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:

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

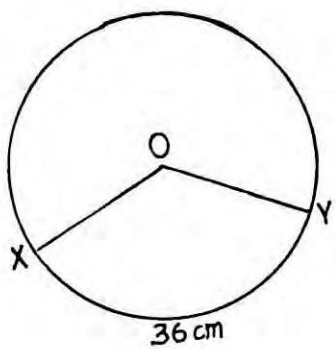
2. *(a)* Solve the equations $8 = 2^{(x+y)}$ and $1 = 3^{(x-y)}$ simultaneously.

(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.

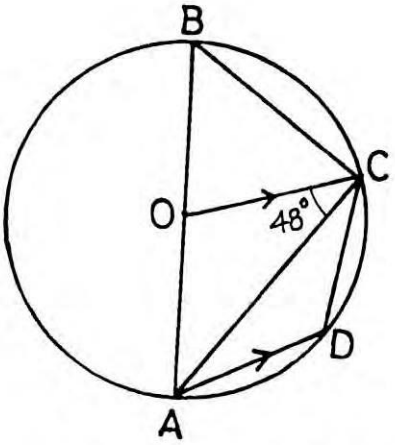
[Take $\pi = \frac{22}{7}$].

(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 $\angle OCA = 48°$. 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.

Turn over

PART II

[60 marks]

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

All *questions carry equal marks.*

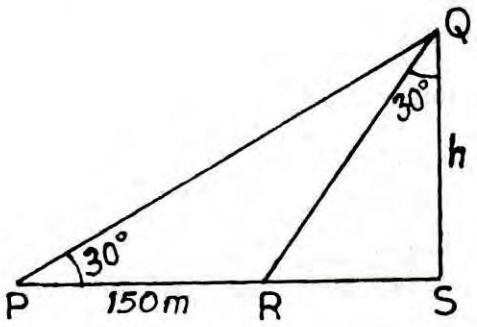
6. A man whose annual basic salary is ₦750,000.00 is allowed the following tax reliefs:

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.

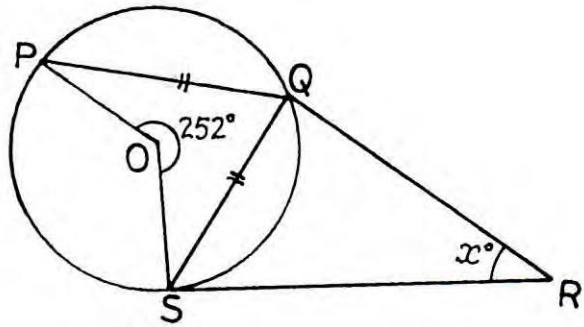
(b) If he pays tax at the rate of 35 kobo in the naira on the first ₦180,000.00 taxable income and 15 kobo in the naira on the remaining taxable income, calculate his monthly tax.

7. *(a)*



In the diagram $\angle QSR = 90^{\circ}$, $/PR/ = 150\,m$, $/QS/ = h$ 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 $P\hat{O}S = 252^{o}$ and $\angle SQR = 79^{o}$. 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:

(i) $y = 2x^2 - 3x - 4$;

(ii) $y = 3x - 4$.

(c) From your graph, solve the equations

(i) $2x^2 - 3x - 4 = 0$;

(ii) $2x^2 - 6x = 0$.

9. *(a)* Using ruler and a pair of compasses only, construct:

(i) a quadrilateral $PQRS$ such that $|PQ| = 5.9cm$, $|QR| = 7.1cm$, $\angle PQR = 135^{o}$, $|SR| = 11cm$ and $|PS| = 6cm$;

(ii) a perpendicular, l_1, from S to $\overline{PR}$;

(iii) 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

(i) $|TQ|$;

(ii) $\angle PSR$.

Turn over

10. *(a)* Given the Arithmetic Sequence $-6, -2\frac{1}{2}, 1, ..., 71$, find the:

(i) common difference;

(ii) number of terms of the sequence.

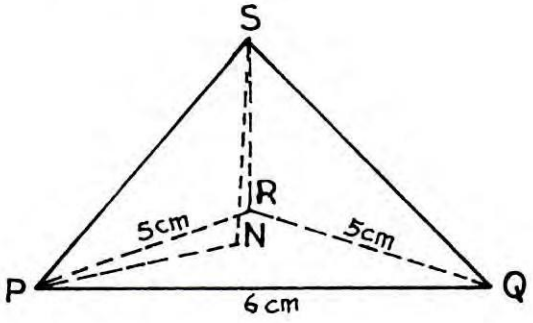
(b) The difference between the third and first terms of a Geometric Progression (G. P.) is 42. If the fourth term is greater than the second term by 168, find the:

(i) first term;

(ii) fourth term

of the progression.

11.



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

(i) vertical height $|SN|$;

(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.