S4022 WASSCE
May/June 2013
MATHEMATICS
(CORE) 2
2½ hours

2

Name..

Index Number...

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination

MATHEMATICS (CORE) 2

May/June 2013   [100 marks]   2½ hours

Write your **name** *and* **index number** *in* **ink** *in the spaces provided above.*

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.

Graph papers are provided for your use in the examination.

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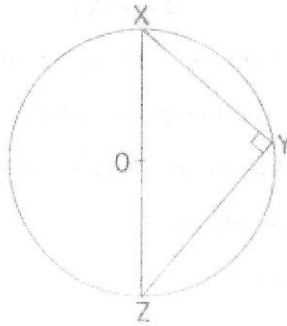
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PART I

[40 marks]

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

1. (a) Simplify: $\dfrac{\frac{3}{4} - \frac{7}{8} + \frac{1}{2}}{\frac{3}{4} \, of \left(\frac{7}{8} - \frac{1}{2}\right)}$

   (b) Using $\log_{10}2 = 0.3010$ and $\log_{10}3 = 0.4771$, evaluate $\log_{10}0.24$

2. The sum of the ages of two brothers is 38 years. Four years ago, the age of the elder brother was the square of the younger brother's age. Find their ages.
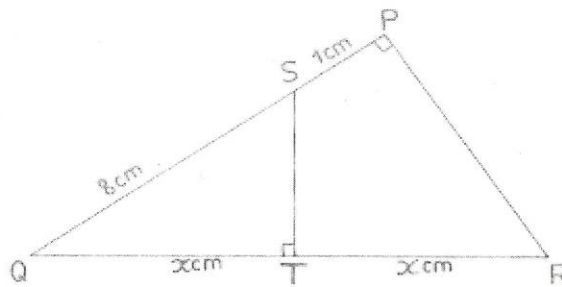
3.

In the diagram, triangle *XYZ* is cut off from the circle, centre *O*. If / *XZ* / = 35 cm and / *YZ* / = 28 cm, find the area of the remaining part of the circle.

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

4. (a) If $\sin x = \dfrac{5}{13}$ and $0° \leq x \leq 90°$, find without using tables or calculator, $\dfrac{\cos x - 2\sin x}{2\tan x}$.

   (b)
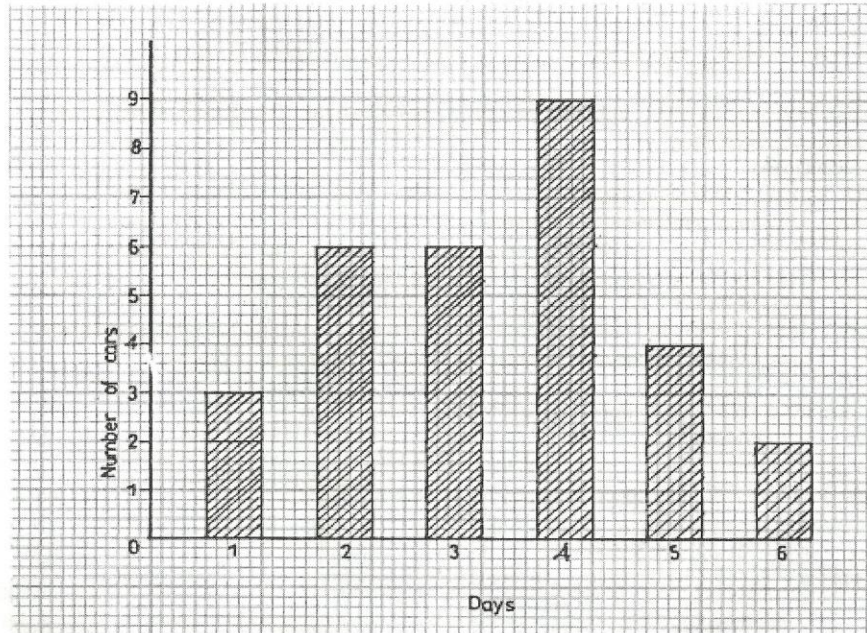

In the diagram, / *PS* / = 1 cm, / *SQ* / = 8 cm, / *QT* / = / *TR* / = x cm and $\angle STQ = \angle QPR = 90°$.
   (i) Name the triangle that is similar to triangle *PQR*.
   (ii) Hence, calculate the value of *x*.

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5. (*a*)

The bar chart shows the number of cars sold by a dealer in the first six days of a month. Find the average number cars sold per day .

(*b*) A man spent $\frac{2}{5}$ of a certain amount on food and shared the remainder between two brothers in the ratio 2 : 3. If the brother with the smaller share has GH¢ 6,000.00, what is the value of the amount initially?

Turn over

PART II

[60 marks]

Answer **five** *questions* **only** *from this part. All questions carry equal marks.*

6.   A company buys a car for GH¢ 27,000.00 and sells it to Mr. Fosu for GH¢ 36,000.00 after a discount of 10 % on the marked price.

   (a)   Calculate the:
   (i)   marked price of the car;
   (ii)   percentage profit made by the company.

   (b)   If Mr. Fosu sells the car after covering a mileage of 128,000 km, find the:
   (i)   value of the car if the rate of depreciation is GH¢ 0.03 per km;
   (ii)   range of values for which Mr. Fosu could sell the car so that he does not lose more than GH¢ 2,000.00 or gain more than GH¢ 3,000.00 on the depreciated value.

7.   (a)   Copy and complete the following table of values for the relation
   $y = 2x^2 - 7x - 3$.

x	-2	-1	0	1	2	3	4	5
y	19		-3		-9			

   (b)   Using scales of 2 cm to 1 unit on the x –axis and 2 cm to 5 units on the y- axis, draw the graph of $y = 2x^2 - 7x - 3$ for $-2 \leq x \leq 5$.

   (c)   From the graph, find the:
   (i)   minimum value of y;
   (ii)   gradient of the curve at $x = 1$, correct to the nearest whole number;
   (iii) values of x for which $2x^2 - 5x + 1 = 2x + 4$.

8.   (a)   The points **M**(2,3), **N**(5,–2) and **T**(3,–5) are in the $x - y$ rectangular plane.
   If $\mathbf{k}\ \overrightarrow{OM} + \mathbf{l}\ \overrightarrow{ON} = \overrightarrow{MT}$, where **k** and **l** are real numbers, calculate the value of:
   (i)   **k**;
   (ii)   **l**.

   (b)   Given that $\overrightarrow{AC} = \begin{pmatrix} -7 \\ 12 \end{pmatrix}$, calculate the:

   (i)   length of $\overrightarrow{AC}$, correct to three significant figures;
   (ii)   bearing of C from A, correct to the nearest degree.

9.   (a)   Using ruler and a pair of compasses only, construct a quadrilateral $PQRS$ such

   that / PQ / = 8 cm, $Q\hat{P}S$ = 105°, ∠PQS = 30°, / PR / = 9 cm and / RS / = / RQ /.

   (b)   Measure:
   (i)   / RS /
   (ii)   / PS /
   (iii) angle QRS.

10. (a) Simplify: $\frac{3}{4}\sqrt{128} - \sqrt{50}$ leaving your answer in surd form.

(b)
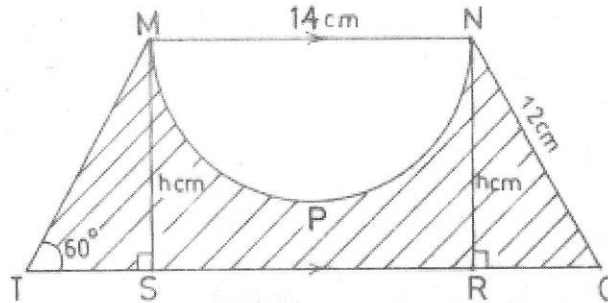
The diagram shows a trapezium *MNOT* in which *MN // TO*, / *MN* / = 14 cm $\angle MTO = 60°$ and / *MT* / = / *NO* / = 12 cm. If the semi-circle *MPN* is removed from the trapezium, calculate, correct to the nearest cm², the area of the remaining portion.

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

11. A pole 25 m long is placed against a vertical wall such that its lower end is 7 m from the foot of the wall on the same horizontal ground. If the upper end of the pole is pushed down by 2 m, calculate correct to 2 significant figures:

(a) how much further away from the wall the lower end will move;

(b) the angle the pole now makes with the horizontal.

12. The number of road accidents recorded in a given period was as follows:

No. of accidents	0	1	2	3	4	5	6	8	10	11	13	15	17	18	19
No. of days	20	10	8	7	5	3	3	5	4	4	3	2	2	3	1

(a) Using the group intervals $0-2, 3-5, 6-8, ...$, prepare a group frequency distribution table for the data.

(b) Construct a cumulative frequency table.

(c) Draw a cumulative frequency curve.

(d) Use the cumulative frequency curve to estimate the:
(i) median;
(ii) upper quartile.

Turn over

13. (a) A translation **T** takes the point **P**(1,2) to **P**′(5,3). What is the image of **Q** (3,4) under **T**?

(b) Construct a table for multiplication in modulo 7 on the set {2,3,5,6}. Use the table to solve the following equations:

   (i) $m \otimes m = 2$;
   (ii) $n \otimes (n \otimes 6) = 3$.

(c) Consider the statements:

   p : Martin trains hard;
   q : Martin wins the race.

   If $p \Rightarrow q$, state whether or not the following statements are valid:
   (i)   If Martin wins the race, then he has trained hard;
   (ii) If Martin does not train hard then he will not win the race;
   (iii) If Martin does not win the race then he has not trained hard.

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

14. An aeroplane flies due North from town **T** on the equator at a speed of 950 km per hour for 4 hours to another town **P**. It then flies eastwards to town **Q** on the longitude 65° E. If the longitude of **T** is 15° E,
   (a) represent this information in a diagram.

   (b) calculate the:
      (i)   latitude of **P** correct to the nearest degree;
      (ii) distance between **P** and **Q**, correct to 4 significant figures.

      [Take $\pi = \frac{22}{7}$, Radius of the earth = 6400 km]

15. (a)
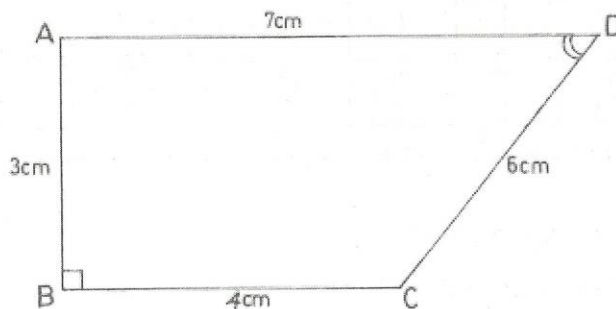
   In the diagram, $/ AB / = 3$ cm, $/ BC / = 4$ cm, $/ CD / = 6$ cm, $/ DA / = 7$ cm and $\angle ABC = 90°$. Calculate $\angle ADC$, correct to the nearest degree.

   (b) If $(3 - x)$, 6, $(7 - 5x)$ are consecutive terms of a Geometric Progression with constant ratio $r > 0$, find the:
      (i)   values of x;
      (ii) common ratio.

END OF PAPER

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