NAME...INDEX NO..

CANDIDATE'S SIGNATURE ....   DATE...................

GATUNDU SUB COUNTY FORM FOUR 2018 EVALUATION EXAM

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2018
TIME: $2\frac{1}{2}$ HOURS

INSTRUCTIONS TO CANDIDATES

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of exam in the spaces provided above
(c) This paper consists of two sections: section 1 and section 11.
(d) Answer **all** questions in **section 1** and **Only Five** questions from **section 11**
(e) All answers and working must be written on the question paper in the space
   provided below each question.
(f) Show all the steps in your calculation.
(g) Marks may be given for correct working even if the answer is wrong.
(h) Non – programmable silent electronic calculators and KNEC Mathematical
   Tables may be used except where stated otherwise.

SECTION 1

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

SECTION 11

17	18	19	20	21	22	23	24	TOTAL

Grand Total

SECTION 1(50 MARKS)

Attempt all questions in this section

1. Simplify $\dfrac{6}{\sqrt{5}+\sqrt{3}}$ - $\dfrac{4}{\sqrt{5}-\sqrt{3}}$ giving your answer in the form $\sqrt{a} + b\sqrt{c}$

   where *a, b* and *c* are constants. (3marks)

2. Find all the integral values of x which satisfy the inequalities.
   $3(3-x) < 5x-9 \leq 2x+8$

   (4marks)

3. Solve the equation

   2 log 15 – log x   = log 5 + log(x – 4)   (3marks)

4. A bag contains 5 white balls, 3 black balls and 2 green balls. A ball is picked at random from the bag and not replaced. In three draws find the probability of obtaining white, black and green in that order.   (2marks)

5. Use binomial coefficients to expand:

   $(2x - \sqrt{3})^4$ (3marks)

6. Given that $a = b + \sqrt{b^2 + c^2}$, make c the subject of the formula.   (3marks)

7. Mrs. Beth wants to buy a flat screen television set on hire purchase. The cash price is *Kshs. 28,000*. She can pay the cash price or make a down payment of *Kshs. 8,000* and *15* monthly instalments of *Kshs. 2,000* each. Calculate the rate of interest charged per month. (3mks)

8. Solve for *x* in the equation $2sin(x - \frac{\pi}{6})^c = -\sqrt{3}$ for the range $0 \leq x \leq 2\pi$ *c* (3marks)

9. The area of triangle ABC is *7cm²*. Find the area of the image of *ABC*, if it's transformed using the matrix $\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$. (3 marks)

10. PQR is a triangle of area *9cm²*. If PQ is the fixed base of the triangle and is *6cm* long, draw it and describe the locus of point R. (3marks)

11. In the figure below, AB is a tangent, meeting chord *CDE at B.*
    DE = x cm, EB = 7.
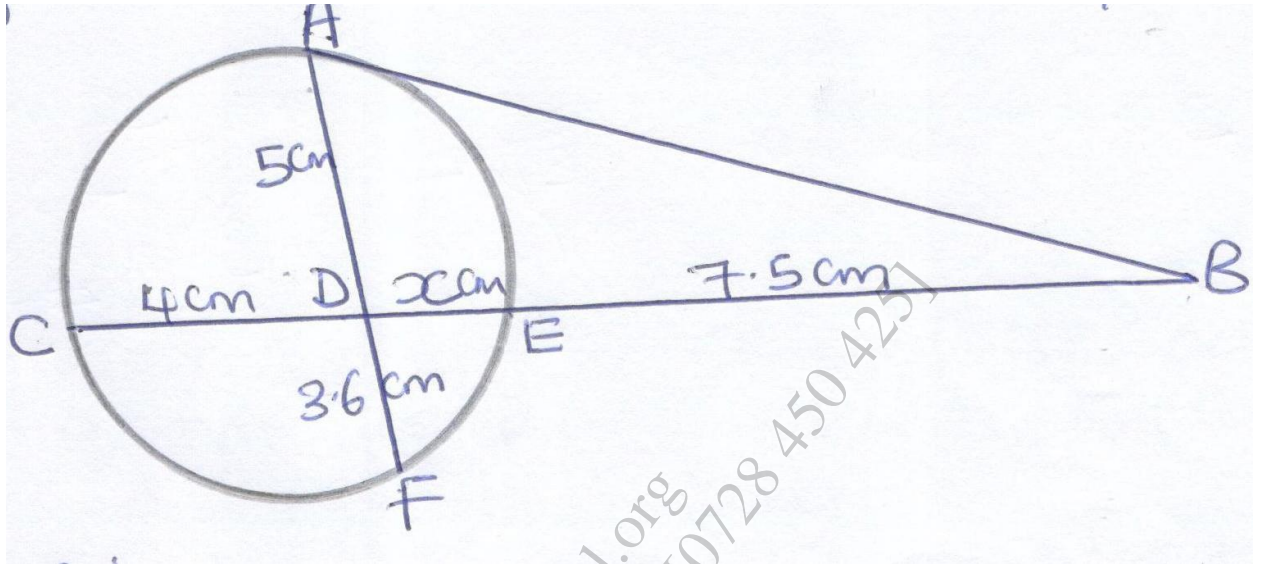
Determine :
a) The value of *X.*   (1mark)

b) The length of *AB* correct to *2* decimal places.

12. The lengths of two similar iron bars were given as *12.5m* and *9.23m*.
    a) Calculate the maximum possible difference in the lengths between the two bars. (2marks)

b) Calculate the percentage error in the difference between the two lengths: correct to (4sf) (2marks)

13. Using a ruler and a pair of compasses only:
a) Construct a triangle *ABC* such that *AB = 6CM, BC = 8cm* and $\underline{/}$*ABC* - *135⁰*. (2marks)
b) Using *BC* as the base, construct the height of triangle *ABC* in (a) above and measure the height of triangle *ABC* in (a) above and measure the height. (2marks)

14. In a Maths test, the scores of eight Form Two students are as follows;
45, 52, 54, 55, 57, 57, 62 and 66.
Calculate the standard deviation of the scores. (Correct to 1 Decimal place)

15. a) Show that the circle with equation $(x – 3)^2 +(y – 4)^2 = 25$ passes through the origin. (1 mark)

b) Find the co-ordinates of another point (not the origin) where the circle cuts the *x* – axis. (2marks)

16. Three quantities *P, Q and R* are such that *P* varies jointly with *Q* and the square of *R.* Find the percentage decrease in *P* if *Q* is increased by *50%* and *R* is decreased by *20%*. (3marks)

17.   In the figure below, *XW* is a diameter of the circle centre *O*. Points *X,Y,W,Z* are on the circumference of the circle. Angle *XWY = 72⁰, YZ = YX* and line *UZV* is a tangent to the circle at *Z*
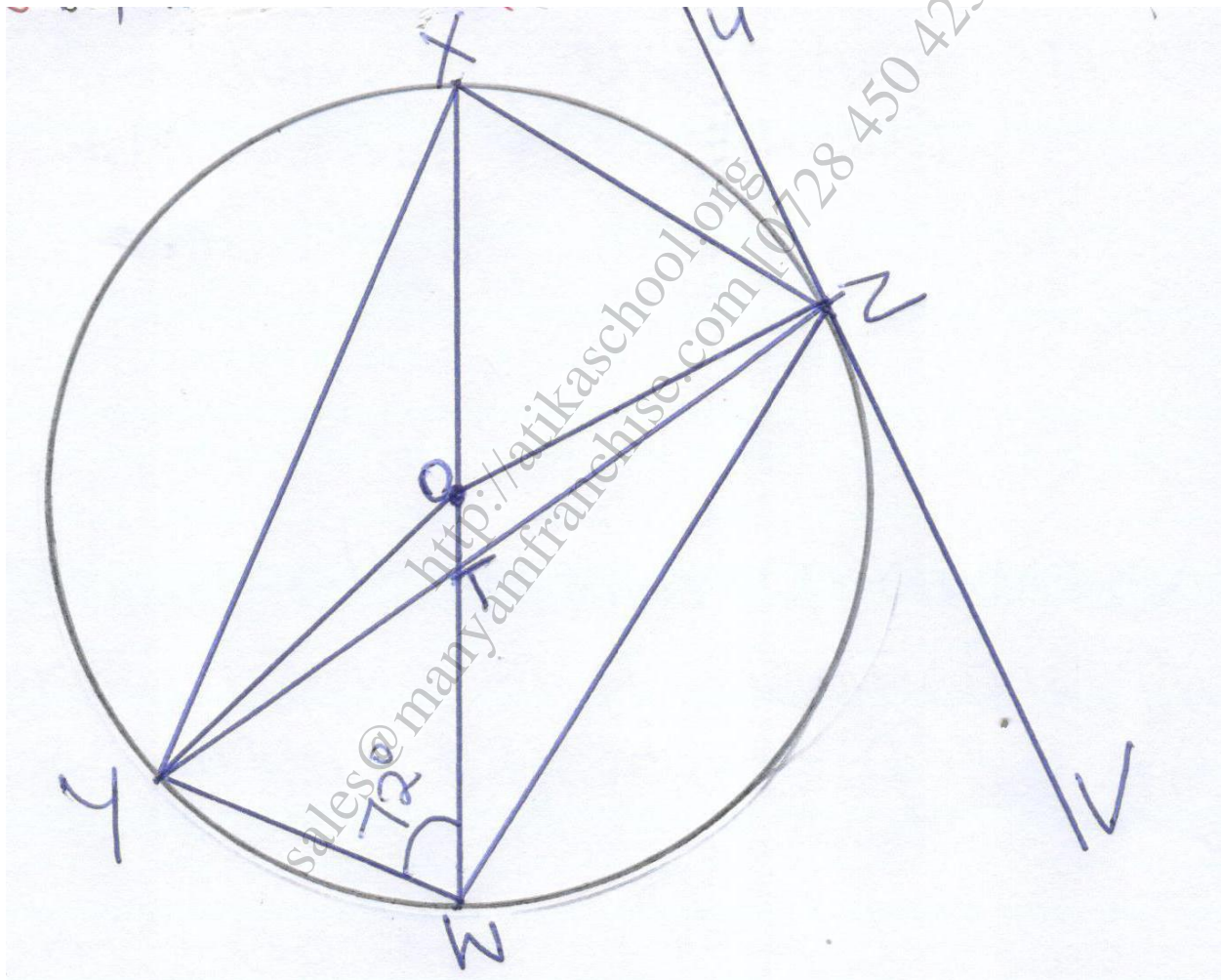
Giving reasons, calculate the size of:

a) ∠ YXW   (2marks)

b) ∠ XYZ   (2 marks)

c) ∠ OYZ   (2 marks)

d) ∠ WTZ   (2marks)

e)∠ WZV   (2marks)

18. a) The first term of an Arithmetic Progression *(AP) is 2*. The sum of the first *8* terms of the *AP* is *156.*

   i)   Find the common difference of the *AP*   (2marks)

   ii) Given that the sum of the first n terms of the *AP* is *416,* find *n.*

                                                            (2marks)

b)The *3rd, 5th* and *8th* terms of another *AP* from the first three terms of a Geometric progression *(GP).* If the common difference of the *AP* is *3*, Find:

   i)   The first term of the *GP*   (4marks)

   ii) The sum of the first *9* terms of the *GP*, to *4 signicant figures*.
        (2marks)

19. Compthe table below for the function y = 2 sin θ and y = 2
Sin(2θ + 60)^0 on the same axis for $0^0 \leq \theta \leq 360^0$. (4marks)

θ	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
2sinθ		1.00		2.00			0.00		-1.73	-2.00		-1.00	0.00
2sin(2θ + 60)^0		1.73			-1.73	0.00	1.73	1.73		-1.73	-1.73		

Using the grid provided, draw the graph of y = 2sinθ and y = 2sin (2θ +
60) *on the same axis for* $0^0 \leq \theta \leq 360^0$
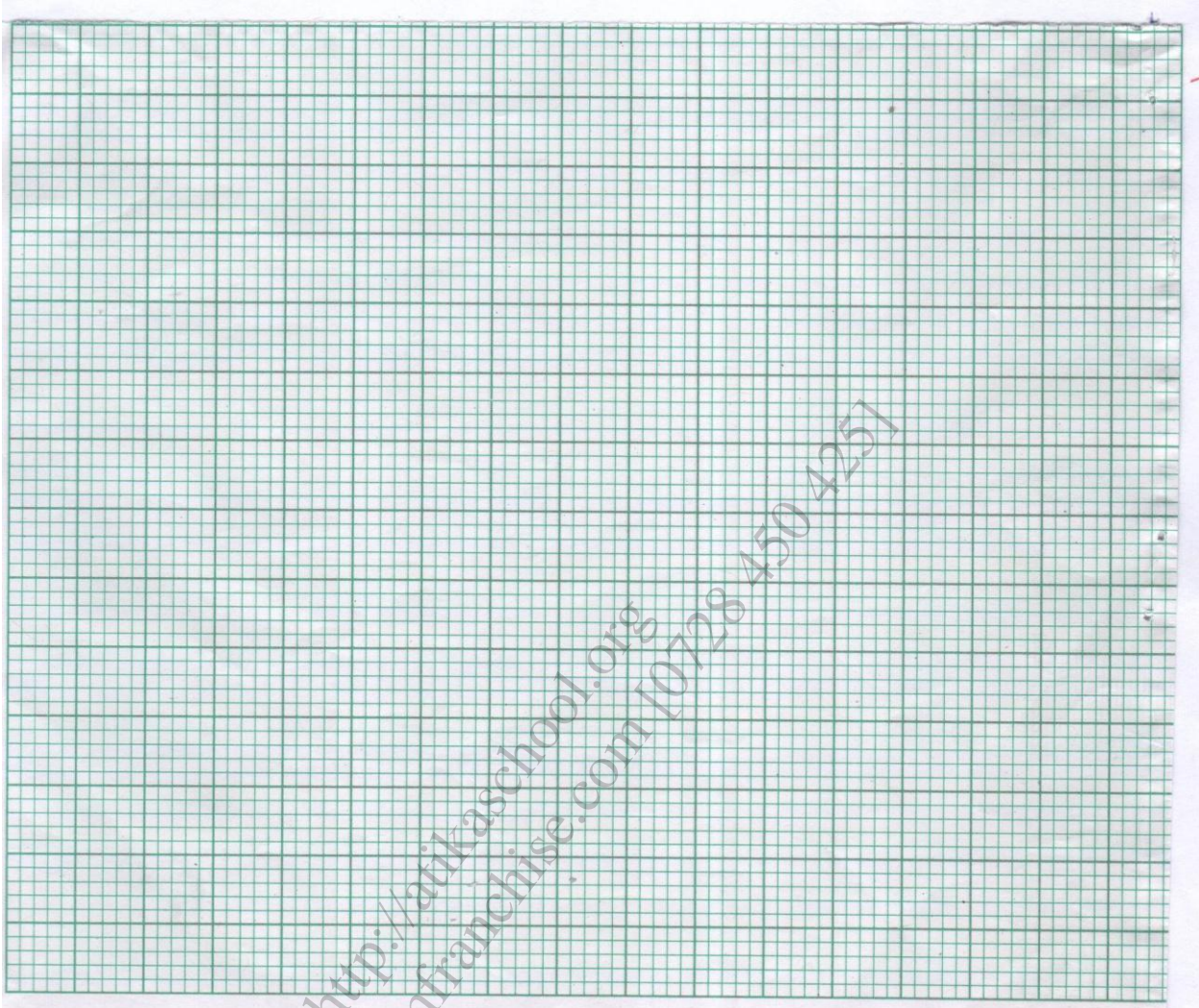
(4marks)

a) Use your graph to find

    i)   The period and amplitude of *y = 2sin(2θ + 60)⁰*.   (2marks)

    ii)   The value of *θ* for which $y = 2\sin\theta = 2\sin(2\theta + 60)^0$ (1 mark)

    d)Describe the transformation that would map *y = 2sinθ onto y = 2 sin(2θ + 60⁰)*   (1mark)

20. a) *A* and *B* are points on the earth surface on the opposite ends of the diameter through the center of the earth. A is located at *(33^0N, 51^0E).*

    i)   Find the position of B   (1mark)

    ii) Calculate the distance between points A and B in Km. Use R = 6370Km and $\pi = \frac{22}{7}$ (2 marks)

b)Two cities lie on the equator at $X(0^0, 32^0E)$ and $Y(0^0, 45^0E)$. Calculate the shortest distance between X and Y to the nearest kilometer.(3marks)

c)A helicopter leaves a wildlife station $P(70^0N, 32^0E)$ and flies due south at *700 Km/hr for 3 hours* to station Q. Find the position of Q . (4 marks)

21. A water tank has *2* inlets *P* and *Q* and one outlet *R. P* can fill the tank in *6* hours while *Q* takes *8* hours when alone. *R* can empty the tank in *4 hours*.

    i)   P and Q are opened at the same time and left for *3* hours before p is closed. Find the fraction of water in the tank after the *3* hours.   (2 marks)

    ii)   After *P* was closed, *R* was opened. Find the time it will take to fill/empty the tank.   (3 marks)

b) In order to prepare lunch for students in a school, the ratio of maize to beans is *M : B* . Maize costs *35/=* per kg while beans costs *80/=* per kg. If the school requests the supplier to mix in the ration above, the cost of the mixture would cost *66/=* per kg.

i)   Find the ratio of maize to beans.   (3 marks)

ii)   If the school uses *225kg* of the mixture per day. Find the amount of beans used daily.   (2 marks)

22. The table below shows the tax levied at different rates for different levels of income.

Monthly taxable pay(shs)	Rate of tax
1 - 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37,040	25%
Over 37,040	30%

Relief: Every taxpayer receives a tax relief of *Shs. 1162* per month.
Magdaline has a monthly salary of *shs. 26,000*. She is provided with a house at a nominal rent of *shs. 800* per month. The value of the house allowance is calculated as *15%* of her salary, less rent .

i)   Find her taxable income.   (2marks)

ii)   The amount of tax she pays.(4mks)

iii)   Calculate Magdaline's net salary.   (1 mark)

b) A man invests Kshs. 10,000 in an account which pays 16% interest p.a. The interest is compounded quarterly. Find the amount in the account to the nearest shilling after $1\frac{1}{2}year$.
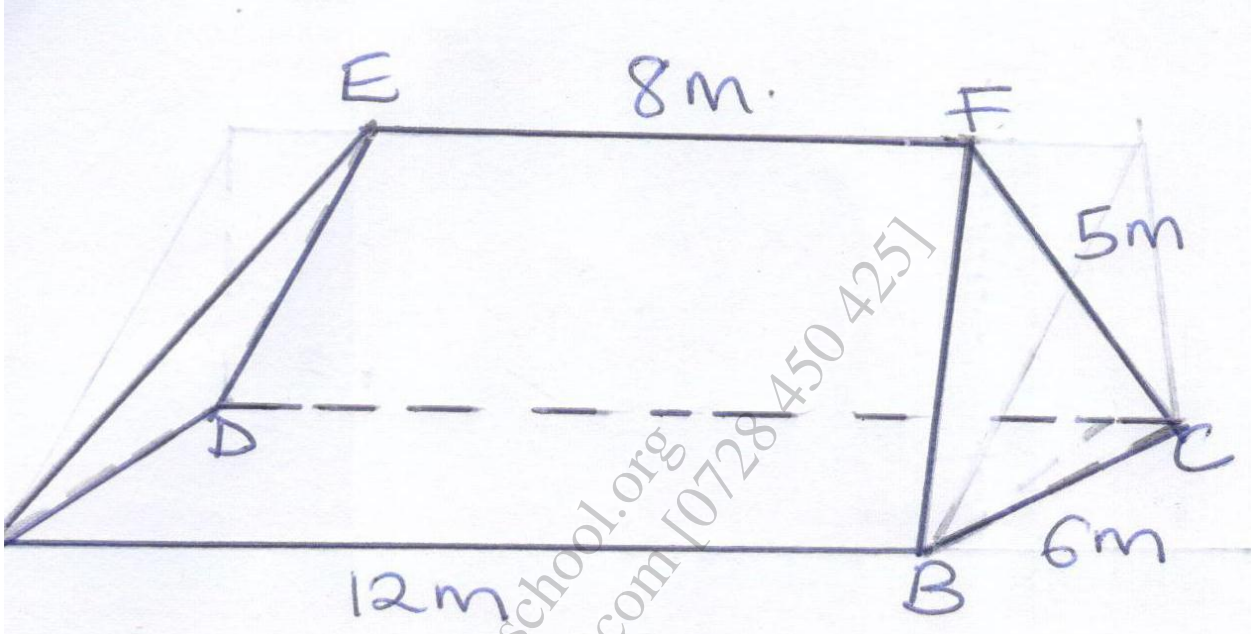
(3marks)

23. The figure *ABCDEF* below represents the roof of a house.
$AB = DC = 12M$, $BC = AD = 6M$,
$AE = BF = CF = DE = 5M$ and $EF = 8M$

a) Calculate correct to 2 decimal places, the perpendicular distance of *EF* from the plane *ABCD*. (2marks)

b) Calculate the angle between
   i)   Planes *ADE* and plane *ABCD*.   (2marks)

   ii)   The line *AE* and plane *ABCD* correct to 1 decimal place. (3 marks)

iii) Plane *ABFE* and *DCFE* correct to 1 decimal place. (3marks)

24. a) The gradient of the tangent to the curve $y = ax^3 + bx$ at the point *(1,1)* is *- 5*. Calculate the value of *a* and *b*. (3 marks)

c) A particle moves in a straight line so that t seconds after passing a fixed point in the line, its velocity V m/s is given by $V = \frac{1}{2}t^2 - 3t + 7$. Calculate;

i) The velocity after 8 seconds. (1mark)

ii) The minimum velocity. (2 marks)

iii) The distance travelled in the third second. (4marks)