

OL/2020/32/E-I

සියලුම හිමිකම් ඇවිරිණි / முழுப் பதிப்புரிமையுடையது / All Rights Reserved

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
 இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம்
 Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka
 ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
 இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம்
 Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

32 E I

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2020
 கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2020
 General Certificate of Education (Ord. Level) Examination, 2020

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

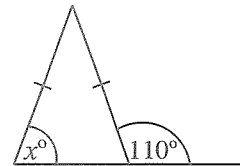
Part	Question Numbers	Marks
A	1 – 25	
B	1	
	2	
	3	
	4	
	5	
Total		
..... First Examiner	 Code Number	
..... Second Examiner	 Code Number	
..... Arithmetic Checker	 Code Number	
..... Chief Examiner	 Code Number	

Part A

Answer all questions on this question paper itself.

1. The bill for the monthly phone usage of a household is 1500 rupees. 180 rupees is added to this as VAT. Accordingly, find the percentage that is charged as VAT.

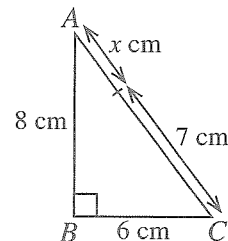
2. Find the value of x according to the information given in the figure.



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

4. It has been estimated that four men will take 6 days to complete a certain task. If two more men joined this group after they had worked for 3 days, in how many more days can this task be completed?

5. In the figure, ABC is a right angled triangle. Find the value of x according to the given information.



6. Find the least common multiple of the following expressions.
 $3x$, $2xy$, $4y^2$

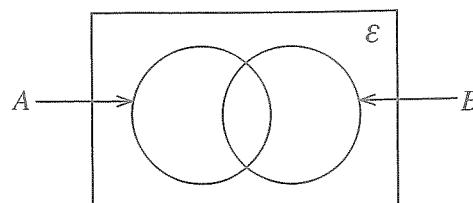
7. Information relevant to the motion of an object travelling at a uniform speed is shown below.

Distance (metres)	0	4	8	12	16
Time (seconds)	0	2	4	6	8

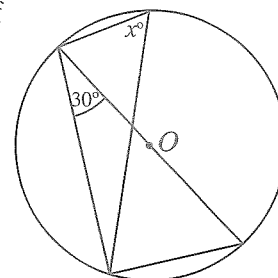
(i) Find the speed of the object in metres per second.

(ii) Find the time the object takes to travel 22 metres at this speed.

8. Shade the region that represents $A' \cap B$ in the given Venn diagram.



9. The centre of the circle shown in the figure is O . Find the value of x according to the given information.



10. If $\log_a b = c$, underline the correct statement from the following statements.

(i) $c^a = b$

(ii) $a^c = b$

(iii) $b^c = a$

(iv) $c^b = a$

11. Simplify: $\frac{3x}{y} \times \frac{5y^2}{6x}$

12. A portion of a grouped frequency distribution is shown here.

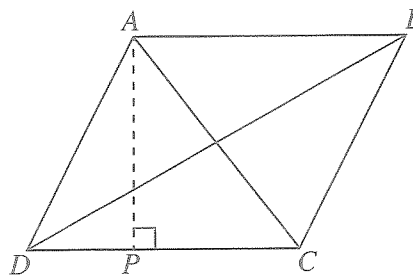
For the interval 11–15, write

(i) the upper class limit,

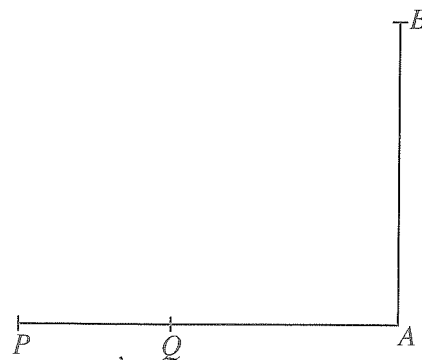
(ii) lower class boundary.

class interval	frequency
5–10	2
11–15	3
16–20	5

13. In the parallelogram $ABCD$, $AB = 12$ cm and the area of triangle BCD is 48 cm^2 . Find the length of AP .



14. AB is a vertical post located on a level ground and P and Q are two points on the level ground as shown in the figure. The top B of the post AB when observed from Q is seen with an angle of elevation of 70° . When observed from B , the point P is seen with an angle of depression of 50° . Represent this information in the figure.

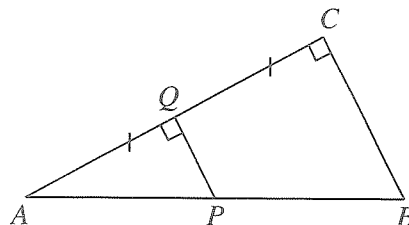


15. Find the third term of the geometric progression with first term 6 and second term -12 .

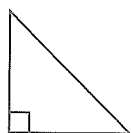
16. Q is the midpoint of the side AC of the triangle ABC shown in the figure. $\hat{AQP} = \hat{QCB} = 90^\circ$.

(i) Name an angle equal to $\hat{APQ}$.

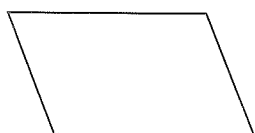
(ii) If $PQ = 4$ cm, find the length of BC .



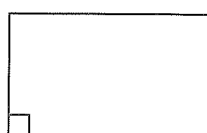
17. A right prism with a right triangular cross section is shown in figure (A). Select and underline the figure which is **not** the shape of a face of the prism.



(i)



(ii)



(iii)

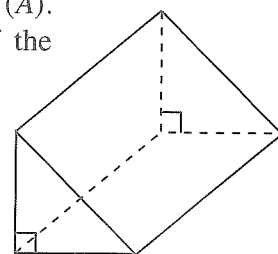


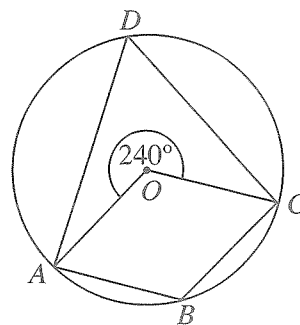
Figure (A)

18. One factor of the expression $2x^2 + 3x + 1$ is $(x + 1)$. Find the other factor.

19. A circle with centre O is shown in the figure. Find the magnitudes of the following angles according to the given information.

(i) $\hat{ABC}$

(ii) $\hat{ADC}$



20. Find the

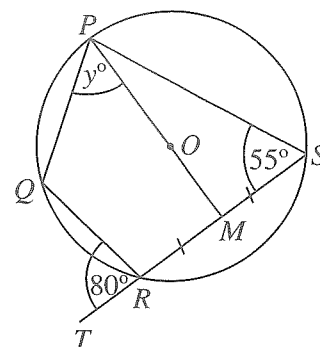
(i) gradient

(ii) intercept

of the straight line which passes through the points (0, 2) and (5, 2).

21. The digits 2, 2, 3, 3, 4, 4 have been written on the six sides of a balanced die. Find the probability of a side with a prime number written on it falling face up when this die is rolled.

22. The points P , Q , R and S lie on the circle with centre O . The side SR has been produced to T and POM is a straight line. Find the value of y according to the information in the figure.



23. The arc lengths of the sectors of circles shown in figure (a) and figure (b) are equal. Find the value of R .

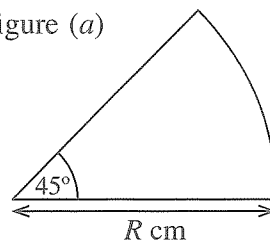


Figure (a)

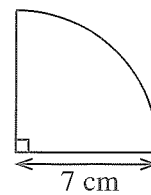
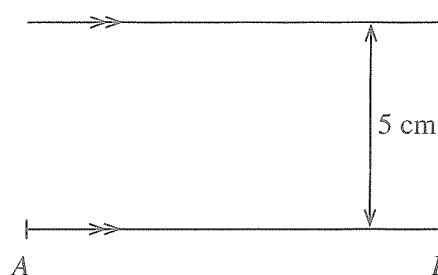


Figure (b)

24. If
$$\begin{pmatrix} 1 & -1 \\ 0 & 2 \\ -1 & 1 \end{pmatrix} + \begin{pmatrix} 3 & 4 \\ 1 & -1 \\ 0 & y \end{pmatrix} = \begin{pmatrix} 4 & 3 \\ 1 & x \\ -1 & x \end{pmatrix},$$

find the value of x and then find the value of y .

25. The figure shows an incomplete sketch of a construction done to find the point P which is 5 cm from the straight line AB and equidistant from the points A and B . Complete the sketch indicating how the location of the point P is found.



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

1. A container of 5 litre capacity was completely filled with a soft drink. $\frac{3}{10}$ of this amount was used to serve drinks.

(i) What fraction of the capacity of the container was the amount of soft drink remaining after using a portion to serve drinks?

(ii) $\frac{5}{7}$ of the soft drink remaining in the container was poured into a bottle. What fraction of the capacity of the container was the amount of soft drink left in the container after that?

(iii) Now, more soft drink was added to the amount of soft drink in the container until the amount in the container was exactly half the capacity of the container. Express the amount of soft drink poured into the container in litres.

10

2. The figure shows a flower bed consisting of a semicircular part of radius 14 m adjoining a rectangular part $ABCD$. Pebbles have been scattered in the two shaded rectangular parts outside the flower bed.

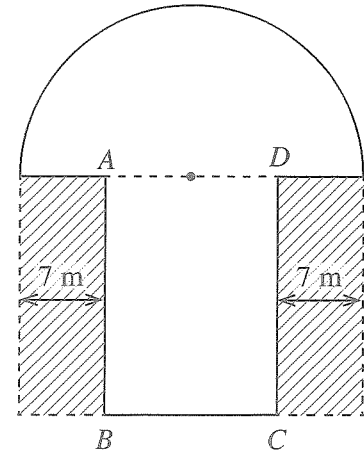
(Take the value of π as $\frac{22}{7}$.)

(i) Find the length BC of the rectangular part of the flower bed.

(ii) Find the area of the semicircular part of the flower bed.

(iii) If the area of the semicircular part is equal to the sum of the areas of the two parts in which pebbles have been scattered, find the length AB of the rectangular part.

(iv) Find the perimeter of the whole flower bed and then find the length of a rectangle that has the same perimeter as the flower bed and breadth equal to the diameter of the semicircle.



10

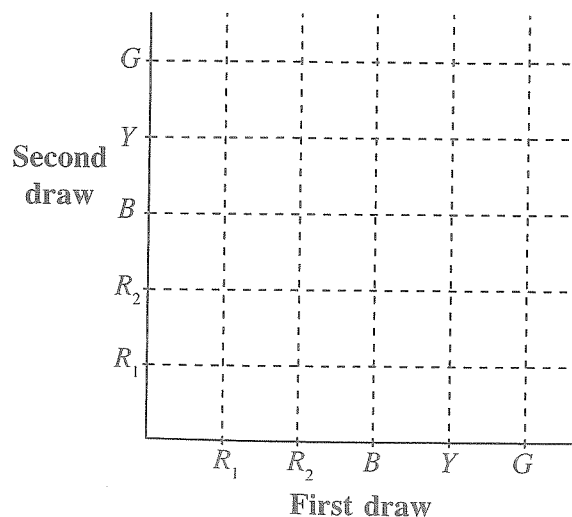
3.

A certain urban council charges 12% of the annual assessed value as annual rates for houses.

- (i) The annual assessed value of the house Kamal owns is 15 000 rupees. How much does he have to pay as annual rates?
- (ii) Kamal rents his house out for a year for a monthly rent of 9000 rupees and receives the total rent as a single payment. Find the amount that remains after Kamal pays the annual rates and spends 8200 rupees on maintenance.
- (iii) Kamal invests the remaining amount to buy shares of a company of which the price of a share is 40 rupees. If he receives dividends of 7350 rupees at the end of a year, how much does the company pay as annual dividends for a share?

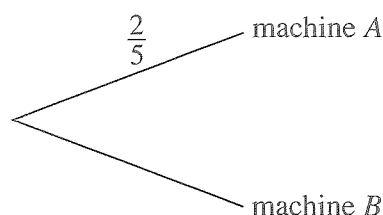
10

4. (a) In a children's party, a game of drawing a ball randomly from a bag of balls and without replacing it, drawing another ball randomly, was played. In the bag were two red balls, (R_1 , R_2), a blue ball (B), a yellow ball (Y) and a green ball (G) that were identical.
 - (i) Mark the sample space relevant to the above game in the given grid using the symbol 'X'.
 - (ii) To win the game, it was required to first draw either a blue ball or a yellow ball and then draw a red ball. In the grid, encircle the event of a child winning the game and find its probability.



- (b) A factory uses two machines named A and B to produce a certain type of toy. $\frac{2}{5}$ of the total number of toys is produced by machine A while the rest is produced by machine B . The probability of a toy produced by machine A being defective is $\frac{1}{16}$ while the probability of a toy produced by machine B being defective is $\frac{1}{36}$.

- (i) Using the above information, extend the incomplete tree diagram given below and include the relevant probabilities.

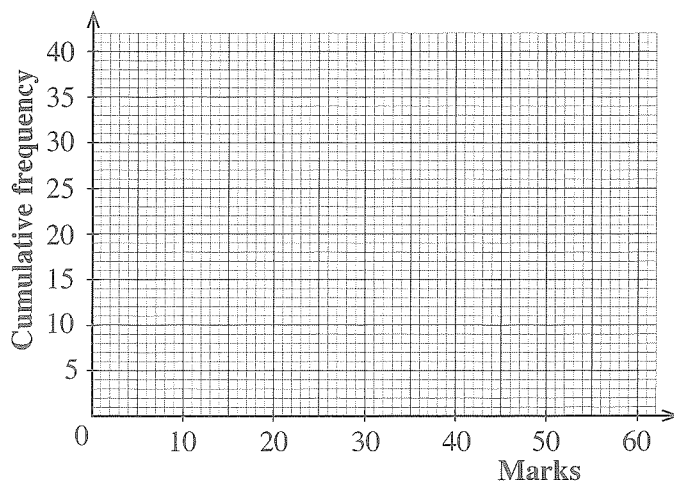


- (ii) Find the probability of a toy produced by this factory being **without** defect.

10

5. An incomplete frequency distribution showing information on the marks obtained in a test by 40 students in a class, from a possible total of 60 marks is given below.

Class interval	Frequency	Cumulative frequency
0 – 10	3	3
10 – 20	5	8
20 – 30	...	14
30 – 40	8	22
40 – 50	12	...
50 – 60	6	40



- (a) (i) Fill in the blanks in the table.

- (ii) Draw the cumulative frequency curve on the given coordinate plane.

- (b) Using this curve,

- (i) if a prize is given to the students who obtained more than 45 marks, find how many students will be selected for it.

- (ii) find the interquartile range.

10

OL/2020/32/E-II

සියලුම හිමිකම් ඇවිරිණි / முழுப் பதிப்புரிமையுடையது / All Rights Reserved]

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
 இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம்
 Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka
 ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
 இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரීட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம் இலங்கைப் பரīட்சைத் திணைக்களம்
 Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka

32 E II

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2020
 கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2020
 General Certificate of Education (Ord. Level) Examination, 2020

ගණිතය II
 கணிதம் II
 Mathematics II

පැය තුනයි
 மூன்று மணித்தியாலம்
 Three hours

අමතර කියවීමේ 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 you will answer and decide which of them you will prioritise.

Important:

- * 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 solid right circular cone of base radius r and height h is $\frac{1}{3}\pi r^2 h$.
- * The volume of a solid right circular cylinder of radius r and height h is $\pi r^2 h$.

Part A

Answer five questions only.

1. Amal takes a loan of 50 000 rupees from a bank for two years at an annual simple interest of 12%.

- (i) Find the total interest amount he has to pay for the two years.
- (ii) Amal deposits the loan amount he obtained, in a fixed deposit account that pays an annual interest of 15% compounded annually, for two years. Find the amount in this account at the beginning of the second year.
- (iii) At the end of the two years, he withdraws the total amount in his fixed deposit account and settles his bank loan by paying the loan amount and the interest. Show that he now has more than 4000 rupees remaining in hand.

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

x	-4	-3	-2	-1	0	1	2
y	6	1	-2	-3	-2	...	6

- (a) (i) Find the value of y when $x = 1$.
- (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 that you drew,
 - (i) write the equation of its axis of symmetry.
 - (ii) write the interval of values of x on which the quadratic function is negative.
- (c) For the graph that is obtained by translating the above graph upwards by five units on the coordinate plane without changing the shape of the graph, write the coordinates of the minimum point, and write the relevant quadratic function in the form $y = (x + p)^2 + q$. (Here p and q are constants.)

3. Information on the runs scored by a cricket team in the 40 matches they played during the last year is given in the following frequency distribution.

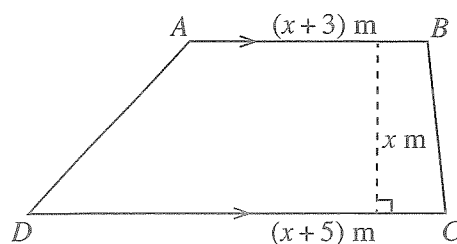
Interval of runs	Number of matches
131 – 141	2
142 – 152	4
153 – 163	5
164 – 174	6
175 – 185	8
186 – 196	5
197 – 207	4
208 – 218	3
219 – 229	3

- (i) Taking the mid value of the interval 175 – 185 as the assumed mean, find the mean number of runs this team scored in a match to the nearest whole number and thereby find the total number of runs that this team can be expected to score in the 60 matches that will be held this year.
- (ii) Show that the maximum number of runs that this team may have scored in total, in the 10 matches in which they scored the most number of runs during the last year, is less than 2170 runs.
4. A solid right circular cylindrical metal block of base radius 8 cm and height 10 cm is melted and 12 identical small solid right circular cones are made. The height of a cone is 6 cm. In making these, a volume of 125.6 cm^3 of metal is wasted. Taking 3.14 as the value of π ,
- (i) calculate the volume of the cylindrical metal block,
- (ii) find the volume of a cone that is made, and show that the base radius r of a cone is given by $r^2 = \frac{157}{6.28}$,
- (iii) find the value of r^2 using the logarithms table and then obtain the value of r .
5. (a) A hall is decorated with white lotus flowers and red lotus flowers. Three times the number of white lotus flowers used for this is 100 more than the number of red lotus flowers used. Each white lotus flower is 12 rupees and each red lotus flower is 11 rupees. The cost of the lotus flowers used for the decoration is 1600 rupees.
- (i) Take the number of white lotus flowers used for the decoration as x and the number of red lotus flowers used as y and construct a pair of simultaneous equations using the above information.
- (ii) Solve the pair of simultaneous equations and find separately the number of white lotus flowers and the number of red lotus flowers used for the decoration.
- (iii) Show that the difference between the amount spent on the red lotus flowers and the amount spent on the white lotus flowers is more than 150 rupees.
- (b) Make h the subject of the following formula:

$$u = \sqrt{2gh}$$

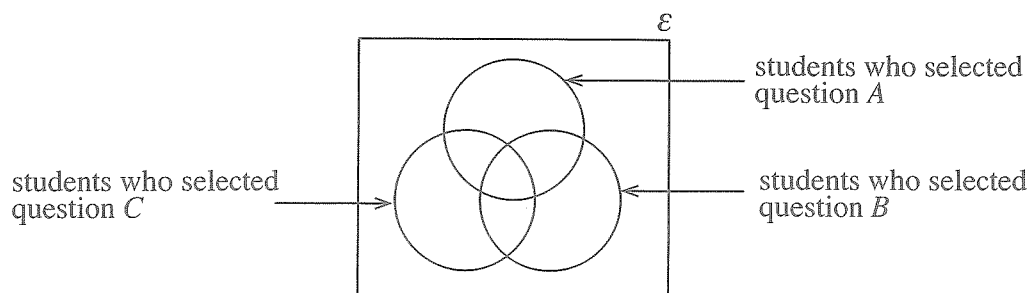
6. The figure shows a lamina in the shape of a trapezium, with its measurements. If the area of the lamina is 20 m^2 , show that x satisfies the quadratic equation $x^2 + 4x - 20 = 0$. Find the perpendicular distance between the two parallel sides of the lamina and show that this distance is less than half the length of AB .

(Take the value of $\sqrt{6}$ as 2.45.)



Part B*Answer five questions only.*

7. A flower bed consists of 50 rows of red flowering shrubs and white flowering shrubs. There are red flowering shrubs at both ends of each row and between every two consecutive red flowering shrubs there is a white flowering shrub. There are 13 flowering shrubs in the first row and each row thereafter has one red flowering shrub and one white flowering shrub more than the previous row.
- Write the number of flowering shrubs there are in the first, second and third rows respectively.
 - How many flowering shrubs are there in the 28th row?
 - How many rows are there with less than 90 flowering shrubs?
 - Find the total number of flowering shrubs there are in the flower bed. How many more red flowering shrubs are there in the bed than white flowering shrubs?
8. Use only a straight edge with a cm/mm scale and a pair of compasses for the following geometric constructions. Show the construction lines clearly.
- Construct a straight line segment AB of length 9.0 cm and its perpendicular bisector.
 - Construct a semicircle with diameter AB and label its centre as C .
 - Mark the point P on the semicircle such that AP is equal to the radius of the semicircle, and draw the triangle APB .
 - Construct the trapezium $APQB$ such that Q lies on the semicircle, and construct the bisector of $P\hat{Q}B$.
 - Find the magnitude of $P\hat{Q}B$.
9. The following Venn diagram has been drawn to represent information on the selection of the questions A , B and C by 100 students who faced a certain examination.

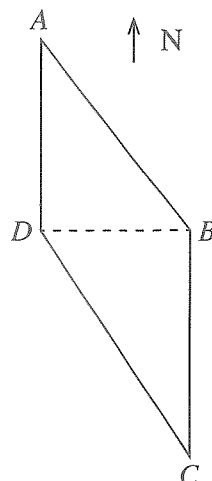


- * The number of students who selected both questions B and C is 10, while no student selected only the questions B and C from these three questions.
 - * The number of students who selected both questions A and B but not question C is 20.
 - * The number of students who selected only question C from these three questions is 8.
- Copy the Venn diagram onto your answer script and include the above information in it.
 - If the number of students who selected question C is equal to the number of students who selected both questions A and B , how many students selected both questions A and C but **not** question B ?
 - 15 students selected only question B from these three questions. The number of students who selected question A is 10 more than the number of students who selected question B . How many students selected only question A from these three questions?
 - From these 100 students, how many students **did not** select any of the three questions A , B and C ?

10. The figure shows four points A , B , C and D on a level ground. D is located to the south of A , B to the east of D and C to the south of B . The bearing of B from A is 145° , $AD = 20$ m and $DC = 42$ m.

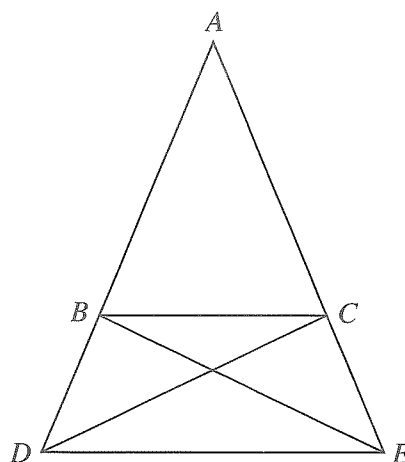
Copy the given figure onto your answer script and include the above information in it.

Using trigonometric ratios, find the distance DB to the nearest whole number and show that $2\hat{BCD} > \hat{DAB}$.



11. In the triangle ABC shown in the figure, $AB = AC$. The side AB is produced to D and the side AC is produced to E such that $BD = CE$.

- Show that $\hat{CBD} = \hat{BCE}$ and then show that the triangles CBD and BCE are congruent.
- Show that the triangle ADE is isosceles and then show that $\hat{ABC} = \hat{ADE}$.
- Show that the triangles ABC and ADE are equiangular and then show that $3BC = 2DE$ when $BD = \frac{1}{2}AB$.



12. As shown in the figure, PAE and PBF are the two tangents to the circle with centre O , drawn at the points A and B on the circle. BC is a diameter.

Copy this figure onto your answer script and,

- join OA and show that $OAPB$ is a cyclic quadrilateral.
- join CA , AB and OP and show that $\hat{ACB} = \hat{POB}$ and $\hat{EAC} = \hat{OAB}$.

