OL/2023(2024)/32/E-I

32 E I

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கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2023(2024)
General Certificate of Education (Ord. Level) Examination, 2023(2024)

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

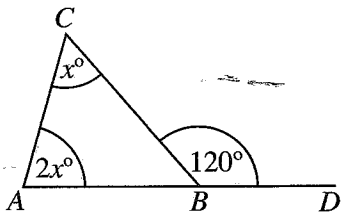
Part A

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

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

1. The annual assessed value of a shop located within the limits of a certain urban council that charges an annual rates percentage of 12%, is 24 000 rupees. How much has to be paid for a year as rates?

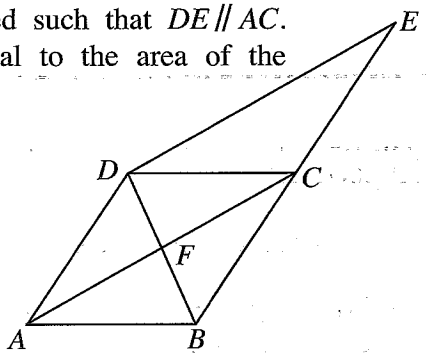
2. The side AB of the triangle ABC has been produced to D. Find the value of x based on the information given in the figure.



3. Find the least common multiple of the following algebraic terms.

$8xy$, $2xy^2$, $12y$

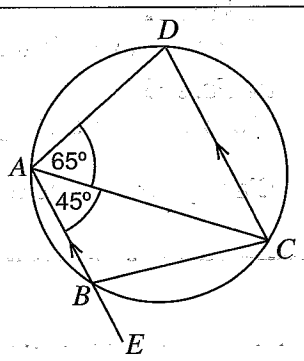
4. $ABCD$ is a parallelogram. E lies on the side BC produced such that $DE \parallel AC$. Name **three** triangles in this figure that are of area equal to the area of the triangle DCE.



5. If $\log_4 x = 3$, find the value of x.

6. Simplify: $\frac{3xy}{2} \div \frac{9y}{4}$

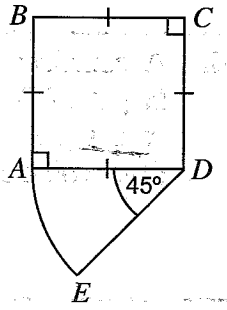
7. The points A, B, C and D lie on the circle shown in the figure. ABE is a straight line. Find the magnitude of $C\hat{B}E$ based on the given information.



[see page three

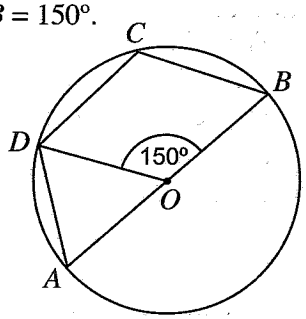
8. In the year 2023, Nimal's monthly income was 138 000 rupees. Nimal had to pay income tax of 6% on the income he earned above 100 000 rupees. Calculate the income tax that he had to pay for a month.

9. The diagram shows a composite figure consisting of a sector of a circle of radius 14 cm and central angle 45°, and a square. Find the perimeter of this figure.



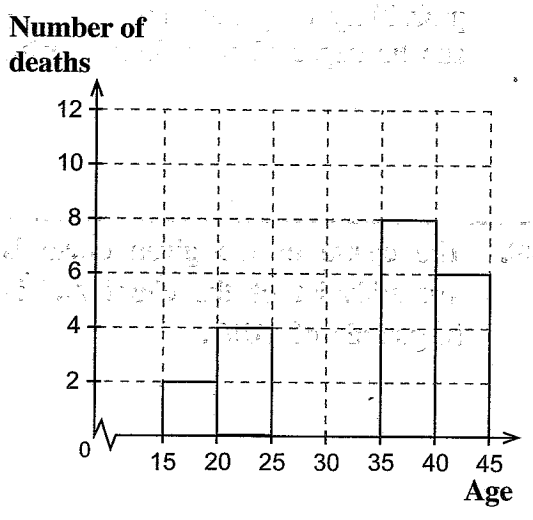
10. Find the equation of the straight line that passes through the points (0, 2) and (1, 5).

11. O is the centre of the given circle. AB is a diameter, and $D\hat{O}B = 150°$. Find the magnitude of $D\hat{C}B$.



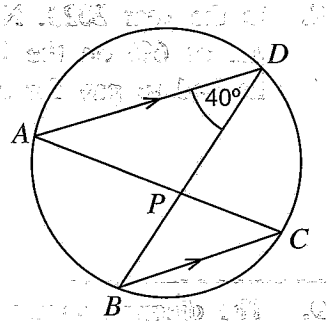
12. The number of deaths that occurred during a year in a certain city due to motorcycle accidents is shown in the following frequency distribution. Complete the histogram that has been drawn based on it.

Age (Years)	Number of deaths
15 – 20	2
20 – 25	4
25 – 35	12
35 – 40	8
40 – 45	6



[see page four

13. The points A, B, C and D lie on the circle shown in the figure. Moreover, $AD \parallel BC$. Find the magnitude of $C\hat{P}D$ based on the information given in the figure.

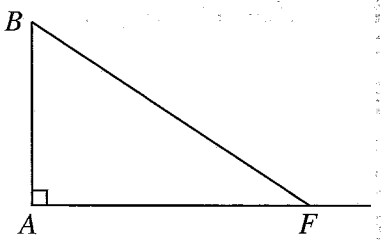


14. A container in the shape of a right prism of base area 77 cm^2 is filled with water to a height of 20 cm. When all this water is poured into a right circular cylindrical container of base radius 7 cm, to what height of the container will the water be filled?
(The volume of a right circular cylinder of base radius r and height h is $\pi r^2 h$.)

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

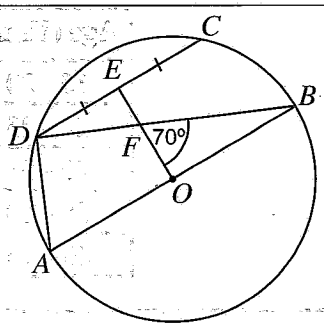
16. The second term of a geometric progression is 6 and its fifth term is 162. Find the common ratio of the progression.

17. A child is at location F on a level ground on which the foot of a vertical tree AB is located, as shown in the figure. In the figure, mark the angle of elevation $a°$ with which the child sees the top of the tree. If $A\hat{B}F = 50°$ find the value of a. (Disregard the height of the child.)



18. A plant is obtained from every bean seed in a certain packet of bean seeds, while the probability of getting an unhealthy plant from them is 0.02. How many unhealthy plants can be expected in a farm in which 300 of these bean seeds are planted?

19. The centre of the given circle is O and AB is a diameter. The midpoint of the chord DC is E. If $O\hat{F}B = 70°$, find the magnitude of $A\hat{D}C$.

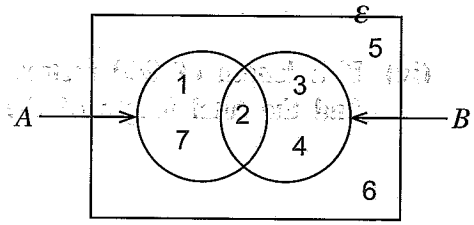


[see page five

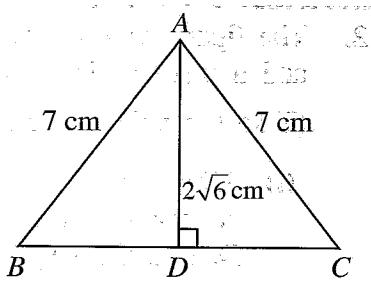
20. Solve: $\frac{2}{3a} - \frac{4}{9a} = \frac{1}{18}$

21. If the curved surface area of a solid right circular cylinder of base radius r cm and height h cm is four times the area of its base, how many times of the base radius is the height of the cylinder?

22. Write the elements of $A' \cup B$.

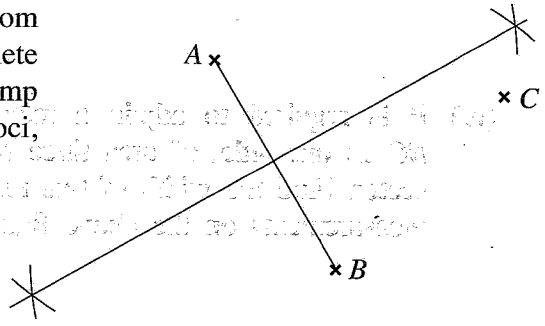


23. The figure shows an isosceles triangle ABC. Find the length of BC based on the given information.



24. Solve: $3 - 12x^2 = 0$

25. In the figure, A, B and C denote three houses. It is required to fix a lamp post at an equal distance from the three houses. The figure shows an incomplete sketch drawn to find the point at which the lamp post is to be located. Using the knowledge on loci, complete the sketch to find this point.



50

* *

[see page six

Part B

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

1. It has been planned to construct a wall in three stages with the participation of a group of men. In the first stage, 10 of them worked together for 4 days and completed $\frac{4}{7}$ of the total length of the wall.

(i) How many man days is the work done in the first stage of constructing the wall?

(ii) If $\frac{1}{3}$ of the remaining length of the wall is completed in the second stage, what fraction of the total length of the wall is this amount?

(iii) If only two men engaged in constructing the wall in the second stage, how many days did the two of them take for it?

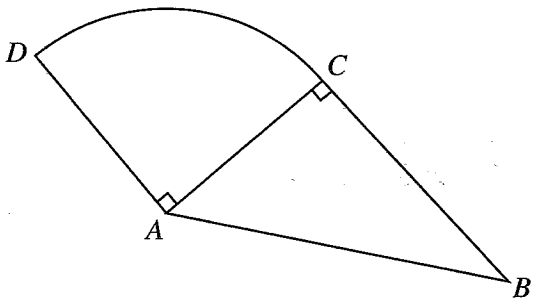
(iv) If a length of 200 metres remains to be built in the third stage of building the wall, find the total length of the wall.

10

2. The figure shows a vegetable plot consisting of a right angle triangular piece of land ABC and a piece of land ACD in the shape of a sector of a circle of central angle 90°.

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

(i) $AD = 7$ m. If a fence is built along the boundary of the sector ACD from C to D, find the length of the fence.



(ii) Find the area of the piece of land ACD.

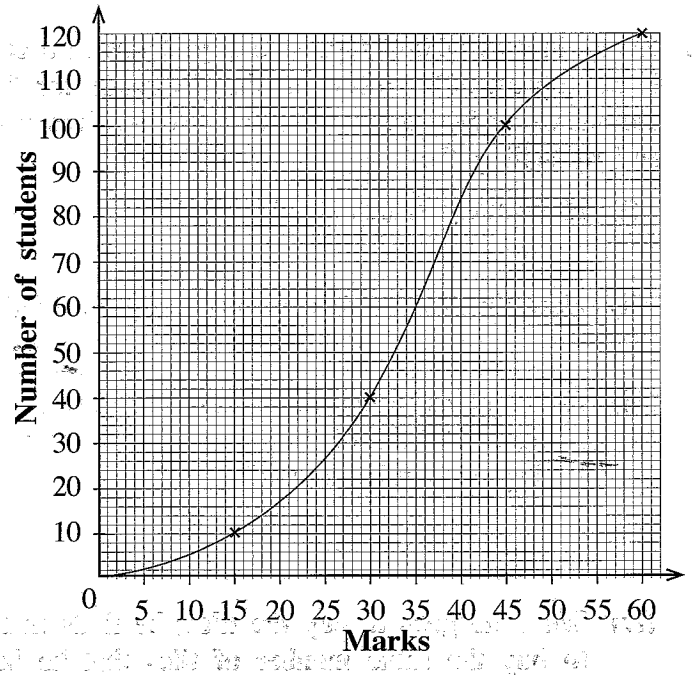
(iii) If the area of the piece of land ABC is 42 m^2, find the length of BC.

(iv) It is required to adjoin a rectangular piece of land outside the vegetable plot, with BC as one side, of area three times the area of the piece of land in the shape of the sector. Find the width of this rectangular piece of land and draw a sketch of it with its measurements on the above figure itself.

10

[*see page seven*

5. A cumulative frequency curve drawn using the marks obtained by 120 students of a certain school for a mathematics test is shown in the figure.



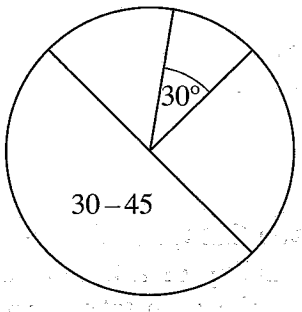
(*a*) (i) What is the maximum mark that a student has been able to obtain in this test?

(ii) How many students got 35 marks or less in this test?

(iii) From the students who took the test, it is required to select the group of 25% who have obtained the highest marks. For this, students who have obtained above which mark should be selected?

(*b*) An incomplete portion of the frequency table that was used to draw the cumulative frequency curve and an incomplete pie chart drawn using it are given below. Each sector of the pie chart represents the relevant number of students.

Interval of marks	Number of students
0 – 15	10
15 – 30	.....
30 – 45	.....
45 – 60	20
	120



(In the table the interval 15 – 30 denotes more than 15 and less than or equal to 30.)

(i) Fill in the blanks in the table based on the cumulative frequency curve.

(ii) Which interval of marks is represented by the sector in the pie chart with central angle 30°?

(iii) Find the central angle of the sector that represents the interval 45 – 60.

10

* * *

3. Kamal invests 50 000 rupees to buy shares in a certain company of which the price of a share is 50 rupees. After receiving the dividends for the shares at the end of a year, he sells all the shares at 54 rupees per share. He receives a total amount of 57 500 rupees, as dividends and by selling the shares.

(i) How many shares did he buy?

(ii) How much does this company pay as dividends annually for a share?

(iii) Kamal plans to buy floor tiles at the price of 500 rupees per tile using the 57 500 rupees in hand. If VAT of 15% has to be paid in addition for each tile, how many tiles can he buy with this amount?

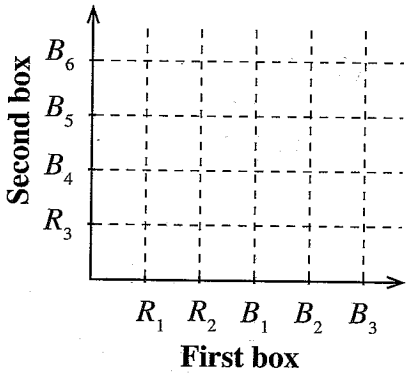
(iv) When he goes to buy the tiles, he finds that the VAT has been increased to 18%. Now, to buy the same number of tiles that he had planned to buy above, how much more money does he need?

10

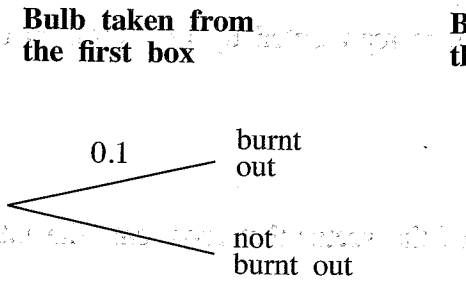
4. In one of two boxes there are two red bulbs and three blue bulbs. There is one red bulb and three blue bulbs in the other box. All the bulbs are of the same shape and size. A student randomly picks a bulb from the first box and a bulb from the second box.

(i) By considering that the red bulbs are denoted by R_1, R_2 and R_3 and the blue bulbs are denoted by B_1, B_2, B_3, B_4, B_5 and B_6, represent the sample space of the above mentioned random experiment on the given grid using the symbol 'X'.

(ii) Encircle on the grid, the event of the two bulbs taken from the two boxes being of the same colour and find its probability.



(iii) It is given that the probability of a bulb taken from the first box being burnt out is 0.1 and the probability of a bulb taken from the second box being burnt out is 0.2. The student examines the bulb taken from the first box and only if it is a burnt out one, does he examine the bulb taken from the second box. Extend the tree diagram given below such that both these events are represented and write the relevant probabilities on its branches.



(iv) Considering both the above mentioned events, find the probability of an examined bulb not being a burnt out one.

10

[see page eight

32 E II

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2023(2024)
கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2023(2024)
General Certificate of Education (Ord. Level) Examination, 2023(2024)

ගණිතය	II
கணிதம்	II
Mathematics	**II**

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

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

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 $\frac{4}{3}\pi r^3$.*
* *The volume of a right circular cone of base radius r and height h is $\frac{1}{3}\pi r^2 h$.*

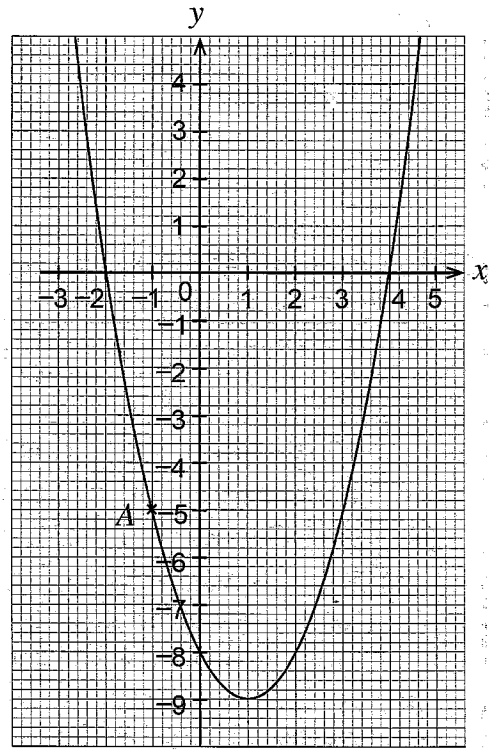
Part A

*Answer **five** questions only.*

1. Rani deposits an amount of 50 000 rupees for two years in a bank that compounds interest annually at an annual interest rate of 10%. Find the total interest amount that she receives and calculate the total amount in the deposit account at the end of the two years.

An interest amount equal to the above mentioned total interest amount can be obtained by investing the 50 000 rupees in a certain finance company for just one year at a simple interest rate. After the initial two years, if Rani invests the total amount in the bank account for another two years in the above finance company, find the interest she receives from the finance company.

2. The graph of a quadratic function of the form $y = f(x)$ is shown in the figure.



(i) Write the coordinates of the point A and the coordinates of the point at which the graph intersects the y-axis respectively.

(ii) Write the roots of the equation $f(x) = 0$ of the function $y = f(x)$ of which the graph has been drawn.

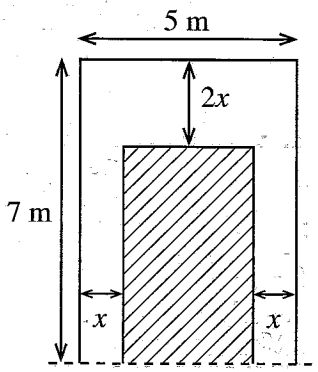
(iii) Write the interval of values of x on which the function is negative and increasing.

(iv) Write the function $y = f(x)$ in the form $y = (x - a)^2 + b$ by considering the equation of the axis of symmetry of the graph and the coordinates of its minimum point.

(v) Write the coordinates of the minimum point and the relevant quadratic function of the graph that is obtained by translating the given graph vertically upwards by four units in the coordinate plane, without changing its shape.

[see page two

3. A portion of a narrow pathway bordering a rectangular plot of land which is shaded in the figure is shown here. The area of this portion is 16 square metres. Using the information in the figure, show that x satisfies the equation $x^2 - 6x + 4 = 0$.



Taking the value of $\sqrt{5}$ as 2.24, find the solutions to the above equation and give reasons why only the smaller value of the two solutions is suitable for x.

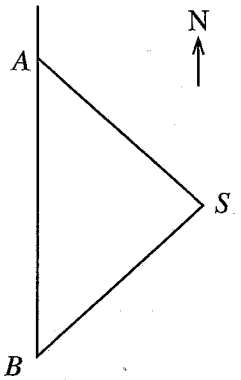
4. Books and pens were donated to the grade 10 and grade 11 students of a certain school in the following manner.

- A total of 516 books with 6 books for each grade 10 student and 8 books for each grade 11 student
- A total of 300 pens with 3 pens for each grade 10 student and 5 pens for each grade 11 student

By taking the number of students in grade 10 as x and the number of students in grade 11 as y, construct a pair of simultaneous equations and by solving them find separately the number of students in grade 10 and the number of students in grade 11.

In another school where it is proposed to distribute books and pens, although the total number of students in grades 10 and 11 is the same as the total number of students in these grades in the above mentioned school, the number of students in grade 11 is twice the number of students in grade 10. Show that 12 additional books are required to distribute books and pens in this school in the same manner as before.

5. Amal is at point A of a field, to the north of Bimal who is at point B. A statue S is located in this field. The bearing of S from A is 144°. Moreover $A\hat{B}S = 54°$ in the figure. The distance between Amal and the statue is 80.9 metres.



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

(ii) Give reasons why the triangle ABS can be used to find the distance between Amal and Bimal using trigonometric ratios.

(iii) Using trigonometric ratios, show that the distance between Amal and Bimal is 100 metres.

(iv) A flag pole is located at point F, 30 metres to the west of Bimal. Include this information in the figure you drew and find the magnitude of $A\hat{F}B$.

6. The following grouped frequency distribution has been prepared using the information obtained on the mass of each student in a certain group of students.

Class interval (kg)	40 – 44	44 – 48	48 – 52	52 – 56	56 – 60	60 – 64	64 – 68
Frequency	3	5	9	11	7	3	2

(The class interval 40 – 44 denotes greater than or equal to 40 and less than 44.)

(i) To which class interval does the most number of students belong?

(ii) Find the mean mass of a student in this group to the nearest kilogramme.

(iii) The maximum total mass of the students who can be taken in one van which was found for this group of students who plan to go on a trip is 600 kilogrammes. By using the mean, find the maximum number of students that can be expected to travel in this van.

(iv) Find the maximum number of students that it may be possible to take in the above mentioned van, based on the given frequency table. Give reasons for your answer.

[*see page three*

Part B

*Answer **five** questions only.*

7. A decoration has been made by fixing blue and white bulbs in several concentric circles. The blue bulbs have been fixed such that the innermost first circle has 3 bulbs and each of the following circles have three more bulbs than the previous circle. The white bulbs have been fixed such that the innermost first circle has 2 bulbs, the next circle has 3 bulbs, the circle after that has 4 bulbs, and so forth.

(i) Write the number of blue bulbs fixed in the first three circles respectively.

(ii) How many more blue bulbs are there than white bulbs in the 10^{th} circle?

(iii) The number of circles in which bulbs have been fixed in the decoration is 16. Sunil states that a total of 550 blue and white bulbs are sufficient for this. Is his statement correct? Give reasons for your answer.

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

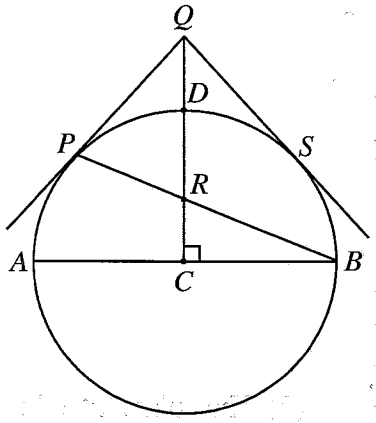
(i) Construct a straight line segment AB such that $AB = 6$ cm and construct its perpendicular bisector.

(ii) Construct the circle that touches AB at its midpoint P and has its centre O, 5 cm from A.

(iii) Construct the bisector of $A\hat{P}O$ and name the point at which it intersects the circle as Q.

(iv) Produce the line PO, take the point at which it meets the circle as T and construct the perpendicular from the point T to the line PQ. Give reasons why this perpendicular should pass through Q.

9. C is the centre and AB is a diameter of the circle in the given figure. P is a point on the circle. The radius CD is perpendicular to AB and it intersects PB at R. The tangent to the circle at P and CD produced meet at Q. The other tangent to the circle drawn from Q meets the circle at S.



Copy the figure in your answer script and join PA.

Show that $PACR$ is a cyclic quadrilateral and that $Q\hat{P}R = Q\hat{R}P$.

Join RS and show that RQS is an isosceles triangle.

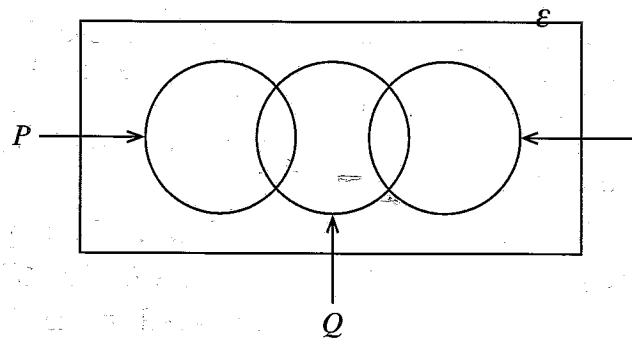
10. (*a*) A solid hemisphere of radius r cm made of metal is melted and 56 solid right circular cones of base radius $\frac{1}{4}$ the radius of the hemisphere, and height h cm are made. By assuming that there is no wastage of metal, show that the relationship between the radius of the hemisphere and the height of a cone is given by $r = \frac{7}{4}h$. If the height of a cone is 8 cm find the volume of the hemisphere. (Take the value of π as $\frac{22}{7}$.)

(*b*) $P = \frac{\sqrt{25.26} \times 0.78}{2.47}$.

Find the value of P to the first decimal place using the logarithms table.

[*see page four*

11. An incomplete Venn diagram providing information on the modes of transport used by 108 students to travel to school is given below. Each of these students use at least one of the three modes of transport, bus, car and train.



No students who travels by car travels by train.

(i) Copy the above incomplete Venn diagram in your answer script and name the sets denoted by P and Q.

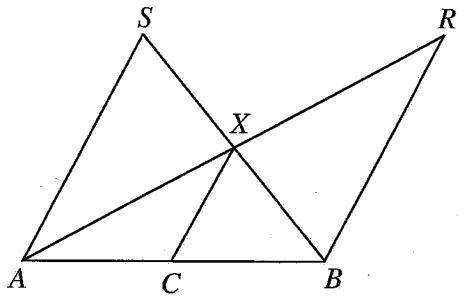
(ii) The number of students who travel by car or by train is 63. How many students travel by bus only?

(iii) If the number of students who travel by car is 23, find the number of students who travel by train.

(iv) If the number of students who travel by bus or train is 99 find the number of students who travel only by car.

(v) If the number of students who travel by bus and train is twice the number that travel by bus and car, find the number of students who use exactly one of these three modes of transport.

12. (*a*) Write the converse of the midpoint theorem.



(*b*) The midpoint of the side AB of the triangle ABX in the given figure is C. The straight line through B drawn parallel to CX meets AX produced at R. The straight line through A drawn parallel to CX meets BX produced at S.

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

(ii) Show that the triangles AXS and BXR are congruent.

(iii) Join SR and show that $SR = AB$.

(iv) Show that the area of $ABRS$ is 8 times the area of triangle ACX.

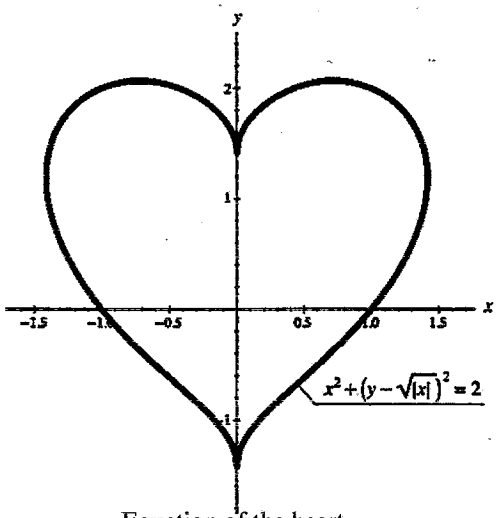
* * *

Department of Examinations - Sri Lanka

G.C.E. (O/L) Examination - 2023(2024)

32 - Mathematics

Marking Scheme



Equation of the heart

12345679 x 9=111111111
12345679 x18=222222222
12345679 x27=333333333
12345679 x36=444444444
12345679 x45=555555555
12345679 x54=666666666
12345679 x63=777777777
12345679 x72=888888888
12345679 x81=999999999

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1
1 10 45 120 210 252 210 120 45 10 1

Pascal Triangle

This document has been prepared for the use of Marking Examiners. Some changes would be made according to the views presented at the Chief Examiners' meeting.

Amendments to be included

අ.පො.ස. (සා.පෙළ) විභාගය - 2023 (2024)
32 - ගණිතය
ලකුණු දීමේ පටිපාටිය

[illegible] I

[illegible] A හා B යනුවෙන් කොටස් දෙකකින් යුක්තය. A කොටස, කෙටි පිළිතුරු අපේක්ෂිත ප්‍රශ්න 25 කින් ද, B [illegible] ප්‍රශ්න පහකින් ද සමන්විතය. මෙම ප්‍රශ්න සියල්ලටම, ප්‍රශ්න පත්‍රයෙහි එක් එක් ප්‍රශ්නය [illegible] තුළ පිළිතුරු සැපයිය යුතුය. කාලය පැය දෙකකි.

[illegible] II

[illegible] A හා B යනුවෙන් කොටස් දෙකකින් යුක්තය. A කොටසෙහි දී ඇති ප්‍රශ්න හයෙන් ප්‍රශ්න පහක් [illegible] දී ඇති ප්‍රශ්න හයෙන් ප්‍රශ්න පහක් ද වශයෙන් තෝරාගත් ප්‍රශ්න 10 කට පිළිතුරු සැපයිය [illegible] සඳහා ලියන පොත් හෝ කඩදාසි භාවිත කළ යුතුය. කාලය පැය තුනකි.

[illegible]	පිළිතුරු සැපයිය යුතු ප්‍රශ්න ගණන	එක් ප්‍රශ්නයකට ලකුණු	ලබා ගත හැකි උපරිම ලකුණු
[illegible] I [illegible]			
[illegible] - 25	25	02	02 × 25 = 50
[illegible] - 5	5	10	10 × 5 = 50
			එකතුව = 100
[illegible] II [illegible]			
[illegible]	5 (කැමති පරිදි තෝරාගත්)	10	10 × 5 = 50
[illegible]	5 (කැමති පරිදි තෝරාගත්)	10	10 × 5 = 50
			එකතුව = 100
			මුළු එකතුව = 200

[illegible] සඳහා අපේක්ෂකයකු ලබාගන්නා මුළු ලකුණු සංඛ්‍යාව 2 න් බෙදා අවසාන ලකුණ [illegible]

[illegible]

[illegible] දීමේ පටිපාටියෙන් බැහැරව ලකුණු නොදෙන්න.

[illegible] II පත්‍රයෙහි ප්‍රශ්න 10 තෝරා ගත යුත්තේ A හා B යන එක් එක් කොටසෙන් ප්‍රශ්න පහ [illegible] නියමිත සංඛ්‍යාවට වඩා වැඩියෙන් පිළිතුරු සපයා ඇති ප්‍රශ්න සඳහා ලකුණු නොලැබේ.

[illegible] විට ප්‍රධාන පරීක්ෂකගේ උපදෙස් ලබා ගන්න.

[illegible] ලකුණු කිරීම සඳහා රතු පෑනක් පමණක් පාවිච්චි කරන්න.

ගණිතය - I

I පත්‍රය ලකුණු කිරීම සඳහා උපදෙස්

❖ උත්තර ලිවීම සඳහා නියමිත ඉඩ ප්‍රමාණය තුළ ගණන සාදා ඇත්නම් ලකුණු ප්‍රදානය කරන්න.

A කොටස

- අංක 1 සිට 25 තෙක් ප්‍රශ්න 25 හි පිළිතුරුවලට අදාළ ලකුණුවල එකතුව අදාළ රවුම් තුළ සඳහන් කරන්න.
- A කොටසට හිමි මුළු ලකුණු පළමුවන පිටුවේ අදාළ ස්ථානයේ සටහන් කරන්න.

B කොටස

- ප්‍රශ්න 5 සඳහා ලකුණු 10 බැගින් ප්‍රදානය කරන්න. එම ලකුණු ද පළමුවන පිටුවේ අදාළ ස්ථානයේ සටහන් කරන්න.

ගණිතය - II

II පත්‍රය ලකුණු කිරීම සඳහා උපදෙස්

1. මෙම ලකුණු දීමේ පටිපාටියේ දක්වා ඇති කොටස් සඳහා ලකුණු තවදුරටත් නොබිඳින්න.

2. යම් ප්‍රශ්නයක් කොටස් කිහිපයකින් සමන්විත වන විට එක් කොටසක් සඳහා ලැබුණු වැරදි උත්තරයක්, ඊට පසු එන කොටසකට උත්තරයක් ලබා ගැනීමට භාවිත කොට ඇත්නම් එම දෙවන කොටසේ ක්‍රමය සඳහා දෙන ලෙස දක්වා ඇති ලකුණු දෙන්න.

3. දත්ත පිටපත් කිරීමේදී හෝ පියවරින් පියවර යාමේදී හෝ අත්වැරැද්දක් සිදුවී ඇත්නම් අ.වැ. යනුවෙන් එතන ලකුණු කොට ඒ සඳහා ලකුණු එකක් අඩු කරන්න. එම අත්වැරැද්දට අනුකූලව ඊළඟට එන පියවර නිවැරදි නම් ඒවාට නියමිත ලකුණු දෙන්න. එහෙත් එම කොටසේම දෙවන අත්වැරැද්ද සිදුවී ඇත්නම් අ.වැ. යනුවෙන් එතනදී ද ලකුණු කර එම ප්‍රශ්නයට ඉන් ඔබ්බට ලකුණු නොදී නවතින්න.

   සැ.යු. යම් වැරැද්දක් අත්වැරැද්දක් ලෙස සැලකිය යුත්තේ ඒ හේතුවෙන් පිළිතුරු සැපයීම පහසු වී නැතිනම් පමණි. විෂය කරුණු පිළිබඳ වැරදි, අත්වැරදි ලෙස සැලකිය යුතු නොවේ.

4. අවසාන උත්තරයේ ඒකකය දක්වා නැතිනම් හෝ වැරදි ලෙස දක්වා ඇත්නම් හෝ ලකුණු එකක් අඩු කරන්න.

5. මෙම ලකුණු දීමේ ක්‍රමය අනුව එක් එක් ප්‍රශ්නයේ ඒ ඒ කොටසේ අතරමැද පියවරවලට දියයුතු කොටස් ලකුණු එම පියවර අසලින් සටහන් කොට, අදාළ කොටස සඳහා මුළු ලකුණු ගණන එම කොටස අවසානයේදී කඩදාසියේ දකුණුපස තීරය සමීපයේ කවයක් තුළ ලියන්න.
   මෙසේ ..... ⑥

6. එක් එක් ප්‍රශ්නය සඳහා දෙන ලද මුළු ලකුණු ගණන උත්තරය අවසානයේදී ප්‍රශ්න අංකය ද සමග මෙසේ ලියා දක්වන්න. 3 — 05 හතරැස් කොටුව තුළ දක්වෙන්නේ ලැබූ ලකුණු ගණනයි.

7. ලකුණු ඇතුළත් කිරීම හා අවසාන ලකුණු (ප්‍රතිශතය) සටහන් කිරීම පිළිබඳ උපදෙස් මෙහි අවසානයේ දක්වේ.

අ.පො.ස. (සා.පෙළ) විභාගය - 2023 (2024)
උත්තරපත්‍ර ලකුණු කිරීමේ පොදු ශිල්පීය ක්‍රම

උත්තරපත්‍ර ලකුණු කිරීමේ හා ලකුණු ලැයිස්තුවල ලකුණු සටහන් කිරීමේ සම්මත ක්‍රමය අනුගමනය කිරීම අනිවාර්යයෙන් ම කළ යුතු වේ. ඒ සඳහා පහත සඳහන් පරිදි කටයුතු කරන්න.

1. සෑම සහකාර පරීක්ෂකවරයකුම උත්තරපත්‍ර ලකුණු කිරීමට රතුපාට බෝල් පොයින්ට් පෑනක් පාවිච්චි කරන්න.
2. ප්‍රධාන පරීක්ෂක විසින් දම්පාට බෝල් පොයින්ට් පෑනක් පාවිච්චි කළ යුතුය.
3. සෑම උත්තරපත්‍රයක ම මුල් පිටුවේ සහකාර පරීක්ෂක සංකේත අංකය සටහන් කරන්න. ලකුණු සටහන් කිරීමේදී **පැහැදිලි ඉලක්කමෙන්** ලියන්න.
4. ඉලක්කම් ලිවීමේදී යම් වැරදීමක් සිදු වුවහොත් එය පැහැදිලිව තනි ඉරකින් කපා හැර නැවත ලියා අත්සන යොදන්න.
5. එක් එක් ප්‍රශ්නයේ අනු කොටස්වල පිළිතුරු සඳහා හිමි ලකුණු ඒ ඒ කොටස අවසානයේ △ ක් තුළ භාග සංඛ්‍යාවක් ලෙස ලියා දක්වන්න. අවසාන ලකුණු ප්‍රශ්න අංකයත් සමඟ □ ක් තුළ, භාග සංඛ්‍යාවක් ලෙස ඇතුළත් කරන්න. ලකුණු සටහන් කිරීම සඳහා පරීක්ෂකවරයාගේ ප්‍රයෝජනය සඳහා ඇති තීරුව භාවිත කරන්න.
6. ගණිත පරීක්ෂක විසින් ලකුණු නිවැරදි බව සටහන් කිරීමට නිල් හෝ කළු පැනක් භාවිතා කළ යුතුය.

උදාහරණ : ප්‍රශ්න අංක 03

(i) .....
.....
..... √ △ 4/5

(ii) .....
.....
..... √ △ 3/5

(iii) .....
.....
..... √ △ 3/5

03 එකතුව → □ 10/15

බහුවරණ උත්තරපත්‍ර :

01. කවුළු පත්‍රය සැකසීම

I. ලකුණු දීමේ පටිපාටිය අනුව නිවැරදි වරණ කවුළු පත්‍රයේ සටහන් කරන්න.
II. එසේ ලකුණු කළ කවුළු බ්ලේඩ් තලයකින් කපා ඉවත් කරන්න.
III. කවුළු පත්‍රය උත්තරපත්‍රය මත නිවැරදිව තබා ගත හැකි වන පරිදි විභාග අංක කොටුව හා නිවැරදි පිළිතුරු ගණන දක්වෙන කොටුව ද කපා ඉවත් කරන්න.
IV. හරි පිළිතුරු හා වැරදි පිළිතුරු ලකුණු කළ හැකි වන පරිදි එක් එක් වරණ පේළිය අවසානයේ හිස් තීරයක් ද කපා ඉවත් කරන්න.
V. විෂය අංකය හා විෂය පැහැදිලිව පෙනෙන ආකාරයට එම කොටු ද කපා ඉවත් කරන්න.
VI. කපා ගත් කවුළු පත්‍රය ප්‍රධාන පරීක්ෂකවරයා ලවා අත්සන් යොදා අනුමත කර ගන්න.

02. **අනතුරුව උත්තරපත්‍ර හොඳින් පරීක්ෂා කර බලන්න. කිසියම් ප්‍රශ්නයකට එක් පිළිතුරකට වඩා ලකුණු කර ඇත්නම් හෝ එකම පිළිතුරක්වත් ලකුණු කර නැත්නම් හෝ වරණ කැපී යන පරිදි ඉරක් අඳින්න. ඇතැම් විට අයදුම්කරුවන් විසින් මුලින් ලකුණු කර ඇති පිළිතුරක් මකා වෙනත් පිළිතුරක් ලකුණු කර තිබිය හැක. එසේ මකන ලද අවස්ථාවකදී පැහැදිලිව මකා නොමැති නම් මකන ලද වරණය මත ද ඉරක් අඳින්න.**

03. කවුළු පත්‍රය උත්තරපත්‍රය මත තිවැරදිව තබන්න. නිවැරදි පිළිතුර ✓ ලකුණකින් ද, වැරදි පිළිතුර x ලකුණකින් ද ලකුණු කරන්න. නිවැරදි පිළිතුරු සංඛ්‍යාව ඒ ඒ වරණ තීරයට පහළින් ලියා දක්වන්න. අනතුරුව එම සංඛ්‍යා එකතු කර මුළු නිවැරදි පිළිතුරු සංඛ්‍යාව අදාළ කොටුව තුළ ලියන්න.

ව්‍යුහගත රචනා හා රචනා උත්තරපත්‍ර :

1. අයදුම්කරුවන් විසින් උත්තරපත්‍රයේ හිස්ව තබා ඇති පිටු හරහා රේඛාවක් ඇඳ කපා හරින්න. **වැරදි හෝ නුසුදුසු පිළිතුරු යටින් ඉරි ඇඳ වැරදි දමන්න. ලකුණු දිය හැකි ස්ථානවල හරි ලකුණු යෙදීමෙන් එය පෙන්වන්න.**

2. ලකුණු සටහන් කිරීමේදී ඕවර්ලන්ඩ් කඩදාසියේ දකුණු පස තීරය යොදා ගත යුතු වේ.

3. සෑම ප්‍රශ්නයකට ම දෙන මුළු ලකුණු උත්තරපත්‍රයේ මුල් පිටුවේ ඇති අදාළ කොටුව තුළ ප්‍රශ්න අංකය ඉදිරියෙන් **අංක දෙකකින් ලියා දක්වන්න.** ප්‍රශ්න පත්‍රයේ දී ඇති උපදෙස් අනුව ප්‍රශ්න තෝරා ගැනීම කළ යුතුවේ. සියලු ම උත්තර ලකුණු කර ලකුණු මුල් පිටුවේ සටහන් කරන්න. ප්‍රශ්න පත්‍රයේ දී ඇති උපදෙස්වලට පටහැනිව වැඩි ප්‍රශ්න ගණනකට පිළිතුරු ලියා ඇත්නම් අඩු ලකුණු සහිත පිළිතුරු කපා ඉවත් කරන්න.

4. පරීක්ෂාකාරීව මුළු ලකුණු ගණන එකතු කොට මුල් පිටුවේ නියමිත ස්ථානයේ ලියන්න. උත්තරපත්‍රයේ සෑම උත්තරයකටම දී ඇති ලකුණු ගණන උත්තරපත්‍රයේ පිටු පෙරළමින් නැවත එකතු කරන්න. එම ලකුණ ඔබ විසින් මුල් පිටුවේ එකතුව ලෙස සටහන් කර ඇති මුළු ලකුණට සමාන දැයි නැවත පරීක්ෂා කර බලන්න.

ලකුණු ලැයිස්තු සකස් කිරීම :

I. එක් පත්‍රයක් පමණක් ඇති විෂයන් හැර ඉතිරි සියලු ම විෂයන්හි අවසාන ලකුණු ඇගයීම් මණ්ඩලය තුළදී ගණනය කරනු නොලැබේ.

II. එක් එක් පත්‍රයට අදාළ අවසාන ලකුණු වෙන වෙනම ලකුණු ලැයිස්තුවලට ඇතුළත් කළ යුතුය.

III. I පත්‍රයට අදාළ ලකුණු, ලකුණු ලැයිස්තුවේ "Total Marks" තීරුවේ **ඇතුළත් කර අකුරෙන් ද ලියන්න.**

IV. II පත්‍රයේ ලකුණු ලැයිස්තුව සැකසීමේ දී විස්තර ලකුණු ඇතුළත් කිරීමෙන් අනතුරුව II පත්‍රයේ අවසාන ලකුණු, ලකුණු ලැයිස්තුවේ "Total Marks" තීරුවේ ඇතුළත් කරන්න.

V. 43 චිත්‍ර විෂයයේ I, II හා III පත්‍රවලට අදාළ ලකුණු වෙන වෙනම ලකුණු ලැයිස්තුවල ඇතුළත් කර **අකුරෙන් ද ලිවිය යුතු වේ.**

VI. 21 - සිංහල භාෂාව හා සාහිත්‍යය, 22 - දෙමළ භාෂාව හා සාහිත්‍යය යන විෂයන්හි I පත්‍රයේ ලකුණු ඇතුළත් කර අකුරෙන් ලිවිය යුතු ය. II හා III පත්‍රවල විස්තර ලකුණු ඇතුළත් කර ඒ ඒ පත්‍රයේ මුළු ලකුණු, ලකුණු ලැයිස්තුවට ඇතුළත් කළ යුතු ය.

සැ.යු :- (I) සෑම විටම එක් එක් පත්‍රයට අදාළ මුළු ලකුණු පූර්ණ සංඛ්‍යාවක් ලෙස ලකුණු ලැයිස්තුවට ඇතුළත් කළ යුතු ය. කිසිදු අවස්ථාවක පත්‍රයේ අවසාන ලකුණු දශම සංඛ්‍යාවකින් හෝ භාග සංඛ්‍යාවකින් නොතැබිය යුතු ය.

(II) ලකුණු ලැයිස්තුවල සෑම පිටුවකම ලකුණු ඇතුළත් කළ සහකාර පරීක්ෂක, ලකුණු පරීක්ෂා කළ සහකාර පරීක්ෂක, ඇගයීම් ලකුණු තහවුරු කිරීමේ පරීක්ෂක හා ප්‍රධාන පරීක්ෂක තම සංකේත අංකය යොදා අත්සන් කිරීමෙන් නිරවද්‍යතාව තහවුරු කිරීම අනිවාර්ය වේ.

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32 - ගණිතය - II පත්‍රය
නිපුණතා සහ ඉගෙනුම් පල

01. **නිපුණතාව 05 :**ප්‍රතිශත යොදා ගනිමින් නූතන ලෝකයේ සාර්ථක ලෙස ගනුදෙනු කරයි.

යම් මුදල් ප්‍රමාණයක් දී ඇති වාර්ෂික වැල්පොලියක් ගෙවන බැංකුවක අවුරුදු දෙකක් සඳහා තැන්පත් කිරීමෙන් ලැබෙන පොලියත් මුළු මුදලත් ගණනය කරයි. ඉහත බැංකුවෙන් අවුරුදු දෙකටම ලැබෙන පොළිය එක්තරා මුල්‍ය සමාගමක සුළු පොලියට වර්ෂයකට තැන්පත් කිරීමෙන් ලබා ගත හැකි නම්, ඉහත බැංකුවෙන් වර්ෂ දෙකකදී ලබා ගත් මුළු මුදල එම මුල්‍ය සමාගමේ වර්ෂ දෙකකට තැන්පත් කිරීමෙන් ලැබෙන පොලිය ගණනය කරයි.

02. **නිපුණතාව 20 :** විවිධ ක්‍රම විධි ගවේෂණය කරමින් විචල්‍ය දෙකක් අතර පවතින අන්‍යොන්‍ය සම්බන්ධතා පහසුවෙන් සන්නිවේදනය කරයි.

වර්ගජ ශ්‍රිතයක ප්‍රස්තාරය දී ඇති විට, එම ප්‍රස්තාරය ඇසුරෙන්,

(a)

i. ප්‍රස්තාරය මත දෙන ලද ලක්ෂ්‍යයකත්, ප්‍රස්තාරය y අක්ෂය ඡේදනය කරන ලක්ෂ්‍යයෙහිත් බණ්ඩාංක ලියයි.

ii. ශ්‍රිතය ශූන්‍ය වන විට ලැබෙන වර්ගජ සමීකරණයෙහි මුල සොයයි.

iii. ශ්‍රිතය ඍණව වැඩිවන x හි අගය ප්‍රාන්තරය ලියයි.

iv. ප්‍රස්තාරයේ සමමිති අක්ෂයේ සමීකරණයත් අවම ලක්ෂ්‍යයේ බණ්ඩාංකත් සැලකීමෙන්, ප්‍රස්තාරය ඇඳි වර්ගජ ශ්‍රිතය $y = (x - a)^2 + b$ ආකාරයට ලබාගනියි.

v. ප්‍රස්තාරයෙහි හැඩය නොවෙනස්ව පවත්වා ගනිමින්, දෙන ලද ඒකක ප්‍රමාණයකින් ප්‍රස්තාරය සිරස්ව විස්ථාපනය කළ විට ලැබෙන නව ප්‍රස්තාරයෙහි අවම ලක්ෂ්‍යයෙහි බණ්ඩාංකත්, එම ප්‍රස්තාරයට අදාළ වර්ගජ ශ්‍රිතයක් ලබා ගනියි.

03. **නිපුණතාව 17:** එදිනෙදා ජීවිතයේ අවශ්‍යතා සාක්ෂාත් කරගැනීම සඳහා සමීකරණ විසඳීමේ ක්‍රම විධි හසුරුවයි.

දෙන ලද රූපයක් මඟින් නිරූපණය කෙරෙන ඍජුකෝණාස්‍ර කිහිපයකින් සමන්විත සංයුක්ත බිම්කඩක වර්ගඵලය දී ඇති විට, රූපයේ සලකුණු කර ඇති අඥාත මිනුමක් මඟින් තෘප්ත කෙරෙන වර්ගජ සමීකරණය දෙන ලද සමීකරණයක් බව පෙන්වයි. අවශ්‍ය වන කරණියෙහි අගය ද ඇති විට, වර්ග පූරණයෙන් හෝ සූත්‍රය භාවිතයෙන් හෝ වර්ගජ සමීකරණය විසඳා අදාළ අඥාත මිනුම සඳහා ගැළපෙන අගය තේරීමට හේතු දක්වයි.

04. **නිපුණතාව 17:** එදිනෙදා ජීවිතයේ අවශ්‍යතා සාක්ෂාත් කරගැනීම සඳහා සමීකරණ විසඳීමේ ක්‍රම විධි හසුරුවයි.

දී ඇති තොරතුරු පදනම් කර ගනිමින් අඥාත දෙකක් සහිත සමගාමී සමීකරණ යුගලයක් ගොඩනඟා එය විසඳීමෙන් අඥාත දෙකේ අගය වෙන වෙනම සොයයි.

දෙන ලද අවශ්‍යතාවකට ගැළපෙන සේ නම් කරන ලද ද්‍රව්‍යයකින් වැඩිපුර ගත යුතු ප්‍රමාණ ගණනය කරයි.

05. **නිපුණතාව 13 :** විවිධ ක්‍රම විධි ගවේෂණය කරමින් ප්‍රායෝගික අවස්ථා සඳහා ත්‍රිකෝණමිතිය භාවිත කරයි.

තිරස් තලයක පිහිටා ඇති ස්ථාන තුනක පිහිටුම ආශ්‍රිත තොරතුරු දිගංශය ද ඇසුරෙන් දී ඇති විට, දී ඇති දළ සටහනක එම තොරතුරු නිරූපණය කරයි. අඳින ලද රූපයෙහි අඩංගු ජ්‍යාමිතික හා ත්‍රිකෝණමිතික සම්බන්ධතා හඳුනාගනියි. ත්‍රිකෝණමිතික අනුපාත භාවිත කරමින්, රූපයෙහි අඥාත මිනුම් ගණනය කරයි. සපයා ඇති අතිරේක තොරතුරුවලට ගැළපෙන පරිදි රූපය විස්තීරණය කරර් ඇසුරෙන් විමසා ඇති කෝණයක විශාලත්වය ගණනය කරයි.

06. **නිපුණතාව 29 :** දෛනික කටයුතු පහසු කර ගැනීම සඳහා විවිධ ක්‍රම මගින් දත්ත විශ්ලේෂණය කරමින් පුරෝකථනය කරයි.

සිසුන් කණ්ඩායමක එක් එක් සිසුවාගේ ස්කන්ධය පිළිබඳ ලබාගත් තොරතුරු ඇතුළත් සංඛ්‍යාත ව්‍යාප්තියක් දී ඇති විට

i. වැඩිම සිසුන් සංඛ්‍යාවකගේ බර ඇතුළත් පන්ති ප්‍රාන්තරය සොයයි.

ii. එක් සිසුවකුගේ මධ්‍යන්‍ය ස්කන්ධය ආසන්න කිලෝග්‍රෑමයට සොයයි.

iii. දෙන ලද සංඛ්‍යාත වගුවට අනුව අවශ්‍යතාවකට ගැලපෙන උපරිම සිසුන් සංඛ්‍යාව හේතු දක්වමින් ගණනය කරයි.

07. **නිපුණතාව 29 :** සංඛ්‍යා රටාවල විවිධ සම්බන්ධතා විමර්ශනය කරමින් ඉදිරි අවශ්‍යතා සඳහා තීරණ ගනී.

සැරසිල්ලක රටා නිර්මාණය කිරීම සඳහා එකිනෙකට වෙනස් වර්ණ දෙකකින් යුත් බල්බ යොදාගනීම ඇසුරෙන් දී ඇති සමාන්තර ශ්‍රේණි දෙකක්,

i. ඒවායේ පළමුවන පද හා පොදු අන්තර සමඟ හඳුනාගනිමින්

ii. එම ශ්‍රේණි දෙකෙහි 10 වන පද ලෙස ලැබෙන බල්බ සංඛ්‍යා සන්සන්දනය කරයි.

iii. එම ශ්‍රේණි දෙකෙහි පද 16 ක එකතුව ගණනය කර, ඒ ඇසුරෙන් සැරසිල්ල සඳහා අවශ්‍ය වන මුළු බල්බ සංඛ්‍යාව පිළිබඳ ප්‍රකාශයක සත්‍යතාව පරීක්ෂා කරයි.

08. **නිපුණතාව 27 :** ජ්‍යාමිතික නියම අනුව අවට පරිසරයේ පිහිටීම්වල ස්වභාවය විශ්ලේෂණය කරයි.

i. දෙන ලද දිගක් සහිත රේඛා ඛණ්ඩයක් නිර්මාණය කර එහි ලම්බ සමච්ඡේදනය නිර්මාණය කරයි.

ii. දෙන ලද අවශ්‍යතාවන් දෙකකට ගැලපෙන ලක්ෂ්‍යයක් සොයා එය කේන්ද්‍රය වන සේ වෘත්තයක් නිර්මාණය කරයි.

iii. නම් කරන ලද කෝණයක කෝණ සමච්ඡේදකය නිර්මාණය කරයි.

iv. නම් කරන ලද රේඛාවක් දික් කිරීමෙන් එය නැවත වෘත්තය හමුවන ලක්ෂ්‍යයේ සිට දෙන ලද රේඛාවකට ලම්බයක් නිර්මාණය කර එය නම් කරන ලද ලක්ෂ්‍යක් හරහා යා යුතු බවට හේතු දක්වයි.

09. **නිපුණතාව 24 :** වෘත්ත ආශ්‍රිත ජ්‍යාමිතික සංකල්ප පදනම් කර ගනිමින් නිගමනවලට එළඹීම සඳහා තර්කානුකූල චින්තනය මෙහෙයවයි.

වෘත්තයක් ආශ්‍රිතව දෙන ලද ජ්‍යාමිතික රූපයක් පිටපත් කරගෙන, දෙන ලද තොරතුරු අනුව රූපය විස්තිරණ කරයි. සපයා ඇති තොරතුරු සහ වෘත්ත ජ්‍යාමිතිය ආශ්‍රිත ප්‍රවේශ භාවිත කර, නම් කරන ලද චතුරස්‍රයක් වන බවටත් නම් කරන ලද කෝණ දෙකක් සමාන වන බවටත්, නම් කරන ලද ත්‍රිකෝණයක් සමද්විපාද වන බවටත් විධිමත් සාධක, හේතු සහිතව ඉදිරිපත් කරයි.

10. **නිපුණතාව 10 :** පරිමාව පිළිබඳව විචාරශීලීව කටයුතු කරමින් අවකාශයේ උපරිම ඵලදායිතාව ලබා ගනියි.

(a) දෙන ලද අරයක් සහිත ඝන ලෝහ අර්ධ ගෝලයක් උණු කිරීමෙන් අර්ධ ගොලයේ අරයේ $\frac{1}{4}$ ත් අරය සහ උස දී ඇති කේතු 56ත් සාදයි නම්, අර්ධ ගෝලයේ අරය සහ කේතුවක උස අතර සම්බන්ධතාවක් ගොඩ නඟයි.
කේතුවේ උස දී ඇති විට අර්ධ ගෝලයේ අරය ගණනය කර එහි පරිමාව ගණනය කරයි.

11. **නිපුණතාව 30 :** එදිනෙදා ජීවිතයේ කටයුතු පහසුකර ගැනීම සඳහා කුලක ආශ්‍රිත මූලධර්ම හසුරුවයි.

i. සර්වත්‍ර කුලකයකට අයත් උපකුලක තුනක් පිළිබඳව සපයා ඇති තොරතුරු නිරූපණය කිරීම සඳහා උචිත වන වෙන් රූප සටහනක් දී, එක් කුලකයක් පමණක් නම් කර ඇති විට අනෙක් කුලක දෙක නිවැරදිව වෙන් කර හඳුනාගනියි.

ii. වෙන් රූප සටහනෙහි සමහර උපකුලක ආශ්‍රිත තොරතුරු දී ඇති විට අනෙක් උපකුලක ආශ්‍රිත තොරතුරු ගණනය කරයි.

iii. නම් කරන ලද උප කුලකයක අවයව සංඛ්‍යාව දී ඇති විට වෙනත් උප කුලකයක සංඛ්‍යාව ගණනය කරයි.

iv. උප කුලක දෙකක මේලය දී ඇති විට එක් උප කුලකයක පමණක් ඇති අවයව සංඛ්‍යාව ගණනය කරයි.

v. උප කුලක දෙකක ඡේදන කොටසේ ඇති අවයව සංඛ්‍යාව වෙනත් උප කුලක දෙකක ඡේදන කොටසේ ඇති අවයව සංඛ්‍යාව මෙන් දෙගුණයක් නම් ඡේදනය නොවන උප කුලකවල පමණක් ඇති අවයව සංඛ්‍යාව ගණනය කරයි.

12. **නිපුණතාව 23 :** සරල රේඛීය තලරූප ආශ්‍රිත ජ්‍යාමිතික සංකල්ප පදනම් කරගනිමින් එදිනෙදා ජීවිතයේ කටයුතු සඳහා අවශ්‍ය නිගමනවලට එළඹෙයි.

(a) නම් කරන ලද ප්‍රමේයක විලෝමය ලියා දක්වයි.

(b) දී ඇති ත්‍රිකෝණයක එක් පාදයක මධ්‍ය ලක්ෂ්‍යය සම්මුඛ ශීර්ෂයට යා කිරීමෙන් ලැබෙන රේඛාවට ඉතිරි ශීර්ෂ දෙක හරහා පළමු රේඛාවට සමාන්තරව අඳින ලද රේඛා දෙකක් සහිත රූප සටහනක් දී ඇති විට

i. දී ඇති රූපය පිටපත් කර දී ඇති තොරතුරු එහි ඇතුළත් කරයි.

ii. නම් කරන ලද ත්‍රිකෝණ දෙකක් අංගසම බව පෙන්වයි.

iii. නම් කරන ලද පාද දෙකක් සමාන බව පෙන්වයි.

iv. නම් කරන ලද චතුරස්‍රයක වර්ගඵලය, දැක් වූ නම් කරන ලද ත්‍රිකෝණයක වර්ගඵලය මෙන් අට ගුණයක් බව පෙන්වයි.

G.C.E.(O/L) EXAMINATION - 2023 (2024)
Common Techniques of Marking Answer Scripts.

It is compulsory to adhere to the following standard method in marking answer scripts and entering mark sheets.

1. Each Assistant Examiner should use red colour ball-point pen for marking answer scripts.
2. A purple colour ball-point pen should be used by Chief Examiners.
3. Code number of the Assistant Examiner should be noted down on front page of each answer script. Enter marks in **clear numerals**.
4. Write off incorrectly written numerals with a clear single line and authenticate the alterations with Examiner's initial.
5. Enter the marks of each subsection of a question as a rational number in the given space of Δ and the final marks of each question should be entered as a total rational number in the given space of □ by denoting respective question number as well. Use the column assigned for the Examiners to write marks.
6. Evaluation Mark Finalizer should use blue or black colour pen to verify the accuracy of the marks.

Example: **Question No. 03**

(i) ..... √ $\frac{4}{5}$

(ii) ..... √ $\frac{3}{5}$

(iii) ..... √ $\frac{3}{5}$

03 (i) $\frac{4}{5}$ + (ii) $\frac{3}{5}$ + (iii) $\frac{3}{5}$ = $\frac{10}{15}$

MCQ answer scripts: (Template)

1.
   i. Mark the correct options on the template according to the Marking Scheme.
   ii. Cut off the marked windows with a blade.
   iii. Cut off the cages for Index Number and the number of correct options so as to be able to keep the template correctly on the answer script.
   iv. Cut off a blank space to the right of each options column to mark the answers.
   v. Cut off the cages for the subject number and the subject to be clearly visible.
   vi. Submit the prepared template to the Chief Examiner for approval.

2. Then, check the answer scripts carefully. If there are more than one or no answers marked to a certain question write off the options with a line. Sometimes candidates may have erased an option marked previously and selected another option. In such occasions, if the erasure is not clear write off those options too.

3. Place the template on the answer script correctly. Mark the right answers with a '√' and the wrong answers with a 'X' against the options column. Write down the number of correct answers inside the cage given under each column. Then, add those numbers and write the number of correct answers in the relevant cage.

Structured essay type and essay type answer scripts:

1. Cross off any pages left blank by candidates. **Underline wrong or unsuitable answers and write cross mark. Point-out areas by a check mark, where marks can be offered.**
2. Use the right margin of the overland paper to write down the marks.
3. Write down the marks given for each question against the question number in the relevant cage on the front page in **two digits.** Selection of questions should be in accordance with the instructions given in the question paper. Mark all answers and transfer the marks to the front page, and write off answers with lower marks if extra questions have been answered against instructions.
4. Add the total marks carefully and write in the relevant cage on the front page. Turn pages of answer script and add all the marks given for all answers again. Check whether that total tallies with the total marks written on the front page.

Preparation Of Mark Sheets.

Except for the subjects with a single question paper, final marks of two papers will not be calculated within the evaluation board. Therefore add separate mark sheets for each of the question paper. Enter paper I marks in "Total Marks" column of the mark sheet and write them in words as well. Enter paper II Marks in the " Total Marks" Column and include the relevant details. For the subject 43 Art, Paper I, II and III Marks should be entered numerically in the separate mark sheets and **should also be written in words.**

For subjects 21 Sinhala language and literature and 22 Tamil Language and literature, paper I marks once entered numerically should be written in words. Use separate marks sheets for the papers II and III and enter the total marks in the "Total marks column". Write the relevant detailed marks against each of the total mark.

N.B.:-

I. Final marks for paper I, paper II or paper III should always be rounded up to the nearest whole number and they should never be kept as decimal or half values.

II. Each page of the mark sheet should be compulsorily verified by the Assistant Examiner who entered marks to the mark sheet, Assistant Examiner who checked the mark sheet, the Verifying Examiner of the evaluation marks and Chief Examiner by placing respective code number and the signature.

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இலங்கை பரீட்சைத் திணைக்களம்
க.பொ.த (சாதாரண தர)ப் பரீட்சை -2023(2024)
32- கணிதம்
புள்ளி வழங்கும் திட்டம்

கணிதம் - I

இவ்வினாத்தாள் A, B ஆகிய இரு பகுதிகளைக் கொண்ட பகுதி A யில் 25 சிறு வினாக்களும், பகுதி B யில் 5 கட்டமைப்பு வினாக்களும் உள்ளடக்கப்பட்டுள்ளது. எல்லா வினாக்களுக்கும் விடை அளிக்க வேண்டும். நேரம் 2 மணித்தியாலம்

கணிதம் II

இவ் வினாத்தாள் A, B ஆகிய பகுதிகளைக் கொண்டது. பகுதி A யில் உள்ள 6 வினாக்களில் எவையேனும் 5 வினாக்களுக்கும், பகுதி B யிலுள்ள 6 வினாக்களில் எவையேனும் 5 வினாக்களுக்குமாக எல்லாமாக 10 வினாக்களுக்கு மட்டும் விடையளிக்க வேண்டும். நேரம் 3 மணித்தியாலம்

மொத்த வினாக்களின் எண்ணிக்கை	விடையளிக்க வேண்டிய வினாக்களின் எண்ணிக்கை	விடைகளுக்குரிய புள்ளிகள்	பெறக்கூடிய உச்ச புள்ளிகள்
கணிதம் - I பகுதி A - 25	25	பத்திரம் - I வினா இல 1 - 25 வரை 2 புள்ளி வீதம்	02 × 25 = 50
பகுதி B - 5	5	வினா இல 1 - 5 வரை 10 புள்ளி வீதம்	10 × 5 = 50
		மொத்தப் புள்ளி	100
கணிதம்- II A பகுதி - 6	5	பத்திரம் - II	10 × 5 = 50
B பகுதி - 6	5	ஒரு வினாவுக்கு 10 புள்ளி வீதம்	10 × 5 = 50
		ஒரு வினாவுக்கு 10 புள்ளி வீதம்	100
		மொத்த புள்ளி	

இரு பத்திரங்களில் ஒரு பரீட்சார்த்தி பெறும் மொத்தப் புள்ளியை 2 ஆல் வகுத்து இறுதிப் புள்ளி பெறப்படும். 2 ஆல் வகுக்கும்போது மீதி ஏற்படின் இறுதிப்புள்ளியை அடுத்துள்ள முழு எண்ணிற்கு மட்டம் தட்டுக.

முக்கியம் :-

1. இப்புள்ளி வழங்கும் திட்டத்துக்கு புறம்பாகப் புள்ளியை வழங்க வேண்டாம்.
2. கணிதம் II வினாத்தாளின் பிரிவு A,B இலிருந்து தலா ஐந்து வினாக்கள் வீதம் மொத்தம் 10 வினாக்களுக்கு புள்ளி வழங்கப்பட வேண்டும். நிர்ணயிக்கப்பட்ட எண்ணிக்கைக்கு மேல் விடையளிக்கும் வினாக்களுக்கு புள்ளி வழங்க வேண்டாம்.
3. பிரச்சினை ஏற்படும் போது பிரதம பரீட்சகரின் ஆலோசனையைப் பெறுக.
4. புள்ளி வழங்குவதற்காகச் சிவப்பு நிற மை பயன்படுத்தப்படுதல் வேண்டும்.

கணிதம் - I

குறிக்கோள்

1. பரீட்சார்திகள் பாடத்திட்டத்துக்கு அமைவாக கற்றுள்ள கணித அலகுகளுடன் தொடர்புடைய தத்துவங்களை கிரகித்திருக்கும் மட்டங்களையும்
2. கணிதத்துடன் தொடர்புடைய தொடர்பாடல் ஆற்றலும் தொடர்பு காணும் திறன்களையும்
3. பல்வேறு கணிதச் செய்கைகளை அடிப்படையாகக் கொண்ட எண்களைச் சரியாக ஒழுங்குபடுத்தும் ஆற்றலையும்
4. குறித்த நிபுணத்துவங்களை மாணவர் அடைந்துள்ளனரா எனவும், இவ்வினாப்பத்திரம் மூலமாக பரீட்சிக்க எதிர்பார்க்கப்படுகிறது.

பத்திரம் I இற்கு புள்ளி வழங்குவது தொடர்பான அறிவுறுத்தல்கள்

விடை அளிப்பதற்காக ஒதுக்கப்பட்டுள்ள இடத்தில் விடைகள் எழுத்தப்பட்டிருப்பின் முழுப்புள்ளிகளையும் வழங்குக.

A - பகுதி

வினா இல 01- 25 வரையிலான 25 வினாக்களுக்கு 02 புள்ளி வீதம்

வினா இல 01-07 வரை இறுதியில் அந்த 07 வினாக்களுக்குமான மொத்த புள்ளிகளையும்
08-12 வரை இறுதியில் அந்த 06 வினாக்களுக்குமான மொத்த புள்ளிகளையும்
13-19 வரை இறுதியில் அந்த 06 வினாக்களுக்குமான மொத்த புள்ளிகளையும்
20-25 வரை இறுதியில் அந்த 06 வினாக்களுக்குமான மொத்த புள்ளிகளையும்
தரப்பட்ட சதுரக் கூட்டில் எழுதுக.

மொத்தப் புள்ளிகளை இறுதியிலுள்ள வட்ட கூட்டில் எழுதிய பின் முன் பக்கத்தில் உரிய கூட்டினுள் பதிக.

பகுதி B

ஐந்து வினாக்களுக்கு 10 புள்ளி வீதம் புள்ளி வழங்கவும். இப்புள்ளிகளை முதற்பக்கத்தில் உரிய கூட்டினுள் பதியவும்.
முன்பக்கத்தில் குறித்த கூடுகளில் இட்ட புள்ளிகளை கூட்டி மொத்தப் புள்ளியை எழுதுக.

கணிதம் II

குறிக்கோள்கள்

1. பரீட்சார்த்திகள் பாடத்திட்டத்துக்கு அமைவாக கற்றுள்ள கணித எண்ணக் கருக்கள், தத்துவங்கள், கணிதச் செய்கைகள் பற்றிய அறிவைப் பெற்றிருத்தல் அவற்றோடு தொடர்பான திறன்களை விருத்தி செய்தல்.
2. வாய்மொழியாக, எழுத்து மூலமாக வரிப்படங்கள் மூலமாக, வரைபுகள் மூலமாக மாதிரிகள் மூலமாக அட்சர கணித முறையாகத் தொடர்பாடலைச் செய்யும் திறன்களைப் பரீட்சார்த்திகள் பெறுதல்
3. கணிதத்தில் வெவ்வேறு விடயங்களுக்கு இடையிலும், கணிதத்துக்கும் வேறு பாடப் பரப்புக்களுக்கு இடையிலும் காணப்படும் தொடர்புகளை இனங்காண்பதன் மூலம் பெறப்படும் அறிவைப் புதிய சந்தர்ப்பங்களில் உபயோகிக்கும் திறன்களைப் பரீட்சார்த்திகள் பெற்றிருத்தல்
4. மேற்கூறிய விடையங்களுக்காக தேவையான தர்க்க ரீதியான வாதங்களை உருவாக்குவதற்கும் அவ்விடயங்களை மதிப்பீடு செய்வற்குமான தேர்ச்சிகளைப் பரீட்சார்த்திகளிடம் விருத்தி செய்தல்.
5. உரிய கணிதச் செய்கைளின் மூலம் எண்களைச் சரியாக கையாளும் சந்தர்ப்பங்களில் பிரசினம் தீர்க்கும் திறனைப் பெற்றிருத்தல்.

போன்ற விடயங்கள் தொடர்பான அடைவு மட்டங்கள் எய்தப்பட்டுள்ளனவா என்பது இப்பத்திரத்தின் ஊடாக எதிர்பார்க்கப்படகின்றது.

பத்திரம்- II இற்கு புள்ளி வழங்குவது தொடர்பான அறிவுறுத்தல்கள்

1. இப்புள்ளித் திட்டத்தில் காட்டப்பட்டுள்ள பகுதிப் புள்ளிகளை மேலும் பிரிக்க வேண்டாம்

2. ஏதேனும் ஒரு வினா பல பகுதிகளைக் கொண்டதாக இருக்கும்போது ஒரு பகுதியில் பெற்ற பிழையான விடையை அதற்குப் பின்னர் வரும் பகுதியின் விடையைப் பெறுவதற்குப் பயன்படுத்தி இருப்பின், இரண்டாவது பகுதியில் முறை (Method) என்பதற்கு வழங்குவதற்காக காட்டப்பட்டுள்ள புள்ளியை வழங்குக. எனினும் இவ்விரண்டாம் பகுதியின் பிழையான விடைக்குப் புள்ளி வழங்க வேண்டாம்.

3. தரவுகளைப் பிரதி செய்யும்போதோ, படிக்கும்படி சொல்லும்போதோ "வழு" ஏற்படின் "வழு" (Slip) என அவ்விடத்தில் குறிப்பிட்டு 01 புள்ளியைக் குறைக்க. அவ்வழுவிற்கு ஏற்ப அடுத்துவரும் படிகள் சரி எனின் அவற்றிற்குரிய புள்ளிகளை வழங்கவும். எனினும் அப்பகுதியில் இரண்டாவது "வழு" ஏற்படின் "வழு" (Slip) என அவ்விடத்தில் குறிப்பிட்டு அதன்பின்னர் புள்ளி வழங்குவதை நிறுத்தவும்

குறிப்பு:
எந்தவொரு பிழையையும் அதனால் அப்பிரச்சினையைத் தீர்த்தல் கடினமாகும் போது வழு எனக் கொள்ளப்படும். பாட விடயம் தொடர்பான பிழையை "வழு" எனக் கருத்தக்கூடாது.

4. இறுதி விடையில் "அலகு" குறிப்பிடாவிட்டால் அல்லது பிழையாக குறிப்பிட்டிருந்தால் 1 புள்ளியைக் குறைக்க.

5. இறுதிப்புள்ளி வழங்கல் முறைக்கு ஏற்ப ஒவ்வொரு வினாவுக்கும், அவ்வப்பகுதிகளில் உள்ள படிகளுக்கு வழங்க வேண்டிய பகுதிப்புள்ளிகளை அப்படிகளுக்கே அருகே குறித்து பகுதிக்குரிய மொத்தப் புள்ளியை அப்பகுதியின் இறுதியில் தாளின் வலதுபக்க நிரலுக்கு அருகே வட்டம் ஒன்றினுள் ⑥ என்றவாறு எழுதுங்கள்.

6. ஒவ்வொரு வினாவிற்கும் வழங்கும் மொத்தப் புள்ளியை விடையின் இறுதியில் வினா இலக்கத்தடன் சதுரக்கூடு ஒன்றினுள் வலதுபக்க நிரலில் 04 - 06 என்றவாறு எழுதுங்கள்

7. புள்ளிகளை பதிதல், இறுதியில் புள்ளிக்கான நுற்று வீதத்தை குறித்தல் போன்ற விடயங்கள் தொடர்பான அறிவுறுத்தல்கள் இதன் இறுதியில் தரப்பட்டுள்ளன.

விடைப்பத்திரத்திற்கு புள்ளி வழங்கும் பொது அறிவுறுத்தல்

விடைப்பத்திரத்திற்கு புள்ளி வழங்கலுக்கும் புள்ளி பதிதலுக்கும் அறிவுறுத்தல்களைக் கட்டாயம் பின்பற்றப்பட வேண்டும். அதற்காக பின்வரும் நடைமுறைகள் கையாளப்பட்ட வேண்டும்

- ☆ விடைப்பத்திரங்களுக்குப் புள்ளி வழங்கும் போது சிவப்பு நிறப்பென்சில் அல்லது சிவப்பு நிற குமிழ்முனைப் பேனை என்பவற்றைப் பயன்படுத்தவும்
- ☆ சகல விடைத்தாளிலும் பரீட்சகரின் குறியீட்டு எண் எழுதப்பட வேண்டும்
- ☆ இலக்கங்களை எழுதும் போது கீழே குறிக்ப்பட்ட விதிமுறைகளைக் கையாளவும்
- ☆ இலக்கங்களை எழுதும் போது பிழைகள் ஏற்படின் தனிக் கோட்டினால் வெட்டி திரும்பவும் தெளிவாக இலக்கங்களை எழுதி சிற்றொப்பம் வைக்கவும்
- ☆ கணிதம் I வினாக்களும் விடைகளும்
- ☆ A பகுதி வினாக்களுக்கு (2) புள்ளிகள் வழங்கப்பட இருப்பின் சரியான விடை மாத்திரம் இருப்பின் 02 புள்ளிகளை வழங்கவும்
- ☆ படிமுறை தொடர்பாக (1) + (1) எனக் குறிப்பிட்டிருப்பின் உரிய படிமுறைகளுக்கு ஒரு புள்ளி விதம் வழங்குக.
    - விடைத்தாளில் புள்ளியிடப்பட்ட பின்னர் A, B பகுதிகளின் கூட்டுத்தொகையை விடைத்தாளின் முன்பக்கத்தில் அதற்குரிய பக்கத்தில் பதிய வேண்டும். சரியான கூட்டுத்தொகை எழுதப்படல் வேண்டும்.

க.பொ.த (சா.தர)ப் பரீட்சை - 2023(2024)
விடைத்தாள்களுக்குப் புள்ளியிடலுக்கான பொது நுட்ப முறைகள்

விடைத்தாள்களுக்குப் புள்ளியிடும் போதும், புள்ளிப்பட்டியலில் புள்ளிகளைப் பதியும் போதும் ஓர் அங்கீகரிக்கப்பட்ட முறையைக் கடைப்பிடித்தல் கட்டாயமானதாகும். அதன் பொருட்டு பின்வரும் முறையில் செயற்படவும்.

1. சகல உதவிப் பரீட்சகர்களும் விடைத்தாள்களுக்குப் புள்ளியிடுவதற்கு சிவப்பு நிற மைப் பேனாவை பயன்படுத்தவும்.
2. பிரதம பரீட்சகர் ஊதாநிற மைப்பேனாவைப் பயன்படுத்த வேண்டும்.
3. சகல விடைத்தாள்களினதும் முதற்பக்கத்தில் உதவிப் பரீட்சகரின் குறியீட்டெண்ணைக் குறிப்பிடவும். இலக்கங்கள் எழுதும் போது **தெளிவான இலக்கத்தில்** எழுதவும்.
4. இலக்கங்களை எழுதும் போது பிழைகள் ஏற்பட்டால் அவற்றைத் தனிக்கோட்டினால் கீறிவிட்டு, மீண்டும் பக்கத்தில் சரியாக எழுதி, ஒப்பம் இடவும்.
5. ஒவ்வொரு வினாவினதும் உபபகுதிகளின் விடைகளுக்காக பெற்றுக்கொண்ட புள்ளியை பதியும் போது அந்த வினாப்பகுதிகளின் இறுதியில் இன் உள் பின்னங்களாகப் பதியவும். இறுதிப் புள்ளியை வினா இலக்கத்துடன் இன் உள் பின்னமாகப் பதியவும். புள்ளிகளைப் பதிவதற்கு பரீட்சகர்களுக்காக ஒதுக்கப்பட்ட நிரலை உபயோகிக்கவும்.
6. எண்கணித பரீட்சகரினால் புள்ளிகள் பிழையற்றது என உறுதிப்படுத்த நீலநிற அல்லது கறுப்புநிறப் பேனாவினை உபயோகிக்கவும்.

உதாரணம் - வினா இல 03

(i) .....
.....
.....
✓ 4/5

(ii) .....
.....
.....
✓ 3/5

(iii) .....
.....
.....
✓ 3/5

03 $(i)\ \frac{4}{5} + (ii)\ \frac{3}{5} + (iii)\ \frac{3}{5} = \boxed{\frac{10}{15}}$

பல்தேர்வு விடைத்தாள்

1. துளைத்தாள் தயாரித்தல்
   I. புள்ளி வழங்கும் திட்டத்தின் படி சரியான தெரிவைத் துளைத்தாளில் அடையாளமிடவும்.
   II. அவ்வாறு அடையாளமிடப்பட்ட இடத்தை வெட்டி நீக்கித் துளைத்தாளைத் தயாரிக்கவும்.
   III. துளைத்தாளை விடைகளின் மீது சரியாக வைத்துக் கொள்ளக்கூடியதாகச் சுட்டெண் அடைப்பையும் வெட்டி நீக்கவும். சரியான விடைகளின் எண்ணிக்கையைக் காட்டும் அடைப்பையும் வெட்டி நீக்கவும்.
   IV. சரியான, பிழையான விடைகளை குறிப்பிடக்கூடியதாக ஒவ்வொரு வரிசைக்கும் இறுதியில் வெற்று நிரையொன்றை வெட்டி ஏற்படுத்திக் கொள்ளவும்.
   V. வெட்டிக்கொண்ட துளைத்தாளில் பிரதம பரீட்சகரிடம் கையொப்பம் பெற்று அங்கீகரித்துக் கொள்ளவும்.

2. **அதன் பின்னர் விடைத்தாளை நன்கு பரிசீலித்துப் பார்க்கவும். ஏதாவது வினாவுக்கு, ஒரு விடைக்கும் அதிகமாக குறியிட்டிருந்தாலோ, ஒரு விடைக்காவது குறியிடப்படாமலிருந்தாலோ தெரிவுகளை வெட்டிவிடக்கூடியதாக கோடொன்றைக் கீறவும். சில வேளைகளில் பரீட்சார்த்தி முன்னர் குறிப்பிட்ட விடையை அழித்து விட்டு வேறு விடைக்குக் குறியிட்டிருக்க முடியும். அவ்வாறு அழித்துள்ள போது நன்கு அழிக்காது விட்டிருந்தால், அவ்வாறு அழிக்கப்பட்ட தெரிவின் மீதும் கோடிடவும்.**
3. துளைத்தாளை விடைத்தாளின் மீது சரியாக வைக்கவும். சரியான விடையை √ அடையாளத்தாலும் பிழையான விடையை X அடையாளத்தாலும் இறுதி நிரலில் அடையாளமிடவும். சரியான விடைகளின் எண்ணிக்கையை அவ்வவ் தெரிவுகளின் இறுதி நிரையின் கீழ் எழுதவும். அத்துடன் அவற்றை கூட்டி சரியான புள்ளியை உரிய கட்டத்தில் எழுதவும்.

கட்டமைப்பு கட்டுரை மற்றும் கட்டுரை விடைத்தாள்கள்

1. பரீட்சார்த்திகளினால் விடைத்தாளில் வெறுமையாக விடப்பட்டுள்ள இடங்களையும், பக்கங்களையும் குறுக்குக் கோடிட்டு வெட்டிவிடவும், **பிழையான பொருத்தமற்ற விடைகளுக்குக் கீழ் கோடிடவும். புள்ளி வழங்கங்கூடிய இடங்களில் √ அடையாளமிட்டு அதனைக் காட்டவும்.**
2. புள்ளிகளை குறிப்பிடும் போது ஓவலண்ட் கடதாசியின் வலது பக்க நிரலைப் பயன்படுத்தவும்.
3. சகல வினாக்களுக்கும் கொடுத்த முழுப் புள்ளியை விடைத்தாளின் முன்பக்கத்திலுள்ள பொருத்தமான பெட்டியினுள் வினா இலக்கத்திற்கு நேராக **2 இலக்கங்களில் பதியவும்.** வினாத்தாளில் உள்ள அறிவுறுத்தலின் படி வினாக்கள் தெரிவு செய்யப்படல் வேண்டும். எல்லா வினாக்களினதும் புள்ளிகளும் முதல் பக்கத்தில் பதியப்பட்ட பின் விடைத்தாளில் மேலதிகமாக எழுதப்பட்டிருக்கும் விடைகளின் புள்ளிகளில் குறைவான புள்ளிகளை வெட்டிவிடவும்.
4. மொத்தப் புள்ளிகளை கவனமாக கூட்டி முன்பக்கத்தில் உரிய கூட்டில் பதியவும். விடைத்தாளில் ஒவ்வொரு விடைக்கும் வழங்கப்பட்டுள்ள புள்ளிகளின் தொகையினை ஒவ்வொரு பக்கமாக கூட்டவும். அக்கூட்டுத்தொகை 'உங்களால் முன்பக்கத்தில் மொத்தம் எனக் குறிப்பிட்ட மொத்தபுள்ளிகளுக்கு சமமானதா? என பரீட்சிக்கவும்?

★ புள்ளிப்பட்டியல் தயாரித்தல்

I. ஒரு வினாப்பத்திரம் உள்ள பாடங்கள் தவிர ஏனைய சகல பாடங்களுக்குமான இறுதிப்புள்ளி குழுவினுள் கணிப்பிடப்பட மாட்டாது.

II. ஒவ்வொரு வினாப்பத்திரத்துக்குமான இறுதிப்புள்ளி தனித்தனியான புள்ளிப்பட்டியலில் பதியப்படவேண்டும்.

III. வினாப்பத்திரம் I இற்கான புள்ளிப்பட்டியலில் **"Total Marks"** என்ற நிரலில் பதிந்து **எழுத்திலும் எழுத வேண்டும்.**

IV. வினாப்பத்திரம் II இற்கான புள்ளிப்பட்டியலை தயார் செய்யும் போது பகுதிப் புள்ளிகளைப் பதிவதோடு வினாப்பத்திரம் II இன் இறுதிப் புள்ளிகளை புள்ளிப் பட்டியலில் **"Total Marks"** என்ற நிரில் பதியவும்.

V. 43 சித்திரப் பாடத்திற்குரிய I,II மற்றும் III ஆம் வினாப்பத்திரங்களுக்குரிய புள்ளிகளை தனித்தனியாக புள்ளிப்பட்டியிலில் பதிந்து **எழுத்திலும் எழுத வேண்டும்.**

VI. 21 - சிங்களமொழியும் இலக்கியமும், 22 - தமிழ்மொழியும் இலக்கியமும் ஆகிய இரு பாடங்களும் வினாப்பத்திரம் I இற்குரிய புள்ளிப் பட்டியலில் பதிந்து எழுத்திலும் எழுத வேண்டும். வினாப்பத்திரம் II, III இற்கான பகுதிப் புள்ளிகளை உள்ளடக்கி அவ் வினாப்பத்திரத்தின் மொத்தப் புள்ளிகளை, புள்ளிப்பட்டியலில் பதிய வேண்டும்.

முக்கிய குறிப்பு:

I. சகல சந்தர்ப்பங்களிலும் ஒவ்வொரு வினாப்பத்திரத்திற்கும் உரிய முழுப் புள்ளியானது முழுத்தானத்தில் புள்ளிப் பட்டியலில் பதியப்படுதல் வேண்டும். எந்த விதமான காரணங்களிற்காகவும் வினாப்பத்திரத்தின் இறுதிப் புள்ளியானது தசம தானங்களில் பதியப்படலாகாது.

II. புள்ளிப் பட்டியலின் சகல பக்கங்களிலும் புள்ளிகளைப் பதிந்த உதவிப்பரீட்சகர், புள்ளிகளை சரிபார்த்த உதவிப்பரீட்சகர், மதிப்பீட்டுப் புள்ளிகளை உறுதிப்படுத்தும் எண்கணித பரீட்சகர் மற்றும் பிரதம பரீட்சகர் தமது குறியீட்டு இலக்கத்தை எழுதி கையொப்பமிட்டு உறுதிப்படுத்துவது கட்டாயமாகும்.

கணிதம்- 32
தேர்ச்சிகளும் குறிக்கோள்களும்
கணிதம்- II

01. **தேரிச்சி - 5**

- நவீன உலகில் வெற்றிகரமான கொடுக்கல் வாங்கல்களைப் பயன்படுத்தி மேற்கொள்வார்.
- இரு ஆண்டுகளுக்கான மொத்த வட்டியைக் கூட்டுவட்டி முறையில் கண்டு, மொத்த தொகையைக் காண்பார்.
- குறித்த தொகையும் வட்டியும் தரப்படும் போது எளிய வட்டி வீதத்தை கண்டு மொத்தத் தொகையின் இரு ஆண்டுகளுக்கான எளிய வட்டியை காண்பர்
- கூட்டுவட்டி மூலம் பெற்றுக் கொண்ட கொகையையும் ஒப்பிட்டு கூடுதலாக உள்ள பணம் குறித்த தொகைப் பணத்திற்கு சமனனாது எனக் காட்டுவார்.

02. **தேரிச்சி - 20**

- பல்வேறு முறைகளை ஆராய்ந்து இருமாறிகளுக்கிடையில் காணப்படும் தொடர்பை இலகுவாக தொடர்படுவார்.
- $y = ax^2 + bx + c: a, b, c, \epsilon, \mathbb{Z}$ வடிவிலான சார்பொன்றின் வரைபு தரப்படும்போது வரைபைப் பயன்படுத்தி,

i. வரைபின் யாதுமொரு புள்ளியினதும் y அச்சை வெட்டும் புள்ளியின் ஆள்கூறுகளை எழுதுவார்.

ii. $f(x) = 0$ ஆகும் சமன்பாட்டின் மூலங்களைப் காண்பார்.

iii. சார்பு மறையாக அதிகரிக்கும் x இன் பெறுமான ஆயிடையை எழுதுவார்.

iv. சார்பை $y = (x - a)^2 + b$ வடிவில் எழுதுவார்

v. தரப்பட்ட வரைபு நிலைக்குத்தாக மேல்நோக்கி குறித்த அலகுகள் இடம்பெயரும்போது பெறப்பல் வரைபின் இருபடி சார்பை எழுதுவார்.

03. **தேரிச்சி – 17**

- அன்றாட வாழ்கையில் தேவைகளை நிறைவேற்றி கொள்வதற்கு சமன்பாடுகளை உருவாக்கி தீர்ப்பதில் பல்வேறு முறைகளை நுட்பங்களை கையாள்வார்.
- இரு செவ்வகங்கள் தரப்படும் போது தரப்பட்ட பரப்பளவை தரப்பட்ட பெறுமானத்துடன் தொடர்புபடுத்தி தரப்பட்ட இருபடிசமன்பாட்டை திருப்திப்படுத்தும் எனக் காட்டி செவ்வகங்களின் நீளங்களுக்கிடைப்பட்ட தூரத்தை பொருத்தமாகக் காண்பர்.

04. **தேரிச்சி – 17**

அன்றாட வாழ்கையில் தேவைகளை நிறைவேற்றி கொள்வதற்கு சமன்பாடுகளை உருவாக்கி தீர்ப்பதில் பல்வேறு முறைகளை நுட்பங்களை கையாள்வார்.

- தரப்பட்ட தரவுகளைக் கொண்டு இருமாரிகளுக்கிடையிலான ஒருங்கமைச் சமன்பாட்டுச் சோடி ஒன்றை உருவாக்கி அவற்றை தீர்ப்பதன் மூலம் இரு மாறிகளுக்கான பெறுமானங்களை தனித்தனியாகக் காண்பர்.
- குறித்த விகிதத்தில் மாறுப்படும் மாறிகளுக்கேற்ப மாறுபடும் தொகையின் வித்தியாசத்தைக் காண்பர்.

05. **தேர்ச்சி - 13**

பல்வேறு முறைகளை ஆராய்ந்து நடைமுறையில் அளவிடைப்படங்கள் அல்லது திரிகோண விகிதங்களை பயன்படுத்துவார்.

i. தரப்பட்ட உருவில் தரவுகளைக் குறிப்பார்.
ii. திரிகோண விகிதங்களைப் பயன்படுத்த ஏதுவான காரணங்களை காண்பார்.
iii. திரிகோண விகிதங்களைப் பயன்படுத்தி இருபுள்ளிகளுக்கிடையிலான தூரம் குறித்த தூரம் எனக் காட்டுவார்.
iv. இரு நீளங்கள் அல்லது தூரங்கள் தரப்படும் போது குறித்த கோணத்தின் பருமனைக் காண்பார்.

06. **தேரிச்சி - 20**

நாளாந்த தேவைகளை இலகுவாக்கிக் கொள்ள பல்வேறு முறைகளில் தரவுப் பகுப்பாய்வு செய்து எதிர்வு கூறுவார்.

i. ஆகார வகுப்பிடையைக் காண்பார்.
ii. கூட்டமாக்கப்பட்ட தரவுத் தொகுதியின் இடையைக் காண்பார்.
iii. மொத்தம், இடையைப்படுத்தி எண்ணிக்கையின் உயர் பெறுமானத்தை காண்பார்.
iv. இன்னொரு அளவிற்கான உச்ச பெறுமானத்தின் மொத்த எண்ணிக்கையைக் காண்பார்.

07. **தேரிச்சி - 2**

எண்கோலங்களில் காணப்படும் பல்வேறு தொடர்புகளை ஆராய்வதன் மூலம் முடிவுகளை மேற்கொள்வார்.
விருத்தியின் உறுப்புக்களை காண்பதற்கு தரவுகள் முறையாகத் தரப்படுமிடத்து
i. விருத்தியின் முதல் மூன்று உறுப்புக்களை ஒழுங்காக எழுதுவார்
ii. இரு வெவ்வேறான விருத்திகளின் nஆம் உறுப்பைக் கண்டு, அவற்றின் வித்தியாசத்தை எழுதுவார்
iii. குறித்த உறுப்புக்களுடைய மொத்தக் கூட்டுத்தொகை தரப்பட்ட மொத்தத் தொகை பூரணப்படுத்துமா வென கண்டு எழுதுவார்.
iv. குறித்த எண்ணிக்கையான மாணவர்களைப் பயன்படுத்தி குறித்த எண்ணிக்கையான நிரைகளைப் பூரணப்படுத்த முடியுமா எனக் காண்பார்.

08. **தேரிச்சி - 27**

கேத்திர கணித விதிகளை உபயோகித்து அமைவுகளின் தன்மை பற்றி பகுப்பாய்வு செய்வர். cm/ mm அளவிடையுள்ள நேர் விளிம்பு, கவராயம் ஆகியவற்றை மாத்திரம் பயன்படுத்தி

i. குறித்த அளவான நேர்கோட்டுத்துண்டத்தை வரைந்து அதன் செங்குத்து இருகூறாக்கியை அமைப்பார்.
ii. குறித்த நேர்கோட்டை அதன் நடு புள்ளியில் தொடுவதும் நேர்கோட்டின் ஓர் அந்ததத்திலிருந்து குறிப்பிட்ட தூரத்தில் மையத்தை கண்டு வட்டத்தை அமைப்பார்.
iii. தரப்பட்ட கோணத்தின் கோண இருகூறாக்கியை அமைத்து அது வட்டத்தை வெட்டும் புள்ளியை பெயரிடுவார்.
iv. நீட்டப்பட்ட செங்கூத்து இருகூறாக்கி வட்டத்தை வெட்டும் புள்ளியிலிருந்து கோண இருகூறாக்கிற்கு செங்குத்தை அமைத்து அது கோண இருகூறாக்கி வட்டத்தை வெட்டும் புள்ளியினூடாக செல்லும் என்பதற்கான காரணத்தை எடுத்துக்காட்டுவார்.

09. **தேரிச்சி -24**

வட்டம் சார்பான கேத்தர கணித எண்ணக்கருவை அடிப்படையாகக் கொண்டு முடிவுகளை எடுக்க தர்க்க ரீதியாகச் சிந்திப்பார்.

- தரப்பட்ட உருவை பிரதி செய்து தரப்பட்ட தரவுகளை அதில் குறிப்பிடுவார்.
- உருவில் தரப்பட்ட நாற்பக்கல் ஒரு வட்ட நாற்பக்கல் என காரணத்துடன் காட்டுவார்.
- தரப்பட்ட இரு கோணங்களும் சமனெனக் காட்டுவார்.
- தரப்பட்ட முக்கோணி ஓர் இருசமபக்க முக்கோணி எனக் காட்டுவார்.

10. தேரிச்சி -10

(a) கனவளவு தொடர்பான அறிவைக் கொண்டு வெளியின் உச்ச பயனைப் பெறுவார்.

r ஆரையுடைய அரைக்கோள திண்மமொன்றை உருக்கி n எண்ணிக்கையிலான செங்கூம்புகள் உருவாக்கும் போது அதன் ஆரை தரப்படும் கோவையை திருப்திபடுத்தும் எனக்காட்டுவார்.

கூம்பின் உயரம் தரப்படும் பொது அதன் கனவளவைக் காண்பார்.

(b) தேர்ச்சி - 06

மடக்கை கணிக்கருவி என்பவற்றைப் பயன்படுத்தி அன்றாட வாழ்க்கையில் எதிர்கொள்ளும் கணிதரீதியான பிரசீனங்களைத் தீர்ப்பார்.

மூலம் உடனான பெருக்கல், வகுத்தல் உடனான என்தொகுதியை மடக்கை அட்டவணையைபயன்ப்படுத்தி தீர்ப்பார்.

11. தேர்ச்சி -30

அன்றாட வாழ்க்கையை இலகுவாக்கி கொள்வதற்காக தொடைகள் சார்பாக அடிப்படை கோட்பாடுகளை பயன்படுத்துவார்.

i. தரப்பட்ட வென்னுருவை பிரதி செய்வார் தரவுகளை குறிப்பார் தொடைகளை பெயரிடுவார்.

ii. மூட்டற்ற இரு தொடைகளின் ஒன்றிப்பு தரப்படுமிடத்து இடையில் உள்ள தொடையில் மட்டும் பிரதேசத்தின் பெறுமானத்தை காண்பார்.

iii. மூட்டற்ற தொடைகளில் ஒன்றின் எண்ணிக்கை தரபப்டும் போது மற்றைய தொடையின் எண்ணிக்கையைக் காண்பார்.

iv. மூட்டுள்ள இரு தொடைகளின் ஒன்றிப்பு தரப்படும் போது எஞ்சிய தொடையின் மடடும் பிரதேசத்தின் எண்ணிக்கையைக் காண்பார்.

v. இரு தொடைகளின் இடைவெட்டுகளுக்கிடையிலான எண்ணிக்கையின் விகிதங்கள் தரப்படும் போது மூன்று தொடைகளினதும் மட்டும் பிரதேசங்களின் மொத்த எண்ணிக்கையைக் காண்பார்.

12. தேரிச்சி -23

நேர்கோட்டு தளவுருக்கள் தொடர்பான கேத்திர கணித எண்ணக்கருக்களை அடிப்படையாகக் கொண்டு அன்றாட வாழ்க்கைப் பணிகளுக்குத் தேவையான முடிவுகளை எடுப்பார்.

(a) குறித்த தோற்றத்தின் மறுதலையை எழுதிக் காட்டுவார்.

(b) தரப்பட்ட முக்கோணி ஒன்றின் நடுப்புள்ளி அதன் எதிர் உச்சியுடன் இணைத்து பெறும் நேர்கோட்டிற்கு சமாந்தரமாக எஞ்சிய உச்சிகளின் ஊடக வரையப்பட்ட நேர்கோடுகள் இரண்டுடன் உருவொன்று தரப்படும் போது.

i. தரப்பட்ட உருவைப் பிரதிசெய்து தரவுகளை குறித்து காட்டுவார்.

ii. குறித்த முக்கோணிகள் ஒரங்கிசையும் எனக் காட்டுவார்

iii. தரப்பட்ட இரு நேர்கோடுகளின் நீளங்கள் சமனெனக் காட்டுவார்.

iv. இணைகரங்களின் பரப்பளவுக்கும் முக்கோணிகளின் பரப்பளவிற்கிடையிலான தொடர்பை இனங்கண்டு ஒன்றை மற்றையதன் மடங்காக காட்டுவார்.

Part A

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

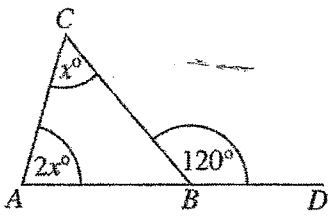
(Take the value of π as $\frac{22}{7}$.)

1. The annual assessed value of a shop located within the limits of a certain urban council that charges an annual rates percentage of 12%, is 24 000 rupees. How much has to be paid for a year as rates?

2880 rupees ———— ②

$24000 \times \frac{12}{100}$ ———— 1

2. The side AB of the triangle ABC has been produced to D. Find the value of x based on the information given in the figure.



$x = 40$ or 40 ———— ②

$x + 2x = 120$ or $x + 2x + 60 = 180$ ———— 1

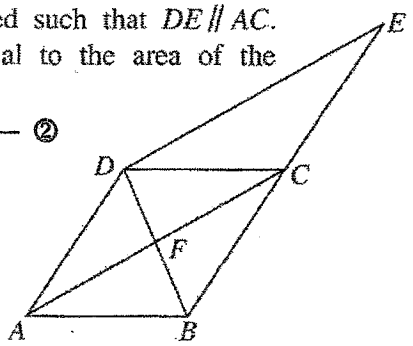
3. Find the least common multiple of the following algebraic terms.

$8xy$, $2xy^2$, $12y$

$24xy^2$ ———— ②

$8xy = 2^3 \times x \times y$
$2xy^2 = 2 \times x \times y^2$ } 1
$12y = 2^2 \times 3 \times y$

4. $ABCD$ is a parallelogram. E lies on the side BC produced such that $DE \parallel AC$. Name **three** triangles in this figure that are of area equal to the area of the triangle DCE.



$\triangle ADC$, $\triangle ABC$, $\triangle BDC$, $\triangle BDA$ for three correct triangles —— ②

For two correct triangles ———— 1

(No marks if there is even one incorrect triangle.)

5. If $\log_4 x = 3$, find the value of x.

$x = 64$ or 64 ———— ②

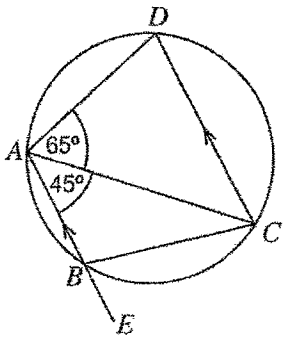
$x = 4^3$ or 4^3 ———— 1

6. Simplify: $\frac{3xy}{2} \div \frac{9y}{4}$

$\frac{2x}{3}$ ———— ②

$\frac{3xy}{2} \times \frac{4}{9y}$ ———— 1

7. The points A, B, C and D lie on the circle shown in the figure. ABE is a straight line. Find the magnitude of $C\hat{B}E$ based on the given information.



$C\hat{B}E = 70°$ ———— ②

$A\hat{C}D = 45°$ ———— 1or
$A\hat{D}C = 70°$ ———— 1or
$D\hat{C}B = 70°$ ———— 1

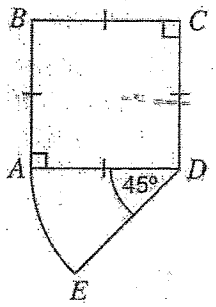
14

8. **In the year 2023,** Nimal's monthly income was 138 000 rupees. Nimal had to pay income **tax of 6% on the** income he earned above 100 000 rupees. Calculate the income tax that **he had to pay** for a month.

2280 rupees ——————— ②

$38000 \times \frac{6}{100}$ ——————— 1

9. **The diagram** shows a composite figure consisting of a sector of a **circle** of radius 14 cm and central angle 45°, and a square. Find **the** perimeter of this figure.



67cm ——————— ②

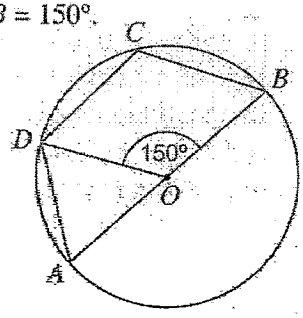
$AE = \frac{1}{8} \times 2 \times \frac{22}{7} \times 14$ ——————— 1

10. Find the equation of the straight line that passes through the points (0, 2) and (1, 5).

$y = 3x + 2$ ——————— ②

gradient= $\frac{5-2}{1-0}$ or intercept $= 2$ ——————— 1

11. O is the centre of the given circle. AB is a diameter, and $D\hat{O}B = 150°$. Find the magnitude of $D\hat{C}B$.

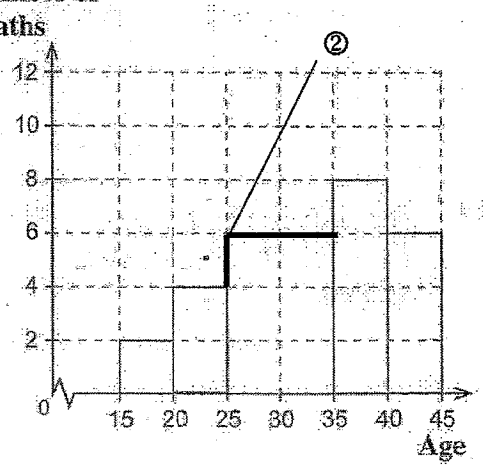


$D\hat{C}B = 105°$ ——————— ②

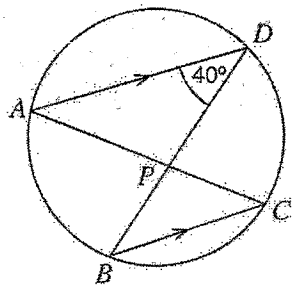
$D\hat{A}O = 75°$ or $D\hat{O}B$ $(reflex) = 210°$ ——————— 1

12. The number of deaths that occurred during a year in a certain city due to motorcycle accidents is shown in the following frequency distribution. Complete the histogram that has been drawn based on it.

Age (Years)	Number of deaths
15 – 20	2
20 – 25	4
25 – 35	12
35 – 40	8
40 – 45	6



13. The points A, B, C and D lie on the circle shown in the figure. Moreover, $AD \parallel BC$. Find the magnitude of $C\hat{P}D$ based on the information given in the figure.



$C\hat{P}D = 80°$ ——— ②

$A\hat{C}B = 40°$ or $D\hat{B}C = 40°$ ——— 1

14. A container in the shape of a right prism of base area 77 cm² is filled with water to a height of 20 cm. When all this water is poured into a right circular cylindrical container of base radius 7 cm, to what height of the container will the water be filled?
(The volume of a right circular cylinder of base radius r and height h is $\pi r^2 h$.)

$h = 10$ cm ——— ②

$\frac{22}{7} \times 7 \times 7 \times h = 20 \times 77$ ——— ①

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

$(3x - 1)$ ——— ②

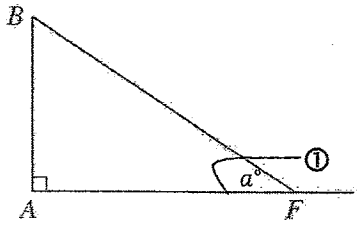
$(3x^2 + 3x - x - 1)$ ——— 1

16. The second term of a geometric progression is 6 and its fifth term is 162. Find the common ratio of the progression.

$ar^4 = 162$ and $ar = 6$ ——— ①

$r = 3$ ——— ①

17. A child is at location F on a level ground on which the foot of a vertical tree AB is located, as shown in the figure. In the figure, mark the angle of elevation $a°$ with which the child sees the top of the tree. If $A\hat{B}F = 50°$ find the value of a. (Disregard the height of the child.)



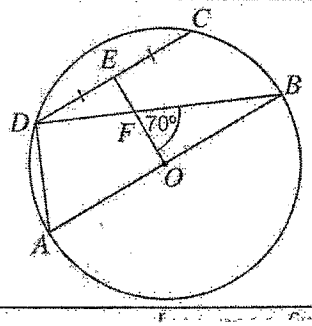
$a = 40$ ——— ①

18. A plant is obtained from every bean seed in a certain packet of bean seeds, while the probability of getting an unhealthy plant from them is 0.02. How many unhealthy plants can be expected in a farm in which 300 of these bean seeds are planted?

6 ——— ②

300×0.02 ———1

19. The centre of the given circle is O and AB is a diameter. The midpoint of the chord DC is E. If $O\hat{F}B = 70°$, find the magnitude of $A\hat{D}C$.



$A\hat{D}C = 110°$ ——— ②

$E\hat{F}D = 70°$ or $D\hat{E}F = 90°$ or $A\hat{D}B = 90°$ ——— 1

14

20. Solve: $\frac{2}{3a}-\frac{4}{9a}=\frac{1}{18}$

$a = 4$ ———— ②

$\frac{6}{9a}-\frac{4}{9a}=\frac{1}{18}$ ———— 1

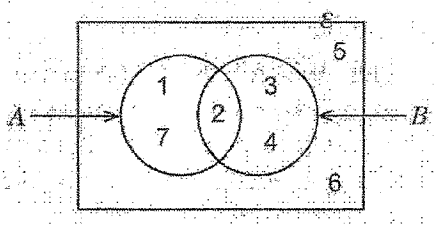
21. If the curved surface area of a solid right circular cylinder of base radius r cm and height h cm is four times the area of its base, how many times of the base radius is the height of the cylinder?

$2\pi rh = 4\pi r^2$ ———— ①

Two times or twice ———— ①

22. Write the elements of $A' \cup B$.

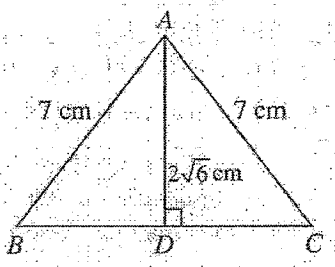
$\{2,3,4,5,6\}$ ———— ②



23. The figure shows an isosceles triangle ABC. Find the length of BC based on the given information.

10cm ———— ②

$7^2 = \left(2\sqrt{6}\right)^2 + BD^2$ or $7^2 = \left(2\sqrt{6}\right)^2 + DC^2$ ———— ①



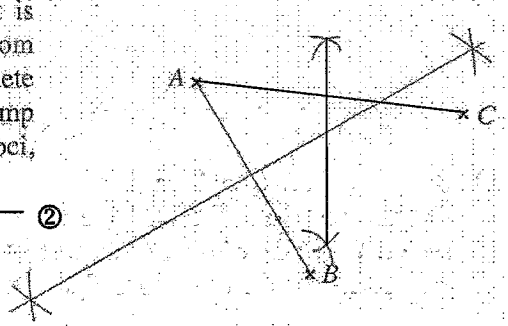
24. Solve: $3 - 12x^2 = 0$

$x = \frac{1}{2}$ and $\frac{-1}{2}$ ———— ②

$3(1-2x)(1+2x) = 0$ or $x^2 = \frac{3}{12}$ ———— 1

25. In the figure, A, B and C denote three houses. It is required to fix a lamp post at an equal distance from the three houses. The figure shows an incomplete sketch drawn to find the point at which the lamp post is to be located. Using the knowledge on loci, complete the sketch to find this point.

Drawing the perpendicular bisector of AC or BC ———— ②



12

50/50

Part B

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

1. It has been planned to construct a wall in three stages with the participation of a group of men. In the first stage, 10 of them worked together for 4 days and completed $\frac{4}{7}$ of the total length of the wall.

(i) How many man days is the work done in the first stage of constructing the wall?

Number of man days $= 10 \times 4$ ——— 1

$= 40$ ——— 1 (2)

(ii) If $\frac{1}{3}$ of the remaining length of the wall is completed in the second stage, what fraction of the total length of the wall is this amount?

Remaining fraction $= \frac{3}{7}$ ——— 1

Fraction completed in second stage $= \frac{1}{3}$ of $\frac{3}{7} = \frac{1}{7}$ ——— 1+1 (3)

(iii) If only two men engaged in constructing the wall in the second stage, how many days did the two of them take for it?

Amount of work for $\frac{4}{7}$ of length= 40man days

Amount of work for $\frac{1}{7}$ of length= 10man days ——— 1

Time taken by two men= 5 days ——— 1 (2)

(iv) If a length of 200 metres remains to be built in the third stage of building the wall, find the total length of the wall.

Fraction remaining at the end of the second stage $= \frac{3}{7} - \frac{1}{7}$ ——— 1

$= \frac{2}{7}$

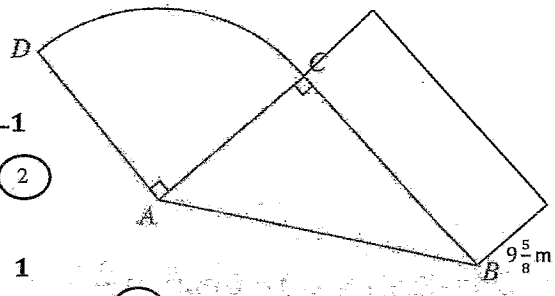
Total length of the wall $= 200 \times \frac{7}{2}$ ——— 1 (3)

$= 700$ m ——— 1

10/10

2. The figure shows a vegetable plot consisting of a right angle triangular piece of land ABC and a piece of land ACD in the shape of a sector of a circle of central angle 90°.

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



(i) $AD = 7$ m. If a fence is built along the boundary of the sector ACD from C to D, find the length of the fence.

Length of fence $CD = \frac{1}{4} \times 2 \times \frac{22}{7} \times 7$ ——— 1

$= 11$ m ——— 1 (2)

(ii) Find the area of the piece of land ACD.

Area of $ACD = \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$ ——— 1

$= \frac{77}{2}$ m^2 *or* 38.5 m^2 ——— 1 (2)

(iii) If the area of the piece of land ABC is 42 m^2, find the length of BC.

$\frac{1}{2} \times 7 \times BC = 42$ ——— 1+1

$BC = \frac{42 \times 2}{7} = 12$ m ——— 1 (3)

(iv) It is required to adjoin a rectangular piece of land outside the vegetable plot, with BC as one side, of area three times the area of the piece of land in the shape of the sector. Find the width of this rectangular piece of land and draw a sketch of it with its measurements on the above figure itself.

Area of rectangular plot to be adjoined= $3 \times \frac{77}{2}$

Width of the rectangular plot= $3 \times \frac{77}{2} \times \frac{1}{12} = \frac{77}{8} = 9\frac{5}{8}$ m $= 9.625$ m ——— 1+1

Indicating on the figure ——— 1 (3)

10/10

3. Kamal invests 50 000 rupees to buy shares in a certain company of which the price of a share is 50 rupees. After receiving the dividends for the shares at the end of a year, he sells all the shares at 54 rupees per share. He receives a total amount of 57 500 rupees, as dividends and by selling the shares.

(i) How many shares did he buy?

Number of shares $= \frac{50000}{50}$ ——— 1

$= 1000$ ——— 1 (2)

(ii) How much does this company pay as dividends annually for a share?

Income from selling the shares = Rs.54 × 1000 ——— 1

= Rs.54 000

Dividends = Rs.57 500 − 54000 = Rs. 3500 ——— 1 (3)

Dividends per share = Rs.$\frac{3500}{1000}$

= Rs 3.50 ——— 1

(iii) Kamal plans to buy floor tiles at the price of 500 rupees per tile using the 57 500 rupees in hand. If VAT of 15% has to be paid in addition for each tile, how many tiles can he buy with this amount?

Price of a floor tile after VAT is added = Rs. 500 × $\frac{115}{100}$ ———1

= Rs. 575 (2)

Number of floor tiles that can be bought = $\frac{57500}{575}$

= 100 ——— 1

(iv) When he goes to buy the tiles, he finds that the VAT has been increased to 18%. Now, to buy the same number of tiles that he had planned to buy above, how much more money does he need?

New price of a floor tile = Rs.500 × $\frac{118}{100}$

= Rs.590 ——— 1 (3)

Increase in price = Rs. 590 -575=Rs. 15 ——— 1

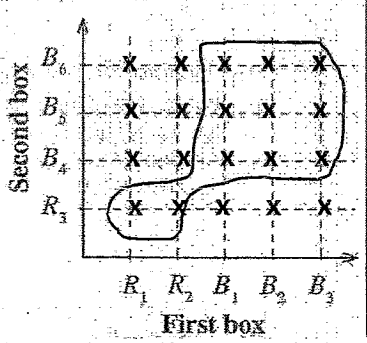
Additional amount required = Rs.15 × 100= Rs. 1500 ——— 1

10/10

4. In one of two boxes there are two red bulbs and three blue bulbs. There is one red bulb and three blue bulbs in the other box. All the bulbs are of the same shape and size. A student randomly picks a bulb from the first box and a bulb from the second box.

(i) By considering that the red bulbs are denoted by R_1, R_2 and R_3 and the blue bulbs are denoted by B_1, B_2, B_3, B_4, B_5 and B_6, represent the sample space of the above mentioned random experiment on the given grid using the symbol 'X'.

Marking the sample space ——— 1 (1)

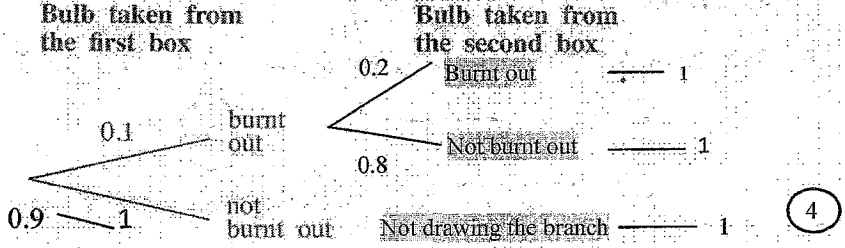


(ii) Encircle on the grid, the event of the two bulbs taken from the two boxes being of the same colour and find its probability.

Encircling the event ——— 1

Probability = $\frac{11}{20}$ ——— 1 (2)

(iii) It is given that the probability of a bulb taken from the first box being burnt out is 0.1 and the probability of a bulb taken from the second box being burnt out is 0.2. The student examines the bulb taken from the first box and only if it is a burnt out one, does he examine the bulb taken from the second box. Extend the tree diagram given below such that both these events are represented and write the relevant probabilities on its branches.



Not drawing the branch ——— 1 (4)

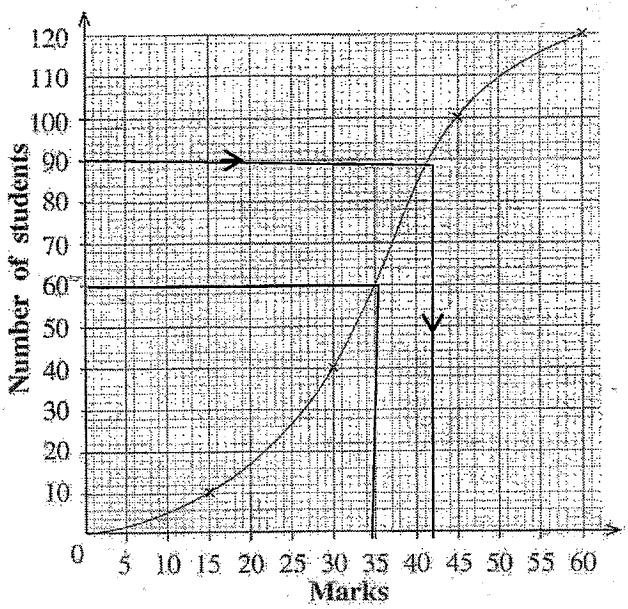
(iv) Considering both the above mentioned events, find the probability of an examined bulb not being a burnt out one.

Probablity of not being a burnt out bulb = 0.9+0.1x0.8 ———1+1 (3)

= 0.98 ——— 1

10/10

5. A cumulative frequency curve drawn using the marks obtained by 120 students of a certain school for a mathematics test is shown in the figure.



(a) (i) What is the maximum mark that a student has been able to obtain in this test?

60 ——— 1

(ii) How many students got 35 marks or less in this test?

60 ——— 1

(iii) From the students who took the test, it is required to select the group of 25% who have obtained the highest marks. For this, students who have obtained above which mark should be selected?

Number of students in group of top 25% $= 120 \times \frac{1}{4} = 30$

Number of students who don't belong to this group = 120-30

= 90 ——— 1

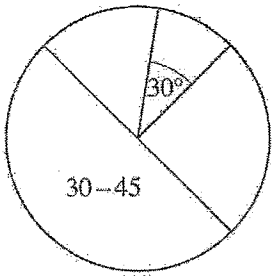
Mark = 41 or 42 (for finding the mark using the graph) ——— 1

2

(b) An incomplete portion of the frequency table that was used to draw the cumulative frequency curve and an incomplete pie chart drawn using it are given below. Each sector of the pie chart represents the relevant number of students.

Interval of marks	Number of students
0 – 15	10
15 – 30	30
30 – 45	60
45 – 60	20
	120

—1 —1 2



(In the table the interval 15 – 30 denotes more than 15 and less than or equal to 30.)

(i) Fill in the blanks in the table based on the cumulative frequency curve.

(ii) Which interval of marks is represented by the sector in the pie chart with central angle 30°?

Number of students in the relevant interval = $\frac{30°}{360°} \times 120 = 10$ ——— 1

Interval of marks = 0 - 15 ——— 1

(iii) Find the central angle of the sector that represents the interval 45 – 60.

$\frac{20}{120} \times 360°$ ——— 1

60° ——— 1

2

10/10

32 – Marking Scheme
Mathematics II

1. Rani deposits an amount of 50 000 rupees for two years in a bank that compounds interest annually at an annual interest rate of 10%. Find the total interest amount that she receives and calculate the total amount in the deposit account at the end of the two years.

An interest amount equal to the above mentioned total interest amount can be obtained by investing the 50 000 rupees in a certain finance company for just one year at a simple interest rate. After the initial two years, if Rani invests the total amount in the bank account for another two years in the above finance company, find the interest she receives from the finance company.

Question Number	Marking Scheme	Marks	Other details
1.	Interest for first year $= \text{Rs. } 50000 \times \frac{10}{100}$	1	
	$= \text{Rs. } 5000$	1	
	Principal amount for 2nd year $= \text{Rs. } 50000 + 5000$	1	
	$= \text{Rs. } 55000$		
	Interest for 2nd year $= \text{Rs.}55000 \times \frac{10}{100}$		
	$= \text{Rs. } 5500$	1	
	Interest for two years $= \text{Rs. } 5000 + 5500$		
	$= \text{Rs.}10500$	1	
	Total amount in account at the end of 2 years $= \text{Rs. } 60500$	1	
	or		
	Total amount in account at the end of 2 years $= 50000 \times \frac{110}{100} \times \frac{110}{100}$	2+1	
	$= \text{Rs.}60500$	1	
	Interest for 2 years $= \text{Rs.}60500 - 50000$	1	
	$= \text{Rs.}10500$	1	
	Simple interest rate of finance company $= \frac{10500}{50000} \times 100\%$	1	
	$= 21\%$	1	
	Interest from finance company for 2 years $= \text{Rs.}60500 \times \frac{21}{100} \times 2$	1	
	$= \text{Rs. } 25410$	1	10

2. The graph of a quadratic function of the form $y = f(x)$ is shown in the figure.

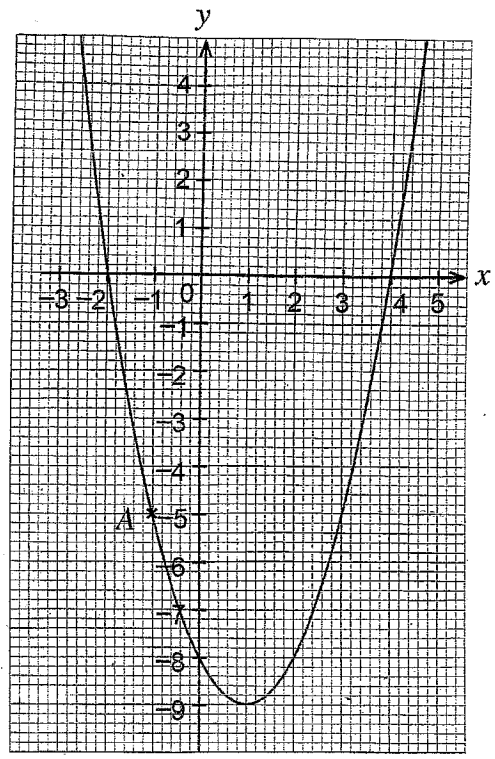
(i) Write the coordinates of the point A and the coordinates of the point at which the graph intersects the y-axis respectively.

(ii) Write the roots of the equation $f(x) = 0$ of the function $y = f(x)$ of which the graph has been drawn.

(iii) Write the interval of values of x on which the function is negative and increasing.

(iv) Write the function $y = f(x)$ in the form $y = (x-a)^2 + b$ by considering the equation of the axis of symmetry of the graph and the coordinates of its minimum point.

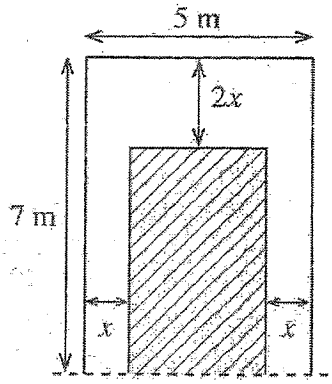
(v) Write the coordinates of the minimum point and the relevant quadratic function of the graph that is obtained by translating the given graph vertically upwards by four units in the coordinate plane, without changing its shape.



Question Number			Marking Scheme	Marks			Other details
2.		(i)	$A \equiv (-1, -5)$ Coordinates of the point at which the graph intersects the y-axis is (0,-8)	1 1	(2)		
		(ii)	$x = 4$ and $x = -2$	1+1	(2)		Give marks if only 4 and -2 are written
		(iii)	$1 < x < 4$ Or Between 1 and 4	2	(2)		For identifying the two points 1 and 4 —— 1
		(iv)	$y = (x-1)^2 - 9$	2	(2)		
		(v)	Coordinates of the minimum point $(1, -5)$ Quadratic function $y = (x-1)^2 - 5$	1 1	(2)	10	

3. A portion of a narrow pathway bordering a rectangular plot of land which is shaded in the figure is shown here. The area of this portion is 16 square metres. Using the information in the figure, show that x satisfies the equation $x^2 - 6x + 4 = 0$.

Taking the value of $\sqrt{5}$ as 2.24, find the solutions to the above equation and give reasons why only the smaller value of the two solutions is suitable for x.



Question Number	Marking Scheme	Marks	Other details
3.	Area of the pathway		
	$= 35 - [(5 - 2x)(7 - 2x)]$	1	
	$= 35 - [35 - 24x + 4x^2]$	1	
	$= 24x - 4x^2$		
	$24x - 4x^2 = 16$ $x^2 - 6x + 4 = 0$	1	
	Or		
	Area of the pathway		
	$= 7 \times 2x + 2x(5 - 2x)$	1	
	$= 14x + 10x - 4x^2$	1	
	$24x - 4x^2 = 16$ $\therefore x^2 - 6x + 4 = 0$	1	
	$x^2 - 6x + 4 = 0$		
	$(x - 3)^2 = -4 + 9$	1	For formula or substitution -1
	$x - 3 = \pm\sqrt{5}$	1	
	$x = 3 \pm 2.24$	1	$\frac{6 \pm \sqrt{20}}{2}$ - 1
	$x = 3 + 2.24$ or $3 - 2.24$		
	$x = 5.24$or0.76	1+1	
	Since $5.24 > 5$,		
	x cannot be equal to 5.24.	1	
	Or		
	Since x has to be less than 5,	1	
	$x = 0.76$ m	1	10

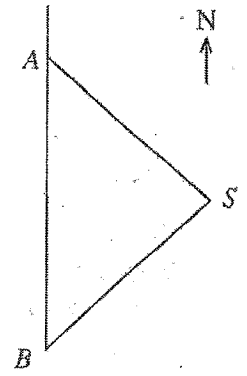
4. Books and pens were donated to the grade 10 and grade 11 students of a certain school in the following manner.
   - A total of 516 books with 6 books for each grade 10 student and 8 books for each grade 11 student
   - A total of 300 pens with 3 pens for each grade 10 student and 5 pens for each grade 11 student

   By taking the number of students in grade 10 as x and the number of students in grade 11 as y, construct a pair of simultaneous equations and by solving them find separately the number of students in grade 10 and the number of students in grade 11.

   In another school where it is proposed to distribute books and pens, although the total number of students in grades 10 and 11 is the same as the total number of students in these grades in the above mentioned school, the number of students in grade 11 is twice the number of students in grade 10. Show that 12 additional books are required to distribute books and pens in this school in the same manner as before.

Question Number	Marking Scheme	Marks	Other details
4.	$6x + 8y = 516$ ——— (1)	1	
	$3x + 5y = 300$ ——— (2)	1	
	(2) $\times 2$ $6x + 10y = 600$ ——— (3)	1	For equating the coefficients
	(3) - (1) $2y = 84$ $y = 42$	1	
	Substituting $y = 42$ in (2)	1	
	$3x + 5 \times 42 = 300$	1	
	$x = 30$	1	
	Number of students in grade 10 =30 Number of students in grade 11 =42	1	
	Total number of students in the other school=72		
	Number of students in grade 10 $= 72 \times \frac{1}{3}$ $= 24$		
	Number of students in grade 11= 48	1	Obtaining 24 or 48 -1
	Required number of books= $24 \times 6 + 48 \times 8$ $= 528$	1	
	Additional books required $= 528 - 516 = 12$	1	
		10	

5. Amal is at point A of a field, to the north of Bimal who is at point B. A statue S is located in this field. The bearing of S from A is 144°. Moreover $A\hat{B}S = 54°$ in the figure. The distance between Amal and the statue is 80.9 metres.

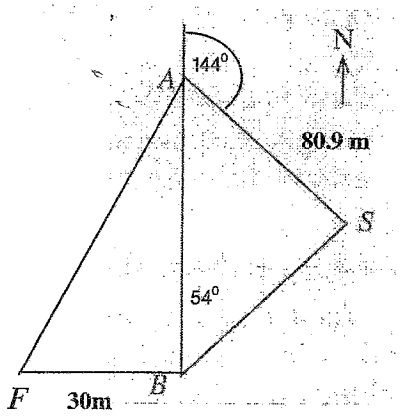


(i) Copy the figure in your answer script and include the given information in it.

(ii) Give reasons why the triangle ABS can be used to find the distance between Amal and Bimal using trigonometric ratios.

(iii) Using trigonometric ratios, show that the distance between Amal and Bimal is 100 metres.

(iv) A flag pole is located at point F, 30 metres to the west of Bimal. Include this information in the figure you drew and find the magnitude of $A\hat{F}B$.

Question Number			Marking Scheme	Marks			Other details
5.	(i)						
			Copying the figure	1			
			Marking 144^o	1			
			Marking 80.9 mor54^o	1	(3)		
	(ii)		Since$S\hat{A}B = 36^o$we have that$A\hat{S}B = 90^o$. Therefore, trigonometric ratios can be used.	1	(1)		
	(iii)		$\sin 54^o = \frac{80.9}{AB}$	1			
			$0.8090 = \frac{80.9}{AB}$	1			
			$\therefore AB = \frac{80.9}{0.8090}$ $= 100$ m	1	(3)		
	(iv)		$\tan A\hat{F}B = \frac{AB}{FB}$ $= \frac{100}{30}$ $= 3.3333$	1			
			$A\hat{F}B = 73^o17'$ or $73^o18'$	1	(3)	(10)	

6. The following grouped frequency distribution has been prepared using the information obtained on the mass of each student in a certain group of students.

Class interval (kg)	40 – 44	44 – 48	48 – 52	52 – 56	56 – 60	60 – 64	64 – 68
Frequency	3	5	9	11	7	3	2

(The class interval 40 – 44 denotes greater than or equal to 40 and less than 44.)

(i) To which class interval does the most number of students belong?

(ii) Find the mean mass of a student in this group to the nearest kilogramme.

(iii) The maximum total mass of the students who can be taken in one van which was found for this group of students who plan to go on a trip is 600 kilogrammes. By using the mean, find the maximum number of students that can be expected to travel in this van.

(iv) Find the maximum number of students that it may be possible to take in the above mentioned van, based on the given frequency table. Give reasons for your answer.

Question Number	Marking Scheme	Marks	Other details
6. (i)	52-56	1 (1)	
(ii)	Class Interval | x | f | fx 40-44 | 42 | 03 | 126 44-48 | 46 | 05 | 230 48-52 | 50 | 09 | 450 52-56 | 54 | 11 | 594 56-60 | 58 | 07 | 406 60-64 | 62 | 03 | 186 64-68 | 66 | 02 | 132 | | $\sum f = 40$ | $\sum fx = 2124$		
	Mid-value column	1	
	fx column	2 →	Disregard up to 2 errors
	$\sum fx$	1	
	Mean $= \frac{2124}{40}$	1	Dividing by 40
	$= 53.1$		
	$= 53$ kg (To the nearest whole number)	1 (6)	
(iii)	Maximum number of students $= \frac{600}{53}$		
	$= 11.3$		
	$\doteq 11$	1 (1)	
(iv)	$600 - (40 \times 3 + 44 \times 5) = 260$	1	
	$\frac{260}{48} \doteq 5$		
	Maximum number of students $= 3 + 5 + 5 = 13$	1 (2) (10)	

7. A decoration has been made by fixing blue and white bulbs in several concentric circles. The blue bulbs have been fixed such that the innermost first circle has 3 bulbs and each of the following circles have three more bulbs than the previous circle. The white bulbs have been fixed such that the innermost first circle has 2 bulbs, the next circle has 3 bulbs, the circle after that has 4 bulbs, and so forth.

(i) Write the number of blue bulbs fixed in the first three circles respectively.

(ii) How many more blue bulbs are there than white bulbs in the 10^{th} circle?

(iii) The number of circles in which bulbs have been fixed in the decoration is 16. Sunil states that a total of 550 blue and white bulbs are sufficient for this. Is his statement correct? Give reasons for your answer.

Question Number	Marking Scheme	Marks			Other details
7. (i)	3, 6, 9	1	(1)		
(ii)	Number of blue bulbs in the 10th circle $= 3 + 9 \times 3$	1			
	$= 30$	1			
	Number of white bulbs in the 10th circle $= 2 + 9 \times 1$				
	$= 11$	1			
	Number of additional blue bulbs $= 30 - 11$				
	$= 19$	1	(4)		
(iii)	$S_n = \frac{n}{2}\{2a + (n-1)d\}$	1			
	Number of blue bulbs $S_{16} = \frac{16}{2}\{2 \times 3 + 15 \times 3\}$				
	$= 8 \times 51$				
	$= 408$	1			
	Number of white bulbs $S_{16} = \frac{16}{2}\{2 \times 2 + 15 \times 1\}$				
	$= 152$	1			
	Total number of bulbs $= 408 + 152$	1			
	$= 560$				
	Since 560> 550, Sunil's statement is false.	1	(5)		
	Or				
	5, 9, 13	1			
	$S_n = \frac{n}{2}\{2a + (n-1)d\}$	1			
	$S_{16} = \frac{16}{2}\{2 \times 5 + (16-1)4\}$	1			
	$= 8\{10 + 15 \times 4\}$				
	$= 560$	1	(5)	(10)	
	Since 560> 550, Sunil's statement is false	1			

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

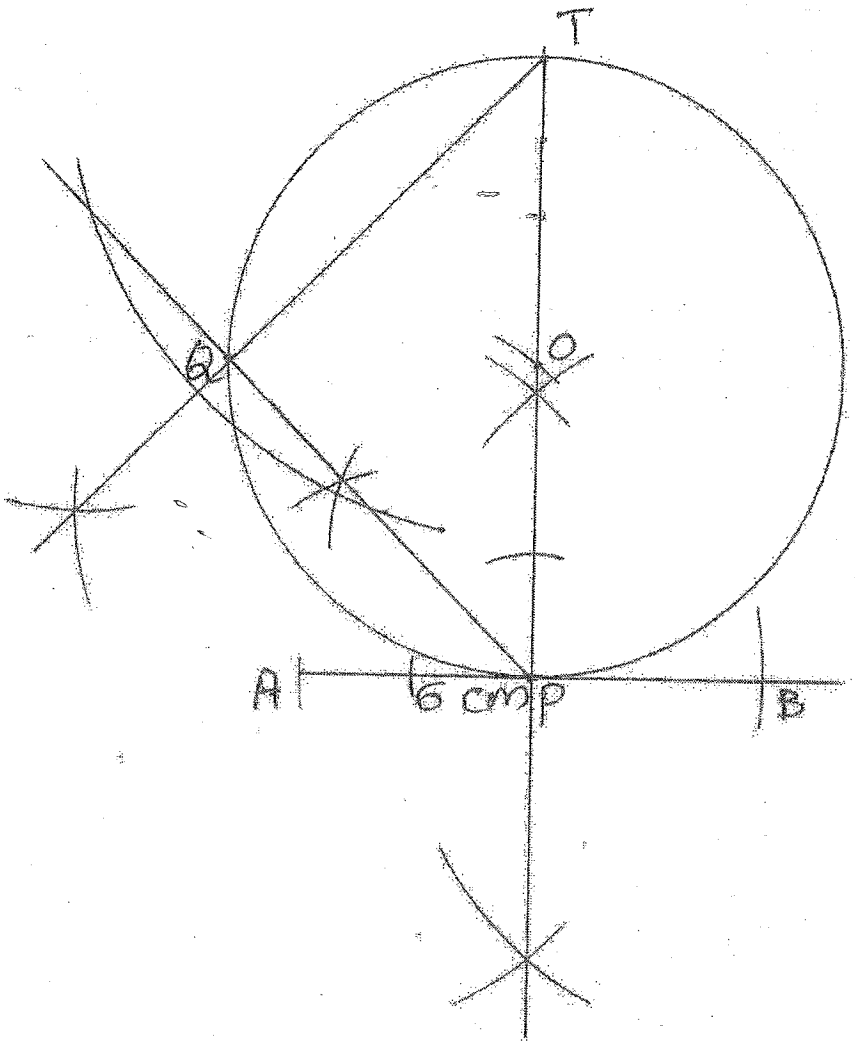
(i) Construct a straight line segment AB such that $AB = 6$ cm and construct its perpendicular bisector.

(ii) Construct the circle that touches AB at its midpoint P and has its centre O, 5 cm from A.

(iii) Construct the bisector of $A\hat{P}O$ and name the point at which it intersects the circle as Q.

(iv) Produce the line PO, take the point at which it meets the circle as T and construct the perpendicular from the point T to the line PQ. Give reasons why this perpendicular should pass through Q.

Question Number			Marking Scheme	Marks			Other details
8.		(i)	Constructing the straight line segment $AB = 6$ cm	1			
			Constructing the perpendicular bisector of AB	2	(3)		
		(ii)	Marking O	1			
			Constructing the circle	1	(2)		
		(iii)	Constructing the angle bisector of $A\hat{P}O$	2	(2)		
		(iv)	Constructing a perpendicular to PQ from T	2			
			$P\hat{Q}T = 90^0$(Angle in a semicircle) Therefore, the perpendicular constructed from Tpasses through Q.	1	(3)		
						10	

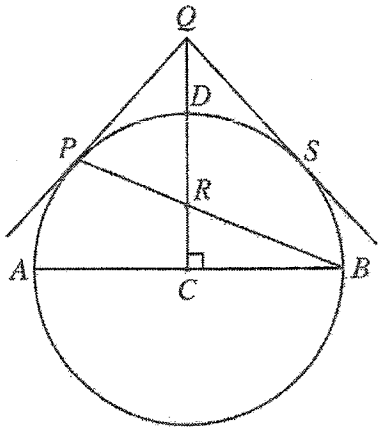

T
O
Q
A
6 cm
P
B

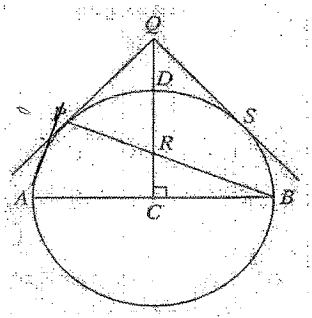
9. C is the centre and AB is a diameter of the circle in the given figure. P is a point on the circle. The radius CD is perpendicular to AB and it intersects PB at R. The tangent to the circle at P and CD produced meet at Q. The other tangent to the circle drawn from Q meets the circle at S.

Copy the figure in your answer script and join PA.

Show that $PACR$ is a cyclic quadrilateral and that $Q\hat{P}R = Q\hat{R}P$.

Join RS and show that RQS is an isosceles triangle.



Question Number	Marking Scheme	Marks	Other details
9.			
	Copyingthe figure	1	
	Data: C isthe centre ofthecircle *AB is a diameter* *CQis perpendicular toAB* *PQandQS are tangents* *TheintersectionpointofPB and CD is R*		
	Toprove:PACR is a cyclicquadrilateral $Q\hat{P}R = Q\hat{R}P$ *RQS is an isosceles triangle*		
	Proof:		
	$A\hat{P}B = 90^0$ (Angle in a semicircle)	1	
	$A\hat{C}R = 90^0$ (Datum)	1	
	$\therefore PACR$ is a cyclic quadrilateral (Opposite angles are supplementary)	1	
	$P\hat{A}C = Q\hat{R}P$(Exterior angle of a cyclic quadilateral is equal to the interior opposite angle)	1	
	$Q\hat{P}R = P\hat{A}B$(Angle in thealternatesegment) $\therefore Q\hat{P}R = Q\hat{R}P$	1 + 1	
	$PQ = QR$(Sides opposite equal angles of an isosceles triangle)	1	
	$PQ = QS$(Tangents are equal) $\therefore QR = QS$	1	
	$\therefore RQS$ is an isosceles triangle	1	10

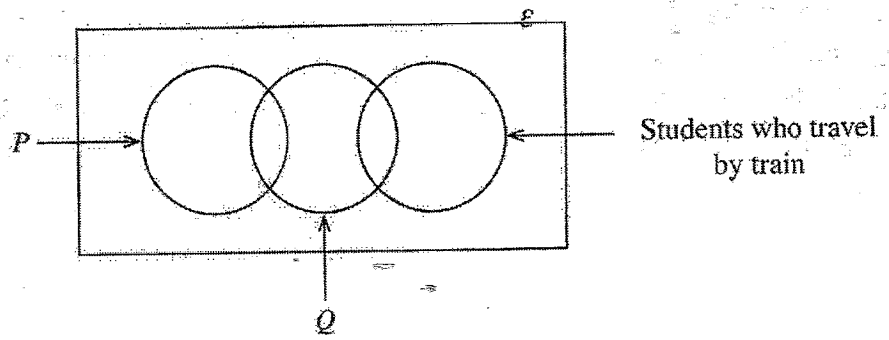
10. (*a*) A solid hemisphere of radius r cm made of metal is melted and 56 solid right circular cones of base radius $\frac{1}{4}$ the radius of the hemisphere, and height h cm are made. By assuming that there is no wastage of metal, show that the relationship between the radius of the hemisphere and the height of a cone is given by $r = \frac{7}{4}h$. If the height of a cone is 8 cm find the volume of the hemisphere. (Take the value of π as $\frac{22}{7}$.)

(*b*) $P = \frac{\sqrt{25.26} \times 0.78}{2.47}$.

Find the value of P to the first decimal place using the logarithms table.

Question Number	Marking Scheme	Marks	Other details
10. (*a*)	Volume of the hemisphere $= \frac{1}{2}\left(\frac{4}{3}\ \pi r^3\right)$		
	Volume of a cone $= \frac{1}{3}\pi\left(\frac{r}{4}\right)^2 h$	1	
	$\therefore\ \frac{2}{3}\pi r^3 = 56 \times \frac{1}{3}\pi\left(\frac{r}{4}\right)^2 h$	1	
	$2r = \frac{56 \times h}{16}$ $r = \frac{7}{4}h$	1	
	Radius of the hemisphere $= \frac{7}{4} \times 8$ $= 14$ cm		
	Volume of the hemisphere $= \frac{1}{2} \times \frac{4}{3} \times \frac{22}{7} \times (14)^3$	1	
	$= 5749\ \frac{1}{3}\text{cm}^3$	1 (5)	5749.33
(*b*)	$P = \frac{\sqrt{25.26} \times 0.78}{2.47}$		
	$\lg P = \frac{1}{2}\lg 25.26 + \lg 0.78 - \lg 2.47$	1	
	$= \frac{1}{2} \times 1.4024 + \bar{1}.8921 - 0.3927$	2	For any two correct logarithm values – 2 For one correct logarithm value – 1
	$= 0.7012 + \bar{1}.8921 - 0.3927$	1	
	$= 0.2006$		
	$P = 1.587$	1 (5)	10
	$= 1.6$	1	

11. An incomplete Venn diagram providing information on the modes of transport used by 108 students to travel to school is given below. Each of these students use at least one of the three modes of transport, bus, car and train.



No students who travels by car travels by train.

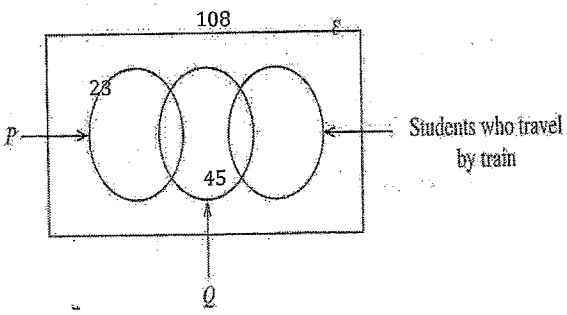
(i) Copy the above incomplete Venn diagram in your answer script and name the sets denoted by P and Q.

(ii) The number of students who travel by car or by train is 63. How many students travel by bus only?

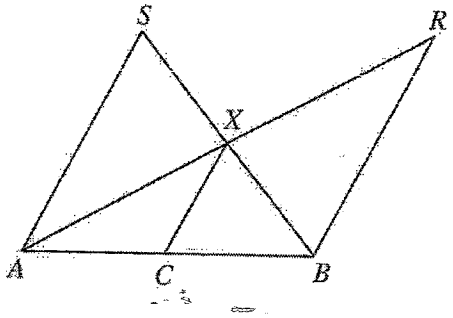
(iii) If the number of students who travel by car is 23, find the number of students who travel by train.

(iv) If the number of students who travel by bus or train is 99 find the number of students who travel only by car.

(v) If the number of students who travel by bus and train is twice the number that travel by bus and car, find the number of students who use exactly one of these three modes of transport.

Question Number	Marking Scheme	Marks	Other details
11.			
(i)	*P*- Students who travel by car *Q*- Students who travel by bus	1 1 (2)	If *P* and *Q* are not identified correctly, no marks for parts (iii), (iv), (v)
(ii)	Number of students who travel only by bus =108 – 63 = 45	1 1 (2)	
(iii)	Number of students who travel by train =63– 23 = 40	1 1 (2)	63 – 23 or marking 23 on the diagram -- 1
(iv)	Number of students who travel only by car = 108-99 = 9	1 1 (2)	
(V)	Number of students who travel by exactly one of these three modes = 9 + 45+ 12 = 66	1 1 (2) (10)	

12. (*a*) Write the converse of the midpoint theorem.



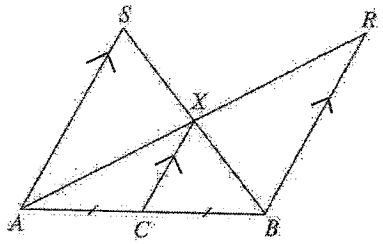
(*b*) The midpoint of the side AB of the triangle ABX in the given figure is C. The straight line through B drawn parallel to CX meets AX produced at R. The straight line through A drawn parallel to CX meets BX produced at S.

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

(ii) Show that the triangles AXS and BXR are congruent.

(iii) Join SR and show that $SR = AB$.

(iv) Show that the area of $ABRS$ is 8 times the area of triangle ACX.

Question Number			Marking Scheme	Marks			Other details
12.	(a)		If a straight line is drawn through the midpoint of one side of a triangle, parallel to the other side, it bisects the third side.	1	(1)		
							
	(b)	(i)	Figure	1	(1)		
		(ii)	*Data: C is the midpoint of AB* $AS \parallel CX \parallel BR$ *To prove:* ΔAXS *and* ΔBXR *are congruent* $SR = AB$ $8 \times$ *Area of* ΔACX $=$ *Area of* $ABRS$				
			Proof: In the triangles AXS and BXR $A\hat{S}X = X\hat{B}R$ (Alternate angles) $S\hat{X}A = R\hat{X}B$ (Opposite angles) $AX = XR$ (Converse of the M.P.T.) $\therefore \Delta AXS \equiv \Delta BXR$ (A.A.S)	1 1 1	(3)		Reason should be given for at least one equal pair of angles
		(iii)	$SA = BR$ (Corresponding sides of congruent Δs) $SA \parallel BR$ (Datum) $\therefore ABRS$ is a paralleogram (Opposide sides are // andequal) $SR = AB$ (Since $ABRS$ is a parallelogram)	1 1 1	(3)		
		(iv)	Area of $ABRS$ = 2×Area of ΔABR: AR is a diagonal) = 2(2×Area of ΔABX) ($AX = XR$ and same height) = 2(2 × 2 Area of ΔACX) = 8×Area of ΔACX	1 1	(2)	10	