

P4022 Nov.
WASSCE 2011
GENERAL
MATHEMATICS/
MATHEMATICS
[CORE] 2

2

2 $\frac{1}{2}$ hours

Name:.....

Index Number:.....

THE WEST AFRICAN EXAMINATIONS COUNCIL
West African Senior School Certificate Examination
GENERAL MATHEMATICS/MATHEMATICS [CORE] 2

November 2011

[100 marks]

2 $\frac{1}{2}$ hours

*Write your **name** and **index number** in the spaces provided at the top right-hand corner of this booklet.*

*Answer **ten** questions in all; **all** the questions in Part I and **five** questions from Part II.*

*In **each** question, all necessary details of working, including rough work, **must** be shown with the answer.*

Give answers as accurately as data and tables allow.

The following are provided for use in the examination:

- (a) graph paper,*
- (b) drawing paper for construction work.*

The use of non-programmable, silent and cordless calculator is allowed.

PART I
[40 marks]

Answer all the five questions in this part.
All questions carry equal marks.

1. (a) Find the value of x in the expression: $\frac{3^{(2x+1)}}{3^{(3x-4)} \times 3^{(6-7x)}} = 27^x$.

(b) Without using Tables or Calculator, simplify:

$$\frac{1}{3} \log \frac{125}{8} - 2 \log \frac{2}{5} + \log \frac{80}{125} \quad (\text{All logarithms are in base 10}).$$

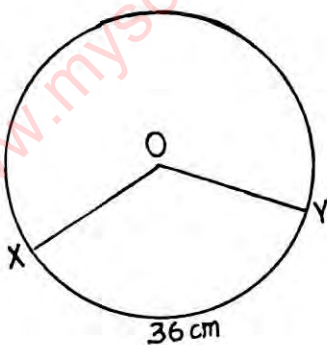
2. (a) Solve the equations $8 = 2^{(x+y)}$ and $1 = 3^{(x-y)}$ simultaneously.

(b) If $\frac{3x + 2y}{5x - 4y} = \frac{9}{4}$, find the ratio $x : y$.

3. (a) A cube of side 4 cm has the same volume as a cone with diameter 7 cm. Calculate, correct to the nearest cm, the height of the cone.

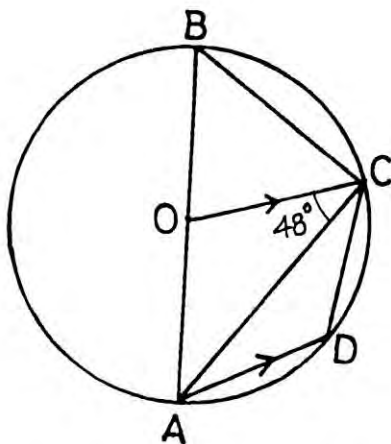
[Take $\pi = \frac{22}{7}$].

(b)



In the diagram, O is the centre of the circle, radius 14 cm. If the length of the minor arc XY is 36 cm, calculate the area of the minor sector OXY . [Take $\pi = \frac{22}{7}$].

4. (a)



In the diagram, O is the centre of the circle, \overline{OC} is parallel to \overline{AD} , \overline{AB} is a straight line and $\angle OCA = 48^\circ$. Calculate $\angle ABC$.

(b) From a window of a building, the angle of elevation of the top of a tower 50 m away is 31° and the angle of depression of the foot of the tower is 25° . Calculate, correct to 2 decimal places, the height of the tower.

5. (a) The number of green (G), red (R), white (W) and black (B) identical balls contained in a bag is as shown in the table.

Balls	G	R	W	B
Frequency	2	4	3	1

If two balls are selected at random **without** replacement, find the probability that both balls are green.

(b) In a test, if a student had scored 80 marks in one of the subjects, his average mark in 8 subjects would be 62. If he had scored 64 marks in that same subject with the scores in the remaining 7 subjects unchanged, the average mark would be m . Find the value of m .

PART II
[60 marks]

Answer five questions **only** from this part.

All questions carry equal marks.

6. A man whose annual basic salary is ₦750,000.00 is allowed the following tax reliefs:

Personal allowance : 20% of annual basic salary

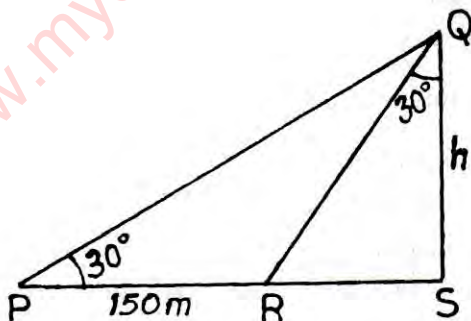
Wife allowance : ₦70,000.00

Children allowance : ₦30,000.00 per child up to 4 children

Dependent Relatives : ₦100,000.00

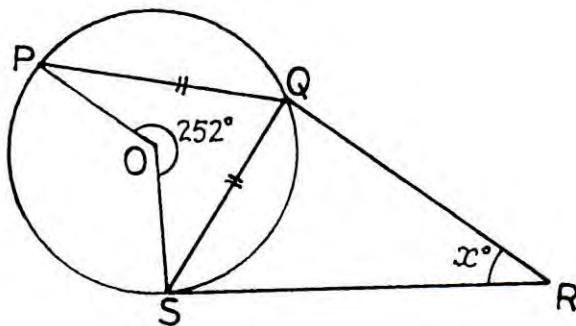
- (a) If the man has four children, calculate his taxable income.
- (b) If he pays tax at the rate of 35 kobo in the naira on the first ₦180,000.00 taxable income and 15 kobo in the naira on the remaining taxable income, calculate his monthly tax.

7. (a)



In the diagram $\angle QSR = 90^\circ$, $|PR| = 150\text{ m}$, $|QS| = h$ metres and $\angle QPR = \angle RQS = 30^\circ$. Calculate, correct to the nearest whole number, the value of h .

(b)



In the diagram, O is the centre of the circle PQS . \overline{SR} is a tangent, reflex $\widehat{POQ} = 252^\circ$ and $\angle SQR = 79^\circ$. Calculate the size of $\angle QRS$.

8. (a) Copy and complete the table of values for $y = 2x^2 - 3x - 4$ for the interval $-3 \leq x \leq 4$.

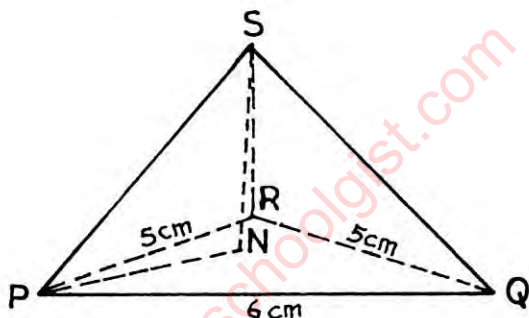
x	-3	-2	-1	0	1	2	3	4
y	23			-4				16

- (b) Using a scale of 2 cm to represent 1 unit on the x -axis and 2 cm to represent 5 units on the y -axis, draw the graph of:
- $y = 2x^2 - 3x - 4$;
 - $y = 3x - 4$.
- (c) From your graph, solve the equations
- $2x^2 - 3x - 4 = 0$;
 - $2x^2 - 6x = 0$.
9. (a) Using ruler and a pair of compasses only, construct:
- a quadrilateral $PQRS$ such that $|PQ| = 5.9\text{ cm}$, $|QR| = 7.1\text{ cm}$, $\angle PQR = 135^\circ$, $|SR| = 11\text{ cm}$ and $|PS| = 6\text{ cm}$;
 - a perpendicular, l_1 , from S to \overline{PR} ;
 - the locus, l_2 , of points equidistant from \overline{PQ} and \overline{PS} .
- (b) Locate a point T such that T is the intersection of l_1 and l_2 .
- (c) Measure
- $|TQ|$;
 - $\angle PSR$.

Turn over

10. (a) Given the Arithmetic Sequence $-6, -2\frac{1}{2}, 1, \dots, 71$, find the:
- (i) common difference;
 - (ii) number of terms of the sequence.
- (b) The difference between the third and first terms of a Geometric Progression (G. P.) is 42. If the fourth term is greater than the second term by 168, find the:
- (i) first term;
 - (ii) fourth term of the progression.

11.



The diagram is a right pyramid with a triangular base PQR and height $|SM|$. If $|PQ| = 6\text{ cm}$, $|PR| = |RQ| = 5\text{ cm}$, $|PN| = 3.3\text{ cm}$ and $\angle SPN = 52^\circ$, calculate, correct to 2 significant figures, the

- (i) vertical height $|SM|$;
 - (ii) area of the base PRQ ;
 - (iii) volume;
 - (iv) angle between the slant face SPQ and the base PRQ of the pyramid.
12. The table shows the distribution of the masses of some bags of beans in a grains stores.

Mass (kg)	51 – 55	56 – 60	61 – 65	66 – 70	71 – 75	76 – 80
No of bags	7	10	24	6	2	1

Calculate, correct to one decimal place, the:

- (a) range;
- (b) mean deviation of the distribution.

13. From a point X , a boat sails 6 km on a bearing of 037° to a point Y . It then sails 7 km from Y on a bearing of 068° to a point Z . Calculate the:
- (a) distance XZ , correct to two decimal places;
 - (b) bearing of Z from X , correct to the nearest degree.

**QUESTIONS 14 AND 15 ARE FOR CANDIDATES IN
GHANA, SIERRA LEONE AND THE GAMBIA ONLY.**

14. (a) Draw the tables for:
- (i) addition \oplus
 - (ii) multiplication \otimes
- on the set $\{0, 1, 2, 3, 4\}$ modulo 7.
- (b) From your table, evaluate:
- (i) $m \otimes m = 2$
 - (ii) $m \oplus (m \otimes 4) = 5$
 - (iii) $m \otimes (m + 3) = 0$
15. (a) Using a scale of 2 cm to 2 units on both axes, draw on a sheet of graph paper two perpendicular axes $0x$ and $0y$ for $-10 \leq x \leq 10$ and $-10 \leq y \leq 10$.
- (b) Draw on this graph, indicating clearly the coordinates of all the vertices;
- (i) quadrilateral $PQRS$ with $P(4, 8)$, $Q(2, 2)$, $R(6, 2)$ and $S(8, 8)$;
 - (ii) the image $P_1 Q_1 R_1 S_1$ of quadrilateral $PQRS$ under a reflection in the line $x = 0$ where $P \rightarrow P_1$, $Q \rightarrow Q_1$, $R \rightarrow R_1$ and $S \rightarrow S_1$;
 - (iii) the image $P_2 Q_2 R_2 S_2$ of quadrilateral $PQRS$ under a rotation through 180° about the origin where $P \rightarrow P_2$, $Q \rightarrow Q_2$, $R \rightarrow R_2$ and $S \rightarrow S_2$.
- (c) Draw the line PP_1 and calculate its gradient.