sold it to a second hand car dealer at Shs.600,000. How long did he stay with the vehicle? (Give answer to 2 d.p) (3mks)

16. The first, second and eighth terms of an AP are the three consecutive terms of a GP. If the first term of the AP is 5, find the common difference of the progression. (3mks)

17. Matu and Mutua contributed Shs.60,000 and Shs.90,000 respectively in order to start a hotel business. They employed a manger and agreed to pay him a salary of Shs.4,500 per month from the profit made each year. They also agreed that 20% of the profit made each year would be put back into the business. The remaining profit would be shared between them in the ratio of their initial contributions. During the first year the business made a profit of Shs. 365,000.

Calculate:

    a) The manager's annual salary for that year           (2mks)
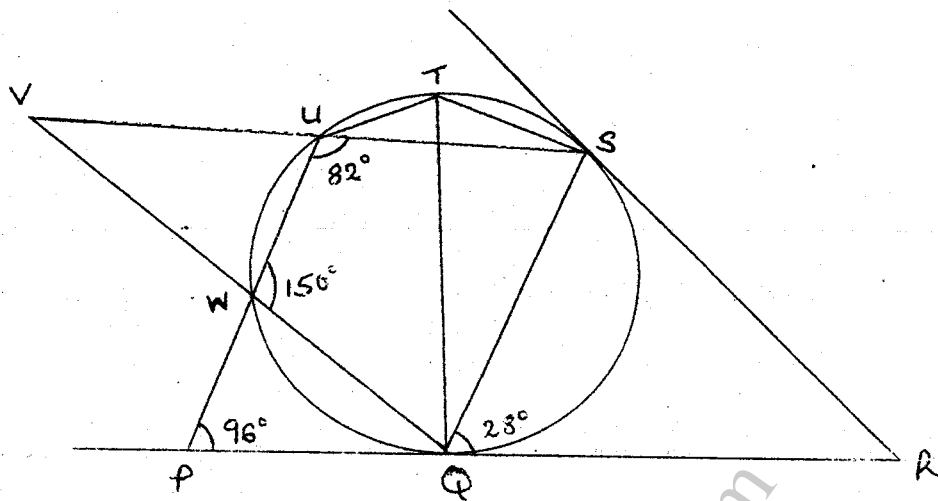
    b) The money put back into the business that year.     (2mks)

    c) The business net profit for that year          (2mks)

    d) How much each partner received that year.      (2mks)

    e) The capital for the following year.         (2mks)

18. The figure below shows a circle with chord UW and tangent PQR meeting at P. RS is another tangent that meet tangent PQR at R.



Given that Angles WUS = 82⁰, QWU = 150⁰, WPQ = 72⁰ and RQS = 28⁰ respectively, find giving reasons the value of the angles.

a) ∠ TSQ                                          (2mks)

b) ∠ SQV                                          (2mks)

c) ∠ WVU                                          (2mks)

d) ∠ QTS                                          (2mks)

e) ∠ PWQ                                          (2mks)

19. The Table below shows the distribution of masses of a sample of pupils in a certain school.

| Mass (kg) | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | 65-69 |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| No. of pupils | 1 | 5 | 9 | 11 | 20 | 20 | 19 | 8 | 4 | 3 |

a) Calculate the median mass.　　　　　　　　　　　　　　(3mks)

b) Using 47 as a working mean, determine:
   i. the actual mean mass　　　　　　　　　　　　(3mks)

   ii. the standard deviation of the masses　　　　　　(4mks)

20. Every morning during class time, Ndaiga either reads a novel or solves mathematics questions. The probability that he reads a novel is 4/5. if he reads a novel, there is a probability of ¾ that he will fall asleep. If he solves maths questions, there is a probability of ½ that he will fall asleep. Sometimes the teacher on duty enters Ndaiga's classroom. When Ndaiga is asked where he had been asleep, there is a probability of 1/5 that he will admit the he has been asleep and a probability of 3/5 that he will claim to have been asleep when he had not been asleep.

    a) Draw a tree diagram to illustrate the probabilities      (2mks)

    b) Find the probability that:
       i.    He sleeps and admits it       (2mks)

       ii.    He sleeps and does not admit it       (2mks)

       iii.    He does not sleep but claims to have been asleep    (2mks)

       iv.    He does not sleep and says that he had not been asleep    (2mks)

21. A ship sails from A($0^0$, $70^0$W) due North to B($25^0$N, $70^0$W) then due East to C($25^0$N, $12^0$E) and finally a further 1800 nautical miles due East to D.
   a)  Calculate the total distance covered in nm                 (5mks)

   b)  If the whole journey took a total time of 300 hours, find its average speed in knots (correct to 1 d.p)                 (2mks)

   c)  Find to the nearest degree the final position of the ship                 (3mks)

22. In the parallelogram ABCD, BA = - 2a and AD = **b**. M is the midpoint of AB. Line AC cuts MD at X.
   a) Sketch the parallelogram ABCD giving all the details                 (3mks)

b) Express AC in terms of **a** and **b**                                             (1mk)

c) Given that Ax = kAC and MX = tMD where k and t are constants, find the values of **k** and **t**.                                             (6mks)

23. Triangle $A_1B_1C_1$ is the image of triangle ABC with coordinates A(2, 2), B(2,6) and C(4,2) under a shear. If the coordinates of $A_1$ are (2,8)

   a) Find:
      i.   The matrix of the shear                                             (3mks)

      ii.  The coordinates of $B_1$ and $C_1$                                             (2mks)

      iii. The area of $A_1B_1C_1$ if the area of triangle ABC is $4cm^2$.                                             (2mks)

b) Triangle $A_1B_1C_1$ is transformed into triangle $A_2B_2C_2$ by a matrix defined by;

$$R = \begin{pmatrix} 0.8 & -0.6 \\ 0.6 & 0.8 \end{pmatrix}$$

    i.    If 'R' represents a general rotation through an angle $\Theta$ and centre (0, 0), determine the angle of rotation $\Theta$    (1mk)

    ii.    Find the coordinates of $A_2B_2C_2$    (2mks)

24. A farmer has a triangular nursery plot PQR measuring PQ = 6m, PR = 7m and QR = 5m. Water sprinklers are placed at the vertices of the plot and their ranges are 2.5m, 3m and 2m placed at P, R, and Q respectively.

    a)  Using a ruler and a pair of compasses only, construct the triangular nursery plot and show a point Y such that it is equidistant from the three vertices of the plot. (use a scale 1cm: 1m)    (5mks)

    b)  Inside the plot, indicate the region which receives no water by shading the watered part.    (3mks)

    c)  Find the area of the plot.    (2mks)