OL/2022(2023)/32/E-I

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இலங்கை பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

32	E	I

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2022(2023)
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2022 (2023)
General Certificate of Education (Ord. Level) Examination, 2022 (2023)

ගණිතය I
கணிதம் I
Mathematics I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Index Number: .....

Certified Correct

.....
Signature of Invigilator

Important:

* This question paper consists of **8** pages.
* Write your **Index Number** correctly in the appropriate places on **this page** and on **page three**.
* Answer **all** questions **on this question paper itself**.
* Use the space provided under each question for working and writing the answer.
* Indicate the **relevant steps** and the **correct units** when answering the questions.
* Marks are awarded as follows:

  In Part A
  2 marks for each question

  In Part B
  10 marks for each question

* Blank papers can be obtained for scratch work.

For Marking Examiners' Use Only		
Part	**Question Numbers**	**Marks**
A	**1 – 25**	
B	**1**	
	2	
	3	
	4	
	5	
Total		

..... First Examiner	..... Code Number
..... Second Examiner	..... Code Number
..... Arithmetic Checker	..... Code Number
..... Chief Examiner	..... Code Number

[see page two

Part A

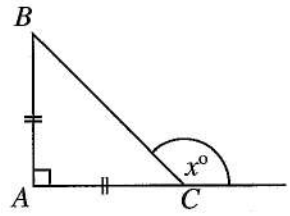
*Answer **all** questions **on this question paper itself.***

(Take the value of π as $\frac{22}{7}$.)

1. It has been estimated that 12 men need four days to complete a certain task. How many men are needed to complete this task in three days?

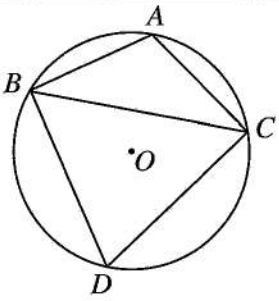
2. Solve: $\frac{1}{2x} - \frac{1}{3x} = \frac{1}{12}$

3. $AB = AC$ in the given right triangle ABC. Find the value of x.

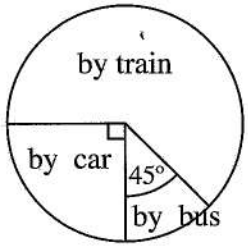


4. A sector of central angle 45° has been cut out from a circle of radius 14 cm. Find the area of this sector.

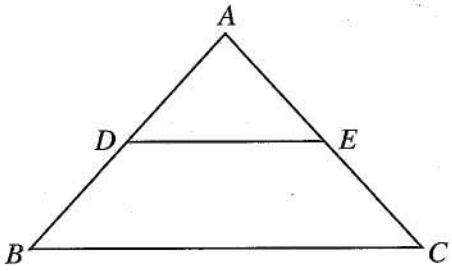
5. In the given figure, A, B, C and D are points located on the circle with centre O. If $AB = AC$ and $A\hat{B}C = 40°$, find the magnitude of $B\hat{D}C$.



6. The three ways in which the employees arrive at an institute are shown in this pie chart. What multiple of the number of employees who arrive by bus, is the number of employees who arrive at the institute by train?



7. In the given triangle ABC, $AB = AC$ and D and E are the midpoints of the sides AB and AC respectively. If the perimeter of the triangle ABC is 14 cm and $AD = 2$ cm, find the length of DE.

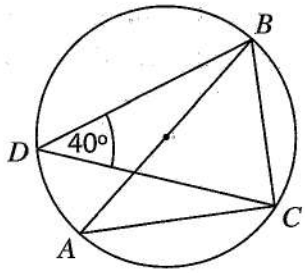


[see page three

8. Express $10^{0.3560} = 2.27$ in logarithm form.

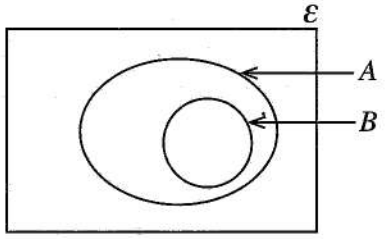
9. Sunil stays in a hostel. Only his father and two brothers will participate in Sunil's birthday party. If the probability of each of them arriving first is the same, and they arrive at different times, find the probability of one of his brothers arriving first.

10. AB is a diameter of the circle shown in the figure. Find the magnitude of $A\hat{B}C$ based on the given information.

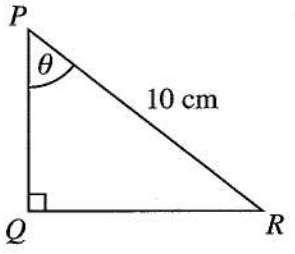


11. The area of the curved surface of a right circular cylinder of base diameter 14 cm is 352 cm^2. Find the height of the cylinder.

12. In the given Venn diagram, shade the region $A \cap B'$.

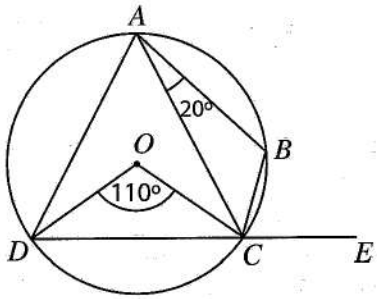


13. If $\cos\theta = 0.4$, find the length of the side PQ of the triangle PQR, according to the given measurements.



[see page four

14. In the given figure, the points A, B, C and D lie on the circle with centre O. The side DC is produced to E. Find the magnitude of $B\hat{C}E$ based on the given information.



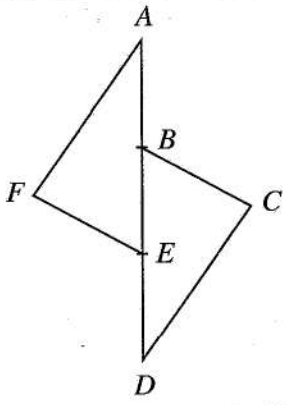
15. Simplify: $\frac{7x^2}{y^3} \times \frac{3y^2}{7x}$

16. In the given figure, the points B and E lie on the straight line AD such that $AB = ED$. Moreover, $AF = CD$ and $AF \parallel CD$. Select under which of the following cases it can be shown that $\triangle AFE \equiv \triangle DCB$, and underline it.

(i) A.A.S.

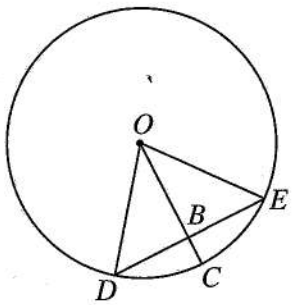
(ii) S.A.S.

(iii) S.S.S.



17. Find the least common multiple of the following algebraic terms.
$3x^2$, $9x^2y$, $12xy^2$

18. The centre of the given circle is O. The chord DE is bisected at B by OC. Find the length of BC if $OD = 10$ cm and $DE = 12$ cm.



19. Factorize: $4x^2 + 5x - 6$

[see page five

20. Write the 13^{th} term of the geometric progression with first term -4 and second term 16, as a power of -4.

21. The heights of two right circular cylinders are equal. The base radius of the smaller of these cylinders is 10 cm. The volume of the larger cylinder is 4 times the volume of the smaller cylinder. Find the base radius of the larger cylinder. (The volume of a right circular cylinder of base radius r and height h is $\pi r^2 h$.)

22. Write the equation of the straight line that passes through the point (2, 1) and has intercept 5, in the form $y = mx + c$.

23. Underline the correct statement.

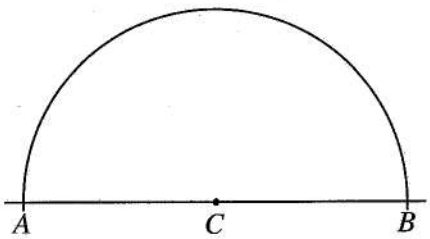
The value of $\sqrt{3}+\sqrt{12}$ is (i) less than 5.

(ii) equal to 5.

(iii) greater than 5.

24. Solve: $4x^2 - 9 = 0$

25. $AB = 10$ cm and C is the midpoint of AB. It is required to find the location of the point P which is 5 cm from C and at an equal distance from A and B. An incomplete sketch consisting of a semicircle is given in the figure. Using the knowledge on loci, complete the sketch indicating how the location of the point P is found.



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* *

[see page six

Part B

Answer ***all*** *questions* ***on this question paper itself.***

(Take the value of π as $\frac{22}{7}$.)

1. $\frac{2}{5}$ of a container is filled with fruit juice. After 700 millilitres of water is also added to this container, $\frac{3}{4}$ of the container is filled.

(i) What fraction of the capacity of the container is the amount of water that was added?

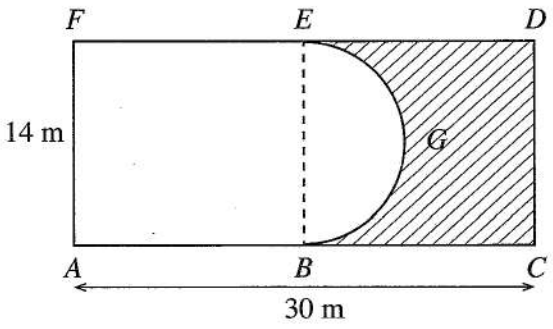
(ii) Now $\frac{4}{5}$ of the fruit drink in the container is separated out to serve. What fraction of the capacity of the container is this separated amount of drink?

(iii) The separated amount of drink is poured out equally into 6 glasses. Find the amount of drink in one glass in millilitres.

(iv) Find the amount of fruit drink remaining in the container now, in millilitres.

10

2. The rectangular plot of land of length 30 m and breadth 14 m represented by *ACDF* in the figure is divided into two equal parts by the line *BE*. The portion denoted by *ABGEF* has been allocated for a swimming pool. *BGE* is a semicircular portion of it. The shaded region has been allocated for a lawn.



(i) Find the radius of the semicircular portion.

(ii) Find the perimeter of the portion allocated for the swimming pool.

(iii) Find the area of the portion allocated for the swimming pool.

(iv) If it is required to adjoin a rectangular plot which is equal in area to the area of the portion allocated for the lawn, with *DC* as one side, sketch this plot with its measurements in the given figure itself.

10

[*see page seven*

3. When an item worth 9000 rupees is imported, 18% of its original value is charged as customs duty.

(i) How much money has to be paid as customs duty when this item is imported?

(ii) Amal imports 12 such items and transports them to his shop by paying 6000 rupees as transport cost. What is the total amount it costs him for one item?

(iii) At what price should he sell an item to make a profit of 20% from the sale?

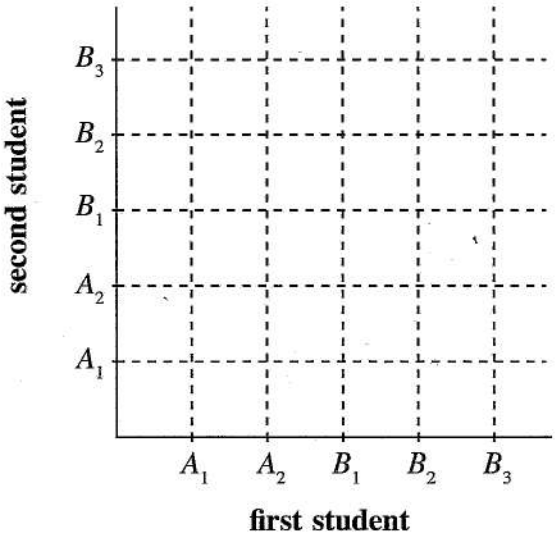
(iv) The annual value of Amal's shop has been assessed as 15 000 rupees by the urban council to which it belongs. He pays 600 rupees as rates for a quarter. Find the annual rates percentage that is charged by the urban council.

10

4. The two grade 11 students A_1 and A_2 and the three grade 12 students B_1, B_2 and B_3 belong to a school tennis pool. For a doubles tennis competition to be held on a future date, two students are to be picked randomly one after the other from the above mentioned students.

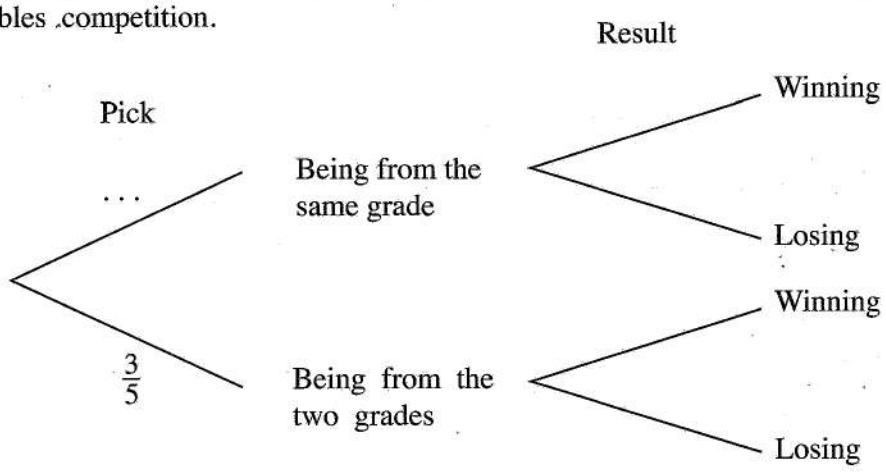
(i) Mark the sample space of this experiment using the symbol 'X', on the grid shown in the figure.

(ii) Encircle the event of picking two students from the same grade and find its probability.



[see page eight

(iii) When the two students who are picked are from the same grade, the probability of them winning the competition is 0.7, and when they are from the two different grades the probability of them winning the competition is 0.5. Complete the given incomplete tree diagram and find the probability of the two students who are picked winning the doubles competition.



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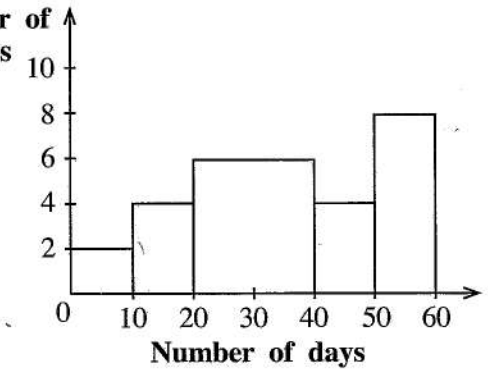
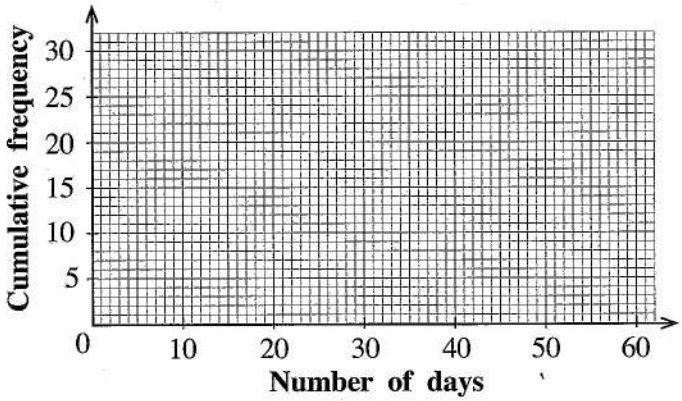
5. 

Number of days	Number of students (frequency)	Cumulative frequency
0 – 10	2	2
10 – 20	4	6
20 – 40	...	...
40 – 50	4	...
50 – 60	...	30

Online teaching was done on 60 days for 30 students of a certain school. A histogram and an incomplete grouped frequency table that represent student participation, which are prepared according to the number of days on which each student participated in this, are shown above.



(i) Fill in the blanks in the column of the table representing the number of students, according to the given histogram.

(ii) Complete the cumulative frequency column of the table and using it, draw the cumulative frequency curve on the given coordinate plane.

(iii) Find the number of students who have participated on more than 30 days.

(iv) It is required to separate out from these 30 students, the 50% of students whose participation in online learning was the lowest. For this, the students who had participated in less than what number of days should be selected?

10

* * *

32 E II

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2022(2023)
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2022(2023)
General Certificate of Education (Ord. Level) Examination, 2022(2023)

ගණිතය II
கணிதம் II
Mathematics II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions and decide on the questions that you give priority to in answering.

Instructions:

* *Answer **ten** questions selecting **five** questions from* **Part A** *and **five** questions from* **Part B**.
* *Write the **relevant steps** and the **correct units** in answering the questions.*
* *Each question carries* **10** *marks.*
* *The volume of a sphere of radius r is $\frac{4}{3}\pi r^3$.*

Part A

*Answer **five** questions only.*

1. Bank A pays an annual compound interest rate of 10% for fixed deposits. The interest is added to the principal amount annually.

A share of finance company B can be purchased for Rs. 40. Annual dividends of Rs. 2.50 is paid per share.

Saman deposits 200 000 rupees in bank A for two years in the above manner. He withdraws the interest and the principal amount at the end of the two years.

Kamal purchases shares in company B by investing 200 000 rupees. After receiving annual dividends at the end of the first year and at the end of the second year, he sells all his shares at 45 rupees per share.

Show with reasons that the amount that Kamal has with him when the annual dividends of the two years and the amount he received by selling the shares are added together is 8000 rupees more than the amount Saman has.

2. An incomplete table of y-values corresponding to several x-values of the function $y = 4 + 2x - x^2$ in the interval $-2 \leq x \leq 4$ is given below.

x	-2	-1	0	1	2	3	4
y	-4	1	4	5	...	1	-4

(a) (i) Find the value of y when $x = 2$.

(ii) Using the standard system of axes and a suitable scale, draw the graph of the given quadratic function on a graph paper according to the above table of values.

(b) Using the graph,

(i) write the interval of values of x on which the function is decreasing in the interval $1 < y < 4$.

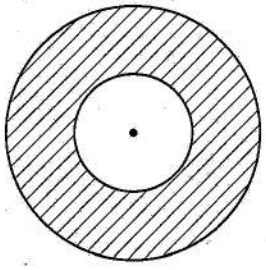
(ii) express the function in the form $y = b - (a - x)^2$; here a and b are two constants.

(iii) find the value of the positive root of the quadratic equation $4 + 2x - x^2 = 0$ to the nearest first decimal place and thereby obtain a value for $\sqrt{5}$.

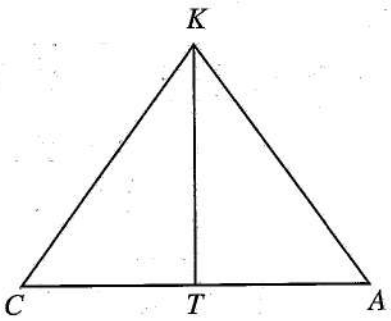
[see page two

3. When a circular lamina of radius r is cut out from a circular lamina of radius $2r+3$, the area of the remaining portion of the lamina is 27π cm^2. Show that r satisfies the quadratic equation $r^2+4r-6=0$ and by solving it find the value of r to the nearest first decimal place. (Take the value of $\sqrt{10}$ to be 3.16)

By considering the value of π to be 3.1, find the circumference of the smaller lamina.



4. Chamara (C) and Amal (A) are standing on a level ground on opposite sides of a vertical tree (KT) as shown in the figure. Amal is 30 m away from the tree and Chamara is flying a kite. The kite suddenly gets entangled at the top of the tree (K) such that the string is taut. The string is 40 m long. At that moment, Chamara sees the kite with an angle of elevation of $44^\circ 50'$. (Disregard the heights of Chamara and Amal.)



(i) Copy the given figure onto your answer script and include the above information in it.

Use trigonometric ratios in the following computations.

(ii) Find the height (KT) of the tree.

(iii) What is the angle of elevation with which Amal sees the kite at this moment?

(iv) With reasons, state which of the two, Chamara or Amal is standing closer to the tree.

5. It is required to buy cricket bats and balls for sports practices in the schools A and B. It costs 6160 rupees to buy 3 cricket bats and 8 balls for school A. It costs 4000 rupees to buy 2 cricket bats and 5 balls for school B.

(i) By taking the price of a cricket bat as x rupees and the price of a ball as y rupees, construct a pair of simultaneous equations and by solving them, find separately the price of a cricket bat and the price of a cricket ball.

(ii) Find the number of cricket bats and the number of balls that can be bought for exactly 9200 rupees such that the number of balls is twice the number of cricket bats.

6. A frequency distribution giving the number of trips that Nimal made in his car during two weeks together with the distances is shown below.

Distance (km)	1–3	3–5	5–7	7–9	9–11	11–13	13–15
Number of trips	6	10	20	8	4	0	2

(Here the interval 3–5 represents greater than or equal to 3 and less than 5.)

(i) Find the mean distance he travelled on a trip during these two weeks.

(ii) For a certain reason Nimal expects to make 120 such trips during the next month. For that month, he is entitled to exactly 80 litres of fuel. To be able to make the 120 trips in his car, on average, what is the distance his car should be able to run on a litre of fuel?

(iii) Nimal decides to cycle instead of using his car for trips that are less than 5 kilometres. By considering that all his trips are as in the above table and that the car can travel 9 kilometres per litre on average, if a litre of fuel is 400 rupees, show that Nimal can save **at least** 1600 rupees.

[*see page three*

Part B

*Answer **five** questions only.*

7. For a school sports activity, the students have been placed such that the first row consists of 7 students and every other row consists of 3 students more than the row before it. Then the number of students in each row when taken in order forms an arithmetic progression.

(i) Write the first, second and third terms of this progression respectively.

(ii) Show that the n^{th} term of this progression T_n is given by $T_n = 3n + 4$.

(iii) In which row are there 40 students?

(iv) If only 700 students have been selected for this sports activity, show with reasons whether the first 20 rows can be filled when the students are placed in the above manner.

8. Use only a straight edge with a cm/mm scale and a pair of compasses for the following geometric constructions. The construction lines should be drawn clearly.

(i) Construct a circle of radius 5 cm and name its centre as C.

(ii) Construct a chord AB of length 7.5 cm.

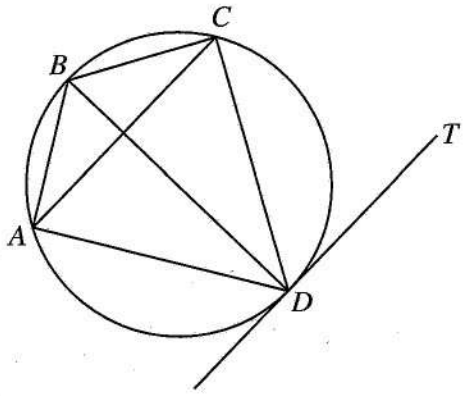
(iii) Construct the perpendicular bisector of AB and name the point at which it intersects the major arc of the circle as P.

(iv) Draw the line PA and construct the interior bisector of $P\hat{A}B$.

(v) Construct a tangent to the circle at P and name the point at which it meets the angle bisector drawn in part (iv) above as K. Give reasons why PK and AB are parallel.

9. In the cyclic quadrilateral $ABCD$ in the given figure, $AB = BC$ and $CD = DA$. Take $D\hat{C}A = x°$.

Copy the given figure onto your answer script and include the above information in it.



(i) If the tangent drawn to the circle at D is DT, show that $AC \parallel DT$.

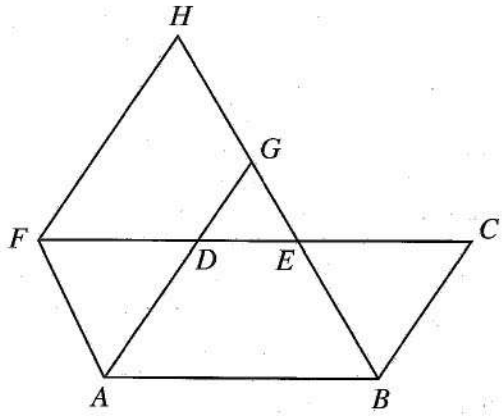
(ii) Show that $A\hat{B}C$ is bisected by BD.

(iii) Show that BD is a diameter of the given circle.

10. The cross-sectional area of a container with water, in the shape of a right prism with a uniform triangular cross-section, is 42 cm^2. When 7 spheres of radius a cm each are submerged in the water in the container, the water level rises by h cm without water spilling over. Show that the radius a of a sphere is given by $a^3 = \frac{9h}{2\pi}$.

By taking the value of h as $\sqrt{31.17}$ and the value of π as 3.14, find the value of a^3 to the nearest whole number using the logarithms tables and thereby obtain the value of a.

11.



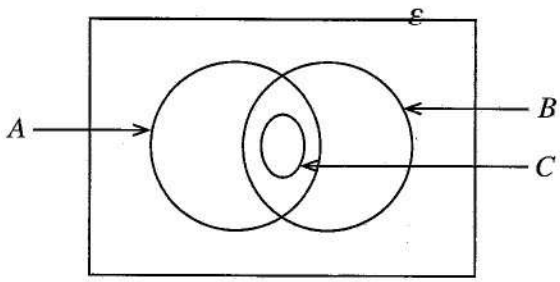
ABCD shown in the figure is a parallelogram. *E* is a point on *CD* as shown in the figure. Moreover, the straight line *CD* has been produced to *F* such that $DF = CE$, and *AD* produced and the straight line through *F* drawn parallel to *AD*, meet *BE* produced at *G* and *H* respectively.

Copy the given figure onto your answer script and

show that the triangles *ADF* and *BCE* are congruent, and

give reasons why *ABEF* and *AGHF* are parallelograms and why their areas are equal.

12. An incomplete Venn diagram drawn to represent the information collected from 60 homes in a certain location on the use of firewood, gas and electricity to prepare food is shown below.



All the homes that use electricity also use the two types firewood and gas.

(i) Copy the given Venn diagram onto your answer script.
If the set *A* denotes the homes that use firewood, name the set *B* and the set *C*.

(ii) The number of homes that do not use any one of firewood, electricity and gas is 5, the number of homes that use firewood is 24 and the number of homes that use gas is 48. How many homes use only gas?

(iii) How many homes use both firewood and gas?

(iv) The number of homes that use electricity is equal to the number of homes that use only firewood. How many homes use only the two methods firewood and gas?
Shade the region that represents these homes in the Venn diagram.