

SC4022  
WASSCE 2020  
MATHEMATICS  
(CORE) 2  
2½ hours

2

Name.....

Index Number.....

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination  
for School Candidates

SC 2020

MATHEMATICS (CORE) 2  
[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 Section A and five questions from Section B.*

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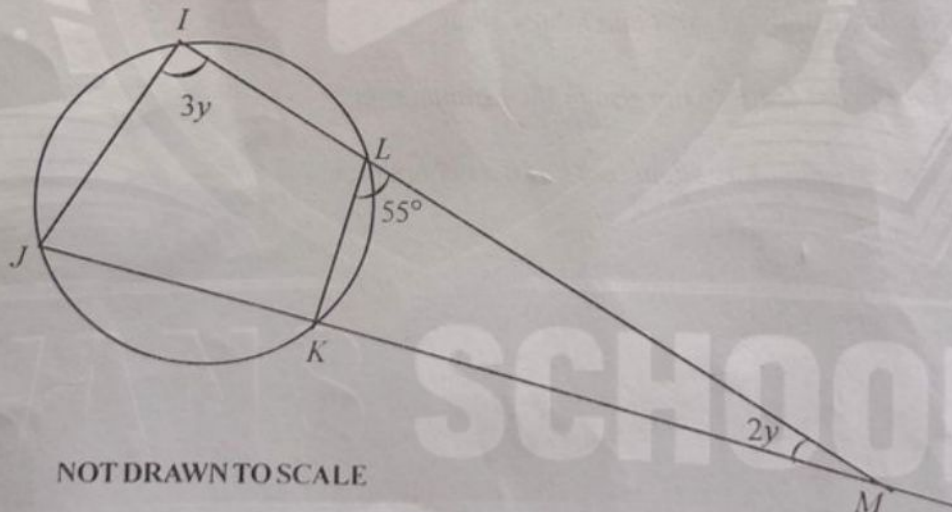
Answer all the questions in this section. All questions carry equal marks.

1. (a) In a small town, 68 % of the people owned Television, 72 % owned Radio and 12 % owned neither Television nor Radio.  
(i) Represent the information on a Venn diagram.  
(ii) What percentage of the population owned Television **only**?
- (b) Boadu and Ansah formed a company and agreed that their annual profit will be shared in the ratio 4 : 5 respectively. If at the end of the year, Ansah received GH¢ 5,000.00 more than Boadu, how much was Boadu's share?

2. (a) Make  $y$  the subject of the relation:  $p = 2x \sqrt{\frac{q \left( 1 + \frac{r^2}{y^2} \right)}{S}}$

(b) Given that  $m = 3$ ,  $n = -2$  and  $x = -1$ , evaluate  $\frac{2mn^2x}{3m - n}$ .

3. (a)



In the diagram  $IJKL$  are points on a circle such that  $\angle JIL = 3y$  and  $\angle KML = 2y$ . If  $\angle KLM = 55^\circ$ , find the value of  $y$ .

(b) Given that  $\tan x = 1$ ,  $0^\circ \leq x \leq 90^\circ$ , evaluate  $\frac{1 - \sin^2 x}{\cos x}$ .

4. (a) A cone and a pyramid have equal heights and volumes. If the base area of the pyramid is  $154 \text{ cm}^2$ , find the radius of the cone. [Take  $\pi = \frac{22}{7}$ ]

- (b) A spherical bowl of radius  $r$  cm is a **quarter** full when 6 litres of water is poured into it. Calculate, correct to **three** significant figures, the diameter of the bowl. [Take  $\pi = \frac{22}{7}$ ]

5.

| Class | JHS 1 | JHS 2 | JHS 3 |
|-------|-------|-------|-------|
| Boys  | 32    | 26    | 26    |
| Girls | 28    | 44    | 36    |

The table above shows three classes: JHS 1, JHS 2 and JHS 3 in a school. The three classes were combined to select a prefect. What is the probability that the prefect will be:

- (a) a boy?  
(b) a girl in JHS 2?

SECTION B  
[60 marks]

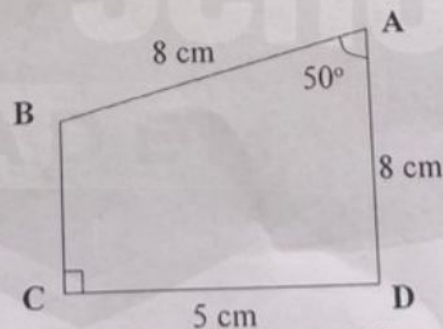
Answer five questions only from this section. All questions carry equal marks.

6. (a) Copy and complete the table of values for the relation  $y = 7\cos x - 3\sin x$ .

| $x$ | $0^\circ$ | $30^\circ$ | $60^\circ$ | $90^\circ$ | $120^\circ$ | $150^\circ$ |
|-----|-----------|------------|------------|------------|-------------|-------------|
| $y$ | 7.0       |            |            | -3.0       |             |             |

- (b) Using a scale of 2 cm to  $30^\circ$  on the  $x$ -axis and a scale of 2 cm to 2 units on the  $y$ -axis, draw the graph of  $y = 7\cos x - 3\sin x$  for  $0^\circ \leq x \leq 150^\circ$ .  
(c) Use the graph to solve the equations:  
(i)  $7\cos x = 3\sin x$ ;  
(ii)  $7\cos x = 3.2 + 3\sin x$ .

7. (a)



NOT DRAWN TO SCALE

In the diagram  $|AB| = |AD| = 8$  cm and  $|CD| = 5$  cm. If  $\angle BCD = 90^\circ$  and  $\angle BAD = 50^\circ$ , calculate, correct to the nearest whole number:

- (i)  $|BD|$ ;  
(ii) the area of  $\triangle BCD$ .  
(b) A man is five times as old as his son. In three years time, the product of their ages will be 380. Find their present ages.

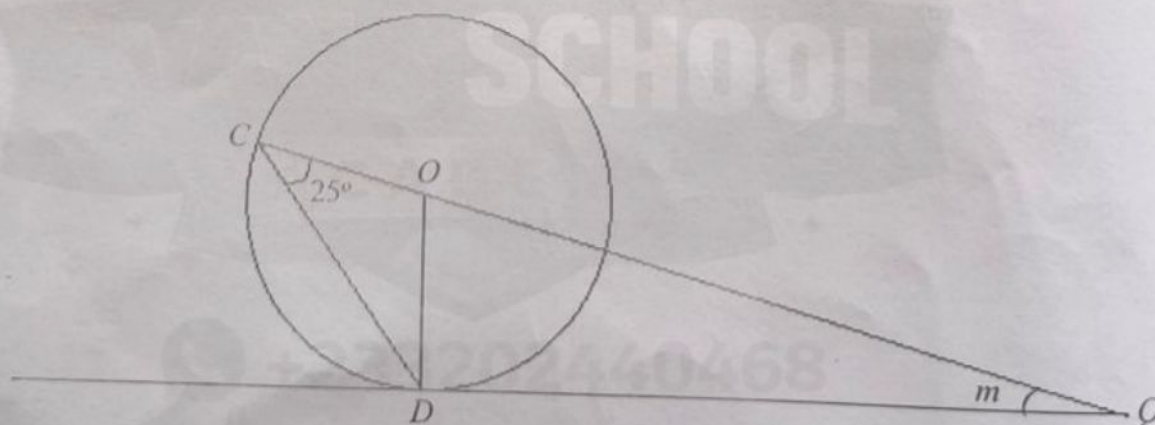
- (b) Solve the equation:  $\frac{3x}{1-x} + \frac{2x}{x+1} = 2$ .

10. The table shows the age distribution of workers in a company.

|                   |       |       |       |       |       |       |       |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| Age (years)       | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 |
| Number of Workers | 11    | 24    | 29    | 15    | 10    | 9     | 2     |

- (a) Construct a cumulative frequency table and use it to draw a cumulative frequency curve.
- (b) Use the curve to estimate the:
- (i) probability of selecting a worker whose age is **not** more than 45 years;
  - (ii) number of workers who will retire if the retiring age is 50 years and above.

11. (a)



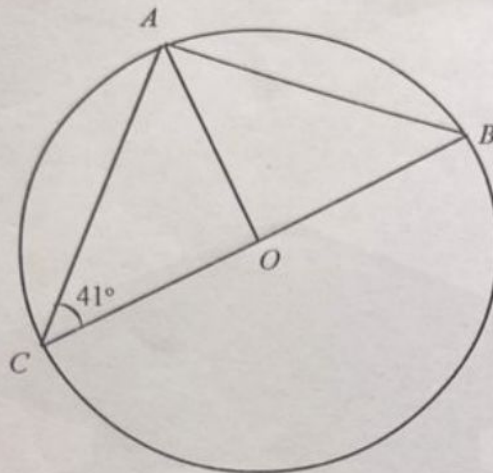
NOT DRAWN TO SCALE

The diagram shows a circle, centre  $O$ , with  $C$  and  $D$  as points on the circumference.  $\overline{DQ}$  is a tangent produced at  $Q$ . Find the value of  $m$ .

- (b) Find the equation of the line which has the same gradient (slope) as  $2y + x = 6$  and passes through the point  $(-2, 3)$ .

- (c) The ratio of the profit, cost of materials and labour in the production of an article is 5 : 7 : 13 respectively. If the cost of materials is Le 840 more than that of labour, find the total cost of producing the article.

12. (a)



NOT DRAWN TO SCALE

In the diagram,  $O$  is the centre of the circle  $ABC$  and  $\angle BCA = 41^\circ$ .

Find:

- (i)  $\angle BOA$ ;
  - (ii)  $\angle BAO$ .
- (b) The angle of depression of a point,  $P$ , on the ground from the top,  $T$ , of a building is  $23.6^\circ$ . If the horizontal distance from  $P$  to the base of the building is 50 m, calculate, correct to **three** significant figures, the height of the building.
- (c) A cow is tied to a post at the centre of a square grazing field of side 25 m by a rope 10 m long. Find, correct to **two** decimal places the percentage of the field the cow is able to graze on. [Take  $\pi = \frac{22}{7}$ ]
13. (a) Given that  $f: x \rightarrow x + 3$  and  $g: x \rightarrow x^2$ ,
- (i) find  $g(f(x))$ ,
  - (ii) evaluate  $g(f(2))$ .
- (b) Find what values of  $x$  is  $\frac{1}{x} + \frac{1}{x+2}$  undefined?
- (c) Given that  $f(x) = \frac{k}{x+1} + \frac{6}{x+2}$  and  $f(5) = 8$ , find the value of  $k$ .

**END OF PAPER**

SC4022

WASSCE 2021

GENERAL MATHEMATICS/  
MATHEMATICS (CORE) 2

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

1. (a) (i) Draw the multiplication  $\otimes$  table in modulo 9 on  $\{2, 3, 7, 8\}$ .  
 (ii) Use the table to find the truth set of  $8 \otimes m = 2$ .

ggghhh

- (b) Consider the following statements:

$X$ : All policemen wear uniform;

$Y$ : Civil servants do **not** wear uniform.

If  $P = \{\text{policemen}\}$ ,  $T = \{\text{people who wear uniform}\}$  and  $C = \{\text{civil servants}\}$ ,

- (i) draw a venn diagram to illustrate  $X$  and  $Y$ ;  
 (ii) use the venn diagram to determine which of the following implications are **valid** or **not valid** conclusions from  $X$  and  $Y$ ;  
 ( $\alpha$ ) Adu wears uniform  $\Rightarrow$  Adu is a policeman;  
 ( $\beta$ ) Ofei is a policeman  $\Rightarrow$  Ofei is **not** a Civil Servant;

2. (a) Given that  $p = \frac{q-t}{t+1}$ ,

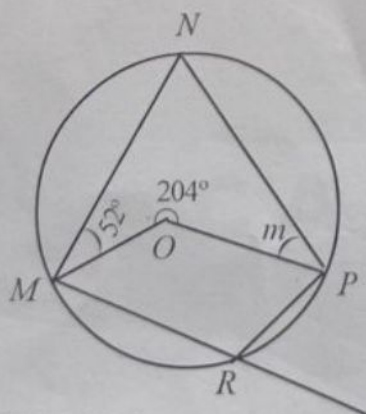
(i) Make  $t$  the subject of the relation.

(ii) Find the value of  $t$  when  $p = \frac{2}{3}$  and  $q = \frac{3}{4}$ .

- (b) Given that  $m = \frac{2x}{1-x^2}$  and  $n = \frac{2x}{1+x}$ , express, in **simplest** form,  $(2m-n)$  in terms of  $x$ .

3. (a)

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NOT DRAWN TO SCALE

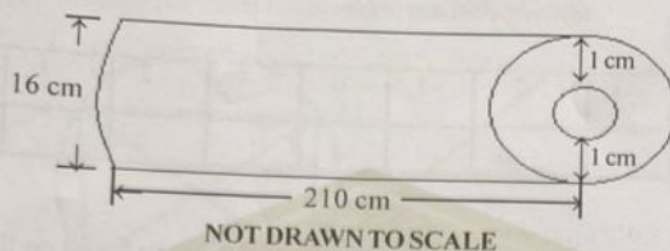
In the diagram is a circle  $MNPR$  with centre  $O$ . The reflex angle at  $O$  is  $204^\circ$ ,  $\angle NMO = 52^\circ$ . Find the value of  $m$ .

- (b) A ladder of length 6.5 m leans against a vertical wall. If the top of the ladder is 3.6 m from the foot of the wall, calculate, correct to **two** decimal places, the distance from the wall to the foot of the ladder.

4. (a)

3

ggghhh



The diagram is a cylindrical pipe with length 210 cm. It has external diameter of 16 cm and is 1 cm thick. Find the volume of the metal used in constructing the pipe. [ Take  $\pi = \frac{22}{7}$  ]

- (b) The coordinates of the points M and N are (5, -7) and (0, 5), respectively. Calculate the distance between M and N.

5. Two dice are thrown together **once**. Find the probability of obtaining:
- an **odd** number on the first die and 6 on the second;
  - a number **greater** than 4 on **each** dice;
  - a **total** of 9 or 11.

ggghhh

### SECTION B

[60 marks]

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

6. In a military camp, 50 officers had a choice of beans, plantain and rice. Of these officers, 21 chose beans, 24 plantain and 18 rice. Also 3 chose beans only, 9 plantain only, 2 rice only and 5 chose all three kinds of food.

- Illustrate the information on a Venn diagram.
- Use the venn diagram to find the number of officers who chose:
  - plantain and beans **only**;
  - exactly **two** kinds of food;
  - none** of the three kinds of food.

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7. (a) Copy and complete the table of values for the relation  $y = 4 + 3x - 2x^2$ , for  $-4 \leq x \leq 4$ .

|     |    |    |     |    |   |   |   |   |   |
|-----|----|----|-----|----|---|---|---|---|---|
| $x$ | -4 | -3 | -2  | -1 | 0 | 1 | 2 | 3 | 4 |
| $y$ |    |    | -10 |    | 4 |   | 2 |   |   |

- (b) Using a scale of 2 cm to 1 unit on the  $x$ -axis and 2 cm to 5 unit on the  $y$ -axis, draw the graph for the relation  $y = 4 + 3x - 2x^2$ , for  $-4 \leq x \leq 4$ .
- (c) Using the graph, find the:
- equation of line of symmetry of the curve;
  - maximum point of the curve;
  - values of  $x$  for which  $y$  decreases as  $x$  increases.

8. (a) A solid metal cylinder of height 6 m and diameter 28 cm is melted and recast into smaller solid cylinders. Each of the smaller cylinders is 14 cm high and 0.5 cm in diameter. How many smaller cylinders were obtained? [Take  $\pi = \frac{22}{7}$ ]

- (b) The unit digit of a two digit number is 1 less than the tens digit. If the number is increased by 8 and then divided by the sum of the digits, the result is 8. Find the number.

9. (a) The ratio of cars to motorcycles sold at a garage is 5 : 7. If a dealer sold 142 more motorcycles than cars in a particular month, find the number of **each** type of vehicle sold.

- (b) The probabilities of an athlete winning two independent events are  $\frac{3}{5}$  and  $\frac{2}{9}$ . Find the probabilities of winning:
- only** one event;
  - none** of the events.

ggghhh

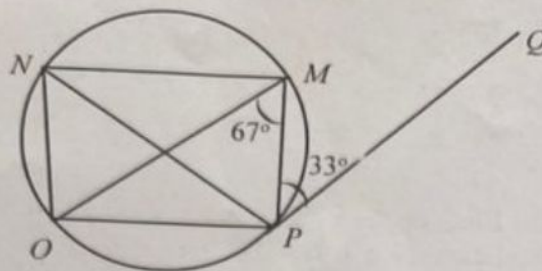
10. (a) A cyclist sets out from a town P on the bearing of  $060^\circ$  to a town Q, 5 km away. He then moves on the bearing of  $345^\circ$  to a town R, 6 km from Q.

- Represent the information on a diagram.
- Calculate, correct to **two** decimal places
  - $|PR|$ ;
  - the bearing of R from P.

- (b) The following are arranged in order of size:  $(x - 2)$ , 4,  $(x + 2)$ ,  $(2x + 1)$  and 9. If the median is equal to the mean, find the value of  $x$ .

11. (a) The average mass of refuse generated in a community in a week contains 35 % plastic, 27.5 % liquid, 17.5 % metal, 12.5 % vegetable matter and others 7.5 %. Draw a pie chart to illustrate the information.

(b)



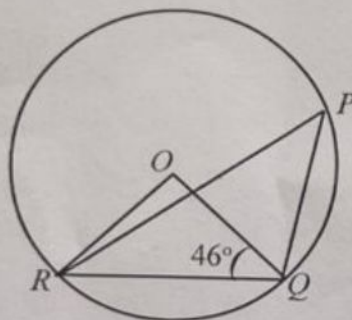
NOT DRAWN TO SCALE

In the diagram  $\overline{PQ}$  touches the circle  $MNOP$  at  $P$  and  $\overline{NP}$  is a diameter.  $\angle MPQ = 33^\circ$  and  $\angle PMO = 67^\circ$ . Find:

- $\angle MNO$ ;
- $\angle MPO$ .

ggghhh

12. (a)



NOT DRAWN TO SCALE

In the diagram,  $PQR$  is a circle with centre  $O$ . If  $\angle ROQ = 46^\circ$ , find  $\angle RPQ$ .

- (b) A train is scheduled to cover a distance of 120 km at a certain average speed,  $r$ . Due to some technical challenges the average speed is reduced by 5 km/h thereby increasing the scheduled time by 20 minutes. Find the average speed,  $r$ .

13. (a) A function  $g$  is defined on the set of real numbers,  $R$ , by

ggghhh

$$g(x) = \frac{1+3x}{x-1}, \quad x \neq 1. \text{ Find the:}$$

- image of  $-1$  under the function  $g$ ;
- value of  $x$  for which  $g(x) = 7$
- value of  $g(-3)$ .

- (b) The sum of the first ten terms of an Arithmetic Progression (A.P) is 120. If the fifth term is 6 less than the eighth term, find the:

- common difference;
- first term.

END OF PAPER

SC40228  
WASSCE 2023  
GENERAL MATHEMATICS/  
MATHEMATICS (CORE) 2  
2½ hours

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**EVANS SCHOOL**  
**ACADEMY**



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**what channel link : <http://whatsapp.com/channel/0029Vb7EΓjAIPXJbHqR:13>**

Answer all the questions in this section. All questions carry equal marks.

1. In a talent hunt competition of 35 artistes, they indicated their interest in playing Xylophone, Flute, and Violin. Out of the number, 24 preferred Xylophone, 16 Flute and 18 Violin. 8 preferred Xylophone only, 2 Flute only and 6 Violin only. 4 played all the three instruments while 7 preferred Xylophone and Flute only.

(a) Illustrate the information in a Venn diagram.

(b) Find the number of artistes who preferred:

- (i) only two types of instruments;  
(ii) only one type of instrument.

2. Peggy walked  $2t$  km from a village, V to visit a friend in another village, W on a bearing of  $065^\circ$ . After spending some time with her friend, she continued to a nearby town, X,  $3t$  km away on a bearing of  $155^\circ$ . If the distance between V and X is  $6\sqrt{13}$  km:

(a) illustrate the information in a diagram;

(b) calculate, correct to the nearest whole number, the:

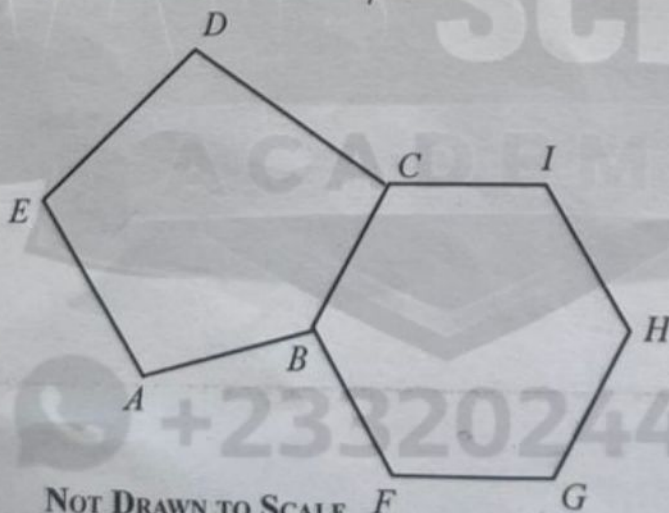
- (i) value of  $t$ ;  
(ii) bearing of X from V.

3. In the frustrum of a cone, the bottom diameter is **thrice** the top diameter.

(a) If the height of the frustrum is 12 cm, calculate the height of the whole cone.

(b) Given that the volume of the whole cone is  $39,600 \text{ cm}^3$ , find, correct to **four** significant figures, the radius. [Take  $\pi = \frac{22}{7}$ ]

4.



NOT DRAWN TO SCALE

In the diagram,  $ABCDE$  is a regular pentagon and  $BFGHIC$  is a regular hexagon. Find:

(a)  $\angle AED$ ;

(b)  $\angle BFG$ ,

(c)  $\angle DCI$ .

5. The mean age of a second year class of a school is  $18\frac{2}{5}$ . At the end of the promotion examination, 3 students aged 20, 19 and 19 years were repeated. The new mean age of the class became  $18\frac{1}{3}$ . Calculate the number of students who were in the class before the promotion examination.

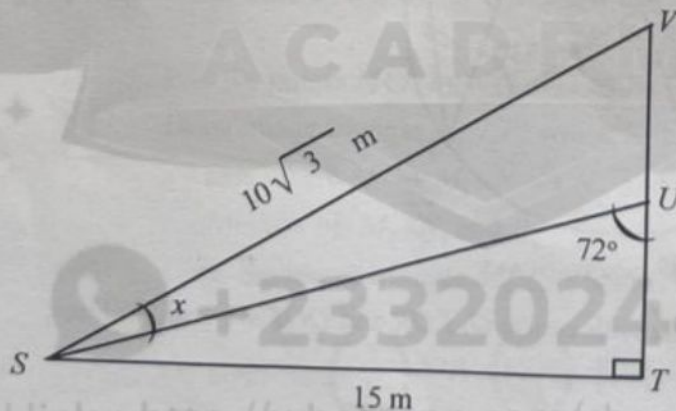
## SECTION B

[60 marks]

Answer five questions only from this section. All questions carry equal marks.

6. (a) In a certain spider web, the lengths of the shortest and longest threads are 3.4 mm and 50.2 mm respectively. The successive equally spaced threads are 1.2 mm apart. If the length of the cross threads form an Arithmetic Progression (A.P), find the number of cross threads.
- (b) At noon, a cargo plane leaves Kaduna airport and heads towards Akanu 500 km away at 180 km/h. At 1.00 pm, a jet takes off from Kaduna and flies on the same course at 450 km/h. What time will the jet overtake the cargo plane?
7. A man left an estate for his wife, extended family and children; Lamptey, Nadia and Joyce. In the will,  $\frac{1}{3}$  of the estate must be given to Lamptey,  $\frac{1}{3}$  of the remaining to Nadia,  $\frac{3}{4}$  of what still remains to Joyce,  $\frac{2}{3}$  of the remaining to the wife and the rest to the extended family. If the wife received a total of GH¢ 105,500.00 as her share of the estate, find the:
- (a) total value of the estate;
- (b) extended family's share of the estate.

8.

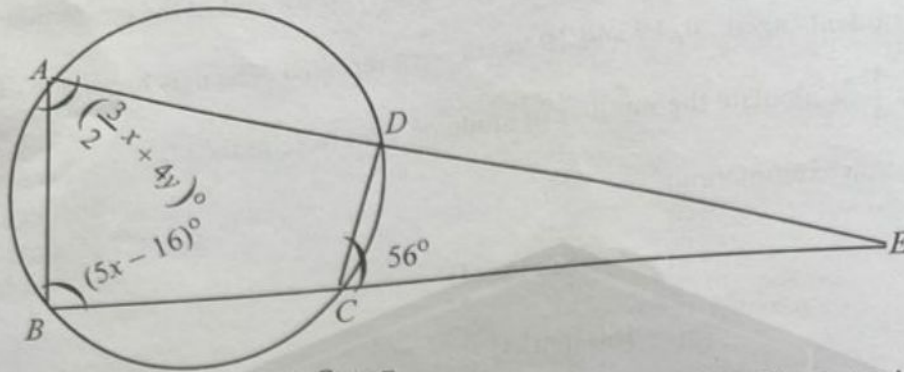


NOT DRAWN TO SCALE

In the diagram,  $STV$  is right angle triangle.  $|ST| = 15\text{ m}$ ,  $|SV| = 10\sqrt{3}\text{ m}$  and  $\angle SUT = 72^\circ$ . Calculate, correct to the nearest whole number:

- (a) the value of the angle marked  $x$ ;
- (b)  $|UV|$ ;
- (c) area of  $\Delta SUV$ .

9.



NOT DRAWN TO SCALE

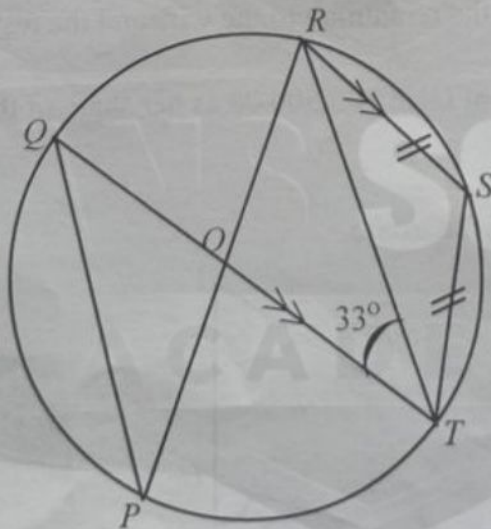
In the diagram, A, B, C, D are points on a circle. ADE and BCE are straight lines.  $\angle DCE = 56^\circ$ ,  $\angle ABE = (5x - 16)^\circ$  and  $\angle BAE = \left(\frac{3}{2}x + 4y\right)^\circ$ . If  $\angle DCE : \angle CDE = 7:8$ , find:

- (a)  $\angle AEB$ ;  
 (b) the values of  $x$  and  $y$ .

10.

- (a) A cupboard contains three kinds of notebooks:  $R$ ,  $S$  and  $T$ , all of the same size. The number of book  $R$  is 3 more than **half** of book  $T$ . The number of  $S$  is **one-third** the number of  $T$ .
- (i) If there are 25 books in the cupboard, find the number of **each** kind of book.
- (ii) If a book is picked at random from the cupboard, what is the probability that it is  $S$  or  $T$ ?

(b)



NOT DRAWN TO SCALE

In the diagram  $PQRST$  is a circle with centre  $O$ .  $POR$  and  $QOT$  are straight lines,  $\overline{QT} \parallel \overline{RS}$ ,  $\angle RTQ = 33^\circ$  and  $|\overline{RS}| = |\overline{ST}|$ . Find  $\angle RST$ .

11. (a) From the top,  $B$  of a building 320 m high, the angles of depression of the top,  $M$  and bottom,  $W$  of another building on the same horizontal ground are  $29^\circ$  and  $41^\circ$  respectively.
- Illustrate the information in a diagram.
  - Calculate, correct to the nearest metre, the height of the other building.
- (b) The time taken to travel a distance of 120 km was reduced by 30 minutes when the speed was increased by 20 km/h. Calculate the initial speed.

12. (a) The following statements are true of a certain community.
- $B$ : Most businessmen are rich.
- $J$ : No salary worker is rich.
- Draw a Venn diagram to illustrate the information.
  - State whether the following statements are **Valid** or **Not Valid**.
    - Kapi is a businessman and is therefore rich.
    - Otto is **not** rich because he is a salary worker.

(b)

| Heights (cm) | 60 — 64 | 65 — 69 | 70 — 74 | 75 — 79 | 80 — 84 |
|--------------|---------|---------|---------|---------|---------|
| Frequency    | 7       | 6       | 5       | 8       | 4       |

The table shows the distribution of height of seedlings in a nursery. Calculate, correct to one decimal place, the:

- mean;
- variance of the distribution.

13. (a) Using a scale of 2 cm to 1 unit on both axes, draw on a graph sheet two perpendicular axes  $ox$  and  $oy$  for  $0 \leq x \leq 8$  and  $-6 \leq y \leq 6$ .
- Plot the points  $M(3, 1)$ ,  $N(1, 1)$  and  $P(3, 5)$ . Join the points to get  $\triangle MNP$ .
  - Draw image triangle  $M_1N_1P_1$  which is the reflection of  $\triangle MNP$  in the  $x$ -axis where  $M \rightarrow M_1$ ,  $N \rightarrow N_1$  and  $P \rightarrow P_1$ . Indicate clearly the coordinates of  $M_1$ ,  $N_1$  and  $P_1$ .
  - Draw the image triangle  $M_2N_2P_2$  which is the image of  $\triangle MNP$  under the mapping  $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} 2x \\ -y \end{pmatrix}$ , where  $M \rightarrow M_2$ ,  $N \rightarrow N_2$  and  $P \rightarrow P_2$ .

Indicate clearly the coordinates of  $M_2$ ,  $N_2$  and  $P_2$ .

- (b) Find the equation of the line joining the points  $M$  and  $M_2$ .

**END OF PAPER**

SC402202

WASSCE 2024

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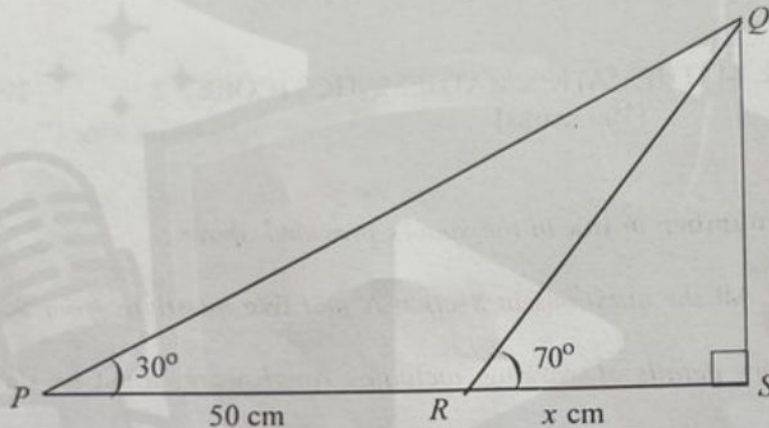
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Answer all the questions in this section. All questions carry equal marks.

1. Badu rode a bicycle for 45 minutes and walked for an hour to cover a total distance of 10.4 km. If the riding speed is 3 times the walking speed, find, correct to two significant figures, the:

- (a) walking speed;  
(b) distance travelled by riding.

2.



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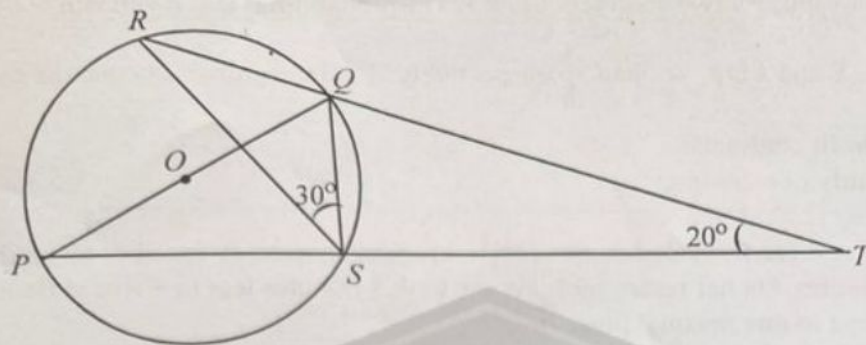
In the diagram,  $PQS$  is a triangle,  $|PR| = 50$  cm and  $|RS| = x$  cm. Find, correct to one decimal place,:

- (a) the value of  $x$ ;  
(b)  $|QS|$ .

3. A man travels 4 km from a point  $U$  on a bearing of  $135^\circ$  to  $V$ . He continues 13 km on a bearing of  $045^\circ$  to  $W$ .

- (a) Illustrate the information in a diagram.  
(b) Find:  
(i) correct to two significant figures,  $|UW|$ ;  
(ii) the bearing of  $W$  from  $U$ .

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NOT DRAWN TO SCALE

In the diagram,  $P, R, Q$  and  $S$  are points on a circle centre  $O$ .  $T$  is a point outside the circle such that  $\angle RTP = 20^\circ$ ,  $\angle QSR = 30^\circ$  and  $\overline{PQ}$  is a diameter. Calculate:

(a)  $\angle QRS$ ;

(b)  $\angle PQS$ .

5. The mean age, in years, of  $n$  boys in a class was 17.6. At the end of the academic year, 4 boys aged 16, 19, 20 and 17 were dismissed. The new mean age of boys in the class became 0.2 less than the original mean. Find the value of  $n$ .

#### SECTION B

[60 marks]

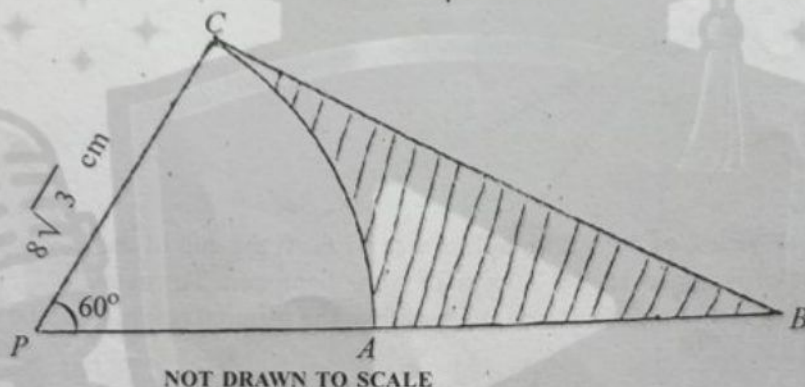
Answer five questions only from this section. All questions carry equal marks.

6. (a) Two towns,  $B$  and  $F$  on the equator are on longitude  $67^\circ\text{E}$  and  $123^\circ\text{E}$  respectively.
- Illustrate the information in a diagram.
  - Find the distance between  $B$  and  $F$  along the equator.
  - How far is  $B$  from the North pole?  
[Take  $R = 6,400$  km and  $\pi = \frac{22}{7}$ ]
- (b)  $K(2, -1)$ ,  $L(3, 5)$ ,  $M(-1, 6)$  are the coordinates of the vertices of triangle  $KLM$ . Find, correct to one decimal place, the perimeter of the triangle.
7. (a) The time a man takes to paint a room alone is an hour **less than** the time his apprentice takes to paint the same room. If both of them take 72 minutes to paint the room, find the time that the apprentice takes to paint the room alone.
- (b) The angle of elevation of the top of a tower from the top of a building, 5 m high is  $30^\circ$ . If on the horizontal ground, the building is 40 m away from the foot of the tower:
- illustrate the information in a diagram;
  - calculate, correct to **three significant figures**, the height of the tower.

8. (a) A company bids for two contracts T and J. The probabilities that it will win contracts T and J are  $\frac{1}{5}$  and  $\frac{3}{8}$  respectively. Find the probability that the company wins;
- both contracts;
  - only one contract.

- (b) Afiba drove a car from Badukom to Nyirakrom at an average speed of 60 km/h in 135 minutes. On her return journey, she took 3 minutes less to arrive at Badukrom. Find correct to one decimal place the:
- distance between Badukom and Nyirakrom;
  - the return speed.

9.

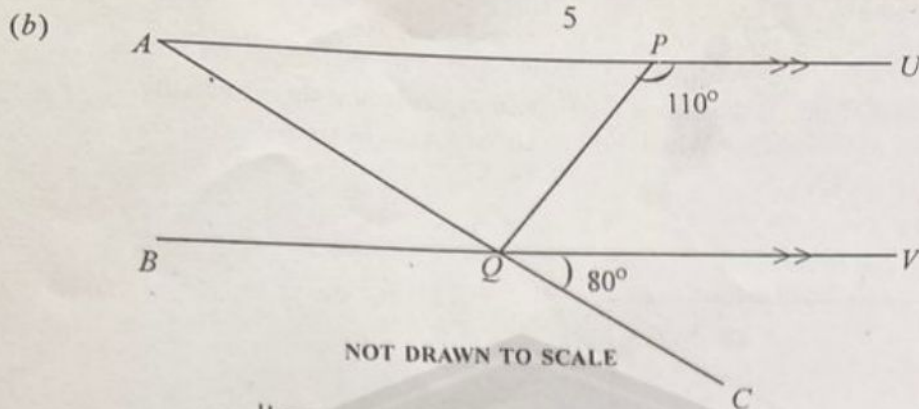


In the diagram,  $AC$  is an arc of a circle centre  $P$ .  $BC$  is a tangent to the circle at  $C$  and  $PB$  is a straight line.  $|PC| = 8\sqrt{3}$  cm and  $\angle APC = 60^\circ$ . Calculate:

- the length of  $\overline{AB}$ ;
  - correct to **three** significant figures, the area of the shaded portion.  
[ Take  $\pi = \frac{22}{7}$  ]
10. (a) At a food festival, the number of individuals who like yam is **thrice** the number who like rice. Those who like **both** foods is **one-third** those who like rice.
- Illustrate the information in a Venn diagram.
  - If 139 out of the 1,382 persons at the festival did **not** like **any** of the two types of food, find the number of persons who like:
    - yam;
    - one type of food only.**

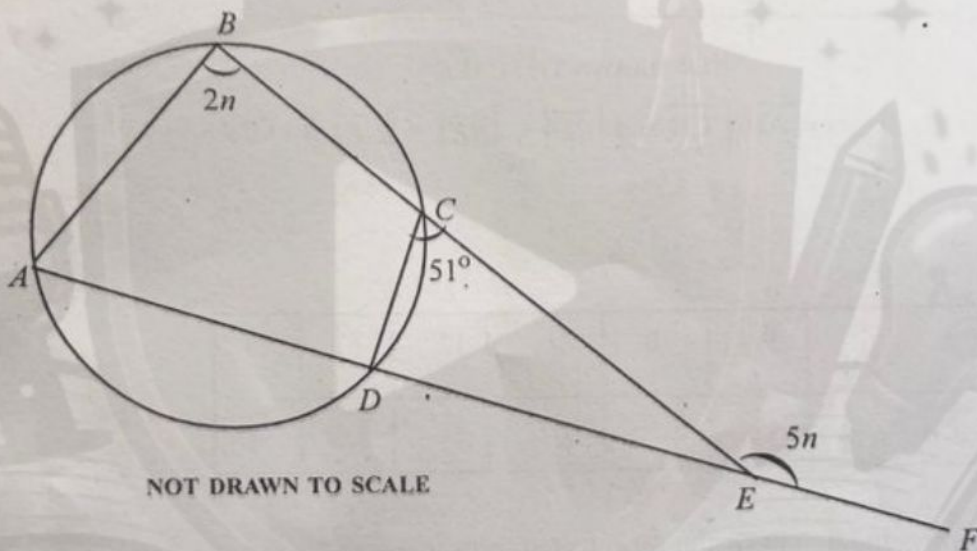
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In the diagram  $\overline{AU} \parallel \overline{BV}$ . If  $\angle QPU = 110^\circ$  and  $\angle CQV = 80^\circ$ . Find  $\angle PQA$ .

11. (a)



In the diagram,  $ABCD$  is a cyclic quadrilateral.  $\overline{BC}$  and  $\overline{AD}$  are produced to  $E$ .

$\angle ABC = 2n$ ,  $\angle CEF = 5n$  and  $\angle DCE = 51^\circ$ . Find

- (i) the value of  $n$ ;
- (ii)  $\angle ADC$ .

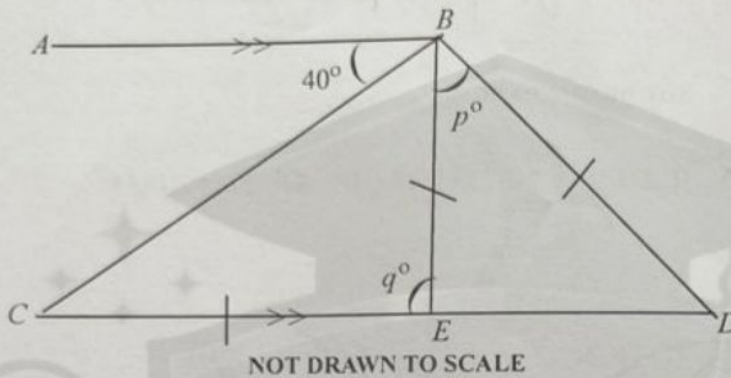
(b) The graph of the relation  $y = x^2 + kx + c$ , where  $k$  and  $c$  are constants, cuts the  $x$  axis at 3 and the  $y$  axis at 6.

- (i) Find the values of  $k$  and  $c$ .
- (ii) Use the values of  $k$  and  $c$  to solve  $x^2 + kx + c = 0$ .

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12. (a) Ato starts a business with \$1,250.00. Florence joins the business later with a capital of \$1,875.00. At the end of the first year, profits are shared equally between Ato and Florence. When did Florence join the business?
- (b)



In the diagram,  $\overline{AB} \parallel \overline{CD}$  and  $|\overline{BD}| = |\overline{BE}| = |\overline{CE}|$ , find the value of:

- (i)  $q$ ;  
 (ii)  $p$ .

13.

|                 |   |    |    |    |    |    |
|-----------------|---|----|----|----|----|----|
| Height (m)      | 9 | 10 | 11 | 12 | 13 | 14 |
| Number of trees | 5 | 4  | 6  | 5  | 6  | 4  |

The table shows the height (m) of 30 selected trees in a forest.

- (a) Find the mean height of the trees.
- (b) Calculate, correct to one decimal place, the:
- (i) median;
- (ii) mean deviation.

**END OF PAPER**

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SC 402206

WASSCE 2025

GENERAL MATHEMATICS/  
MATHEMATICS (CORE) 2

Essay

2½ hours

2

Name .....

Index Number .....

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination  
for School Candidates

SC 2025

GENERAL MATHEMATICS/ MATHEMATICS (CORE) 2

2½ hours

ESSAY

[100 marks]

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

Answer **ten** questions in all. **All** the questions in Section **A** and **five** questions from Section **B**.

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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2  
SECTION A  
[40 marks]

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

1. A private vehicle travels between two towns, Lobi and Pojo, covering the **first** half of the distance at an average speed of 60 km/h and the **second** half at 90 km/h. The total distance between the two towns is 300 km.
  - (a) Calculate, for the entire journey, the average speed of the vehicle.
  - (b) If the speed of the vehicle in the **first** half of the journey is reduced to 50 km/h, determine its effect on the overall time.
  
2. A worker, Abu, invested some amount in two accounts which pay 11 % and 10 % simple interest annually. The amount invested at 11 % is 140 % of the amount invested at 10 %. After  $3\frac{1}{2}$  years, he earned a total of GH¢ 22,580.60 as interest. How much was invested at 11 %?
  
3. Mr Brown builds a rainwater collection system in a shape of a hemispherical tank of radius 2 m to irrigate a  $500 \text{ m}^2$  farm. Each square metre of the farm requires 50 litres of water. Determine, with a mathematical statement, if a full tank of water would be sufficient to irrigate the farm?  
[Take  $\pi = \frac{22}{7}$ ]
  
4. From the top of a lighthouse 100 m high, the angles of depression of two yachts are observed at  $48^\circ$  and  $36^\circ$ . The foot of the lighthouse and the sea level are on the same horizontal and the two yachts are on the same side of the lighthouse.
  - (a) Illustrate the information in a diagram.
  - (b) Find, correct to the **nearest** metre, the distance between the two yachts.
  
5. The midpoint of the line joining  $J(2u, 3)$  and  $K(-4, v)$  is  $M(1, 2u - 1)$ . Find:
  - (a) the values of  $u$  and  $v$ ;
  - (b)  $|JK|$ .

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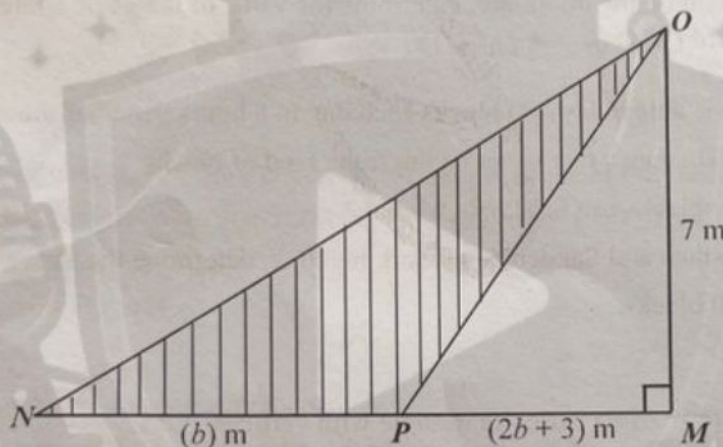
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Answer **five** questions **only** from this section. All questions carry **equal** marks.

6. The estimated cost of building a studio apartment was \$64,000.00. It was made up of the cost of labour, materials and the contractor's charges in the ratio 12 : 15 : 5 respectively. At the start of the construction, the cost of labour increased by  $r\%$ , materials increased by  $2r\%$  due to inflation but the contractor's charges remained same. After the increase, the cost of labour was **two-thirds** the cost of materials. Determine the:

- (a) value of  $r$ ;
- (b) new cost of building the apartment.

7.



NOT DRAWN TO SCALE

The shaded region of the figure is a pattern to be produced in a steel casting shop. If the area of  $\triangle MNO$  is  $98 \text{ m}^2$ , calculate, correct to **one** decimal place, the:

- (a) value of  $b$ ;
- (b) area of the pattern;
- (c) perimeter of the pattern.

8. (a) Mr Akolgo planned to plough 120 acres of farmland each day. Due to unforeseen circumstances, 85 acres could be ploughed each day, resulting in an increase in the planned time by 2 days with 40 acres of the land still remained to be ploughed. Calculate the:

- (i) number of days Mr Akolgo planned to plough the land initially;
- (ii) total area of the farmland.

- (b) A town, Atuabo, is  $5^\circ \text{ N}$  and another town, Akoon is at  $6.8^\circ \text{ N}$  on the earth's surface. Find, correct to the **nearest** whole number, the distance between the two towns.

[Take  $\pi = \frac{22}{7}$ ,  $R = 6,400 \text{ km}$ ]

9. A telecommunication mast and a pillar stand on the same horizontal level. From the midpoint,  $O$ , between the foot of the pillar,  $G$ , and the foot of the mast,  $H$ , the angle of elevation of the top of the mast  $S$ , is  $70^\circ$ . From the point,  $O$ , the angle of elevation of the top of the pillar,  $T$ , is  $28^\circ$ . If the pillar is 10 m high:

- (a) represent the information in a diagram;
- (b) calculate, correct to the **nearest** whole number:
  - (i) the height of the mast;
  - (ii)  $|TS|$ .

10. (a) The points  $Q$ ,  $R$  and  $S$  lie on a circle with centre  $O$ . An angle subtended at the centre by the minor arc  $QR$  is  $88^\circ$ .
- (i) Illustrate the information in a diagram.
  - (ii) If  $S$  is a point on the minor arc, determine the value of the angle subtended by the chord  $QR$  at  $S$ .

- (b) A mason, Boahen, is able to lay 400 blocks each day in 8 hours. Another mason, Sai, works at  $\frac{3}{2}$  times Boahen's rate when laying same kind of blocks.
- (i) How many blocks can Sai lay in 8 hours?
  - (ii) If **both** Boahen and Sai decide to work together, determine the time required to lay 2000 blocks.

11. A wooden ceiling is in the form of an isosceles triangle with vertices  $TUV$ .  $|TU| = |TV| = (2i + j)$  m,  $|UV| = (3i + 5)$  m and the perimeter of the ceiling is  $(7j + 3)$  m.

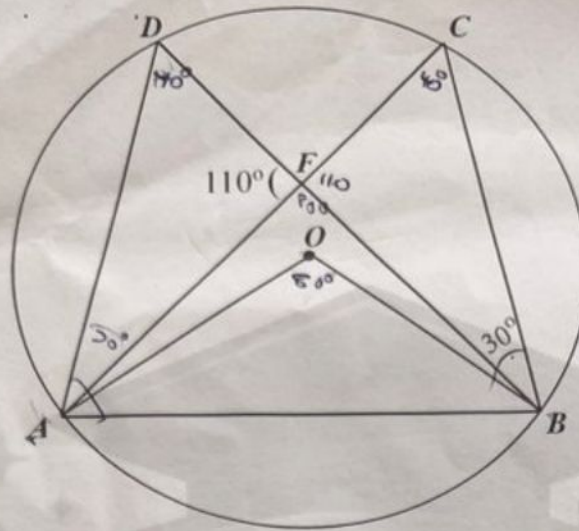
- (a) Illustrate the information in a diagram.
- (b) Given that  $i : j = 2 : 3$ , find, correct to **one** decimal place, the:
  - (i) value of  $i$  and  $j$ ;
  - (ii) area of the ceiling.

12. The following are the marks obtained by 50 students in an Arabic test.

27 31 35 52 81 50 48 15 59 6  
 17 41 30 94 23 38 40 70 76 18  
 52 61 43 68 56 57 62 82 54 25  
 18 35 9 74 59 46 71 4 74 33  
 61 16 50 45 41 45 28 22 26 45

- (a) Using the class interval, 1 – 10, 11 – 20, 21 – 30, ..., construct a cumulative frequency table for the distribution.
- (b) Draw a cumulative frequency curve for the distribution.
- (c) Use the curve to find the upper quartile.
- (d) If **only** 10 % of the students passed the test, use the curve to determine the pass mark.

13. (a)



NOT DRAWN TO SCALE

In the diagram,  $A, B, C$  and  $D$  lie on the circumference of the circle centre  $O$ .  $\overline{AC}$  and  $\overline{BD}$  intersect at  $F$  such that  $\angle CBD = 30^\circ$  and  $\angle DFA = 110^\circ$ . Calculate:

- (i)  $\angle AOB$ ;  $80^\circ$
- (ii)  $\angle FAD$ ;  $30^\circ$

(b) Consider the following statements.

$s$ : Most Arts students are good at Literature.

$t$ : Some Non-Arts students are also good at Literature.

- (i) Illustrate the information in a Venn diagram.
- (ii) Determine from the diagram whether the following conclusions are **Valid** or **Not Valid**.
  - ( $\alpha$ ) Ivan is a non-Arts student so he is **not** good at Literature.
  - ( $\beta$ ) Bernice is an Arts student so she is good at Literature.

**END OF PAPER**



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