

NAMEINDEX
 NO.....
 SCHOOL.....

121/2
 MATHEMATICS
 PAPER 2
 JULY / AUGUST 2010
 TIME: 2 ½ HOURS

BELGUT/AINAMOI JOINT EVALUATION EXAM Kenya Certificate of Secondary Education 2010

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 MATHEMATICS
 PAPER 2
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INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in the spaces provided at the top of this page.
2. This paper consists of two sections: **Section I and Section II.**
3. Answer **all** questions in **section I** and **any five** questions from **Section II.**
4. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. Non- programmable silent electronic calculators **and KNEC Mathematical tables** may be used.

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

17	18	19	20	21	22	23	24	Total

**Grand
Total**

This paper consists of 14 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION I (50 MARKS)

Attempt ALL questions in this section.

1. Use logarithm tables to evaluate

(4mks)

$$\left(\frac{314.3 \times \log 108.6}{\sin 78.6^\circ \div \tan 45.8^\circ} \right)^{\frac{1}{3}}$$

2. Simplify completely $\frac{(x + 5y)^2 + (x - 5y)^2}{3x^2 + 75y^2}$ (3mks)

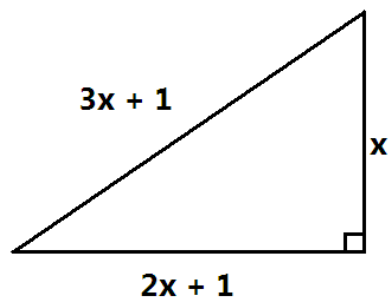
3. Two types of coffee are available in a shop. Grade A cost shs.150 per kilogram and grade B cost shs. 160 per kilogram. If Grade A and B are mixed in the ratio **2:x**, find x such that the selling price will give a 25% profit if the mixture is sold at shs. 1950 for ten kilograms. (3mks)

4. Find the value of y in, (3mks)

$$3 \times 9^y - 4 \times 3^{y+1} + 9 = 0$$

5. Given that $\sin (x + 30)^\circ = \cos (3x)$ for $0^\circ \leq x \leq 90^\circ$. Without using mathematical table or a calculator find the value of $\cos^2 3x$. (3mks)

6. The figure below is a right angled triangle such that $\sin \theta : \tan \theta = 3 : 4$.



Find the value of x .

(3mks)

7. (a) Expand $\left(3 - \frac{1}{2}x\right)^5$ up to the fourth term.

(2mks)

(b) Hence use your expansion to evaluate $(3.25)^5$ and correct your answer to four significant Figures.

(2mks)

8. A tank is supplied by two pipes. The larger pipe can fill the tank in 10 minutes less than the smaller pipe. Running the two pipes together fill the tank in 12 minutes. Find the time taken by each pipe separately to fill the tank. (3mks)

9. Given that $P=2.6\text{cm}$, $Q= 4.0\text{cm}$ and $R=7.8\text{cm}$. Find the percentage error in the expression.

$$\frac{P + Q}{R}. \quad (3\text{mks})$$

10. Given that A is directly proportional to B and inversely proportional to the square of C and that $A=6$ when $B=24$ and $C=8$. Find the value of C when $A=25$ and $B=9$ leaving your answer as mixed fraction. (3mks)

11. A shear parallel to the x-axis maps the point (1, 2) onto point (7, 2). **T** is the transformation equivalent to this shear followed by a reflection in the line $y=x$. Find the matrix which defines **T**. (3mks)

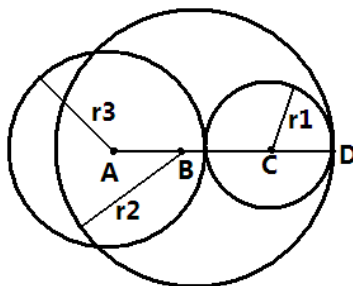
12. Find the quartile deviation of the following set of scores: 138, 121, 111, 143, 101, 120, 107, 106, 137, 141, and 140. (2mks)

13. The derivative function of a curve is given by $\frac{dy}{dx} = 9x^2 - 6x + 1$. If the curve passes through the point (-2, 25), find its equation. (2mks)

14. Find the equation of a circle that passes through (2, 0) and (8,0) and also touches the y –axis.

(4mks)

15. The figure below shows three circles with centres A, B and C respectively.



Given that $AD=14\text{cm}$, $BC= 5\text{cm}$ and $AC=10\text{cm}$. Find the radii r_1 , r_2 , and r_3 of the three circles.

(4mks)

16. Kibet bought a new laptop on hire purchase. The cash value of the laptop was Ksh. 56,000. He paid a deposit of Ksh. 14,000 followed by 24 equal monthly installments of Ksh. 3500 each. Calculate the monthly rate at which the compound interest was charged. (3mks)

SECTION II (50 MARKS)

Answer only Five questions in this section.

17. Aircraft takes off from an airport at A (65°N , 36°E) and flies by the shortest route to another airport at B ($X^{\circ}\text{N}$, 144°W) covering a total distance of 4800 nautical miles.

a) Find the Latitude $X^{\circ}\text{N}$. (4mks)

b) If instead the aircraft had flown along the Latitude and then along the Meridian to point B, find how much longer it would have flown in nautical miles. (4mks)

c) If the aircraft arrived at Airport B at 1846hrs local time, what was the local time at Airport A at that time. (2mks)

18. (a) Complete the table below giving your values correct to 2 decimal places. (2mks)

X	-90	-60	-30	0	30	60	90	120	150	180
Cos(2x + 30°)	-0.87		0.87	0.87		-0.87		0.00		0.87
Sin x	-1			0.00		0.87	1		0.5	0.00

(b) Using the grid provided, draw on the same axes the graph of $y = \cos(2x + 30^\circ)$ and $y = \sin x$ for $-90 \leq x \leq 180^\circ$. Take the scale: 1cm for 30° on the x-axis and 4cm for 1 unit on the y-axis.

(5mks)

Grid

(c) using the graph in part (b) above, estimate the solutions to the equation

$$-\sin x + \cos(2x + 30^\circ) = 0$$

(3mks)

19. The table below shows the values of the variables x and y, obtained from an experiment. Variables x

and y are related by the equation $y = PK^{x+1}$, where P and K are constants.

X	1	2	3	4	5	6
y	4.0	5.7	8.7	13.2	20.0	28.8

- a) Plot $\log y$ against $(x + 1)$, using a scale of 2cm to 1 unit on the $(x + 1)$ –axis and 2cm to 0.2 units on the $\log y$ – axis and hence draw the line of best fit. (5mks)

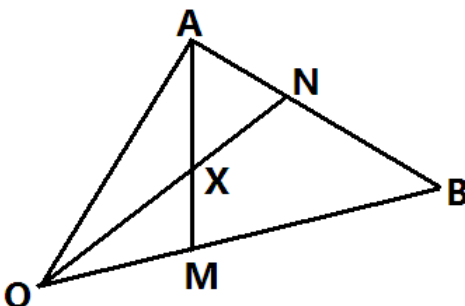
Grid

- b) Use your graph from (a) to find the values of;

(i) P. (2mks)

(ii) K (3mks)

20. In the figure below M and N are points on OB and BA respectively such that $OM:MB = 2:3$ and $BN:NA=2:1$. ON and AM intersect at X



- a) Given that $OA = \mathbf{a}$ and $OB = \mathbf{b}$, express in terms of \mathbf{a} and \mathbf{b}

(i) \mathbf{ON}

(2mks)

(ii) \mathbf{AM}

(1mk)

b) Given that $\mathbf{OX} = h\mathbf{ON}$ and $\mathbf{AX} = k\mathbf{AM}$ where h and k are scalars.

(i) Determine the constants h and k .

(5mks)

(ii) Determine the ratio in which X divides \mathbf{AM} .

(2mks)

21. A form four class at Kimulot secondary school has 15 girls and 25 boys. The probability of a girl completing the secondary school course is $\frac{3}{5}$ and that of a boy is $\frac{4}{5}$.

a) A student is picked at random from the class. Find the probability that;

(i) The student picked is a girl and will complete the course.

(2mks)

(ii) The student will not complete the course.

(3mks)

b) If two students are picked at random from the class. Find the probability that;

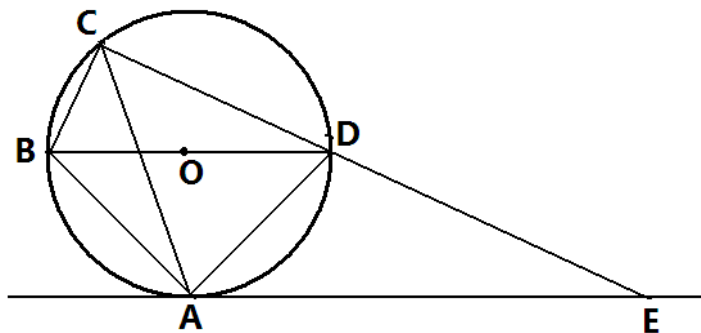
(i) Both are girls.

(2mks)

(ii) Both are of the same gender and will complete the course.

(3mks)

22. In the figure below, line BD is the diameter of the circle, centre O and AE is a tangent. Angle CBA = 110° and angle BAC = 26° .



Find the following angles, giving reasons for each answer.

a) Angle ABD.

(3mks)

b) Angle DAE

(1mk)

c) Angle AED

(3mks)

d) Angle AOD

(3mks)

23. A tailor makes two types of garments, A and B. Garment A requires 3 meters of material while garment B requires 2.5 metres of material. The tailor uses not more than 600 meters of material in making both garments. It must make not more than 100 garments of type A and not less than 80 of type B each day.

a) Write down **four** inequalities to represent the above information.

(4mks)

b) Draw the inequalities and shade the unwanted regions.

(4mks)

Grid

- c) If the business makes a profit of shs.80 on garment A and a profit of shs. 60 on garment B, how many garments of each type must he make to maximize its total profit? Hence find maximum profit. (2mks)

24. (a) Find the co-ordinates of the turning points of the curve whose equation is $y = 2x^2 - x^4$ (3mks)

(b) Determine the nature of the turning points identified in (a) above. (3mks)

(c) Sketch the curve of the equation $y = x^2 (2 - x^2)$. (4mks)