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இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

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
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

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

Instructions:

* *Answer ten questions selecting five questions from* **Part A** *and five questions from* **Part B**.
* *Write the relevant steps and the correct units in answering the questions.*
* *Each question carries* **10** *marks.*
* *The volume of a sphere of radius r is* $\frac{4}{3}\pi r^3$.
* *The volume of a right circular cone of base radius r and height h is* $\frac{1}{3}\pi r^2 h$.

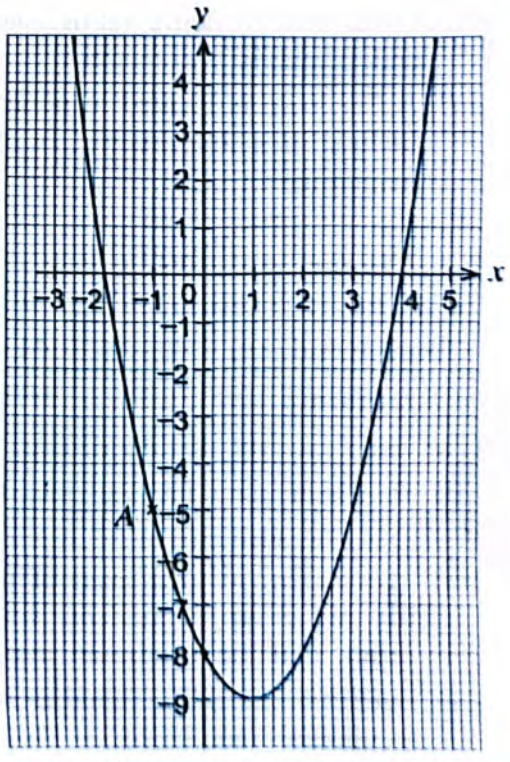
Part A

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.

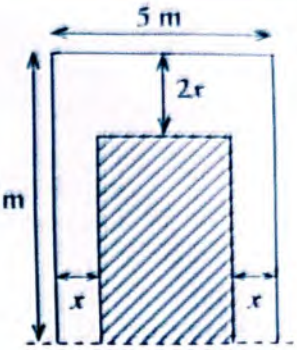
(iii) Write the interval of values of x on which the function is negative and increasing.

(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.

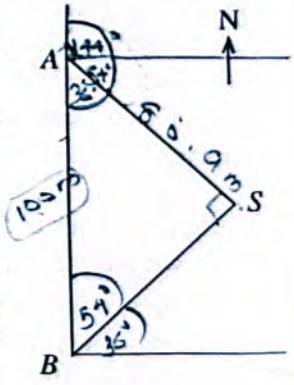
4. Books and pens were donated to the grade 10 and grade 11 students of a certain school in the following manner.

- 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.

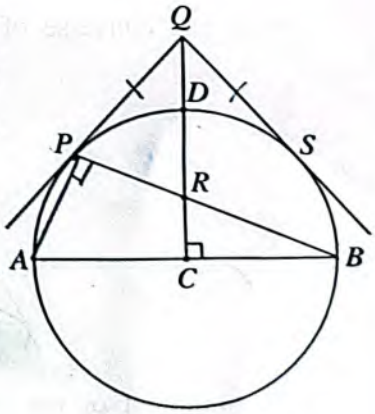
(i) Construct a straight line segment AB such that $AB = 6$ cm and construct its perpendicular bisector.

(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.

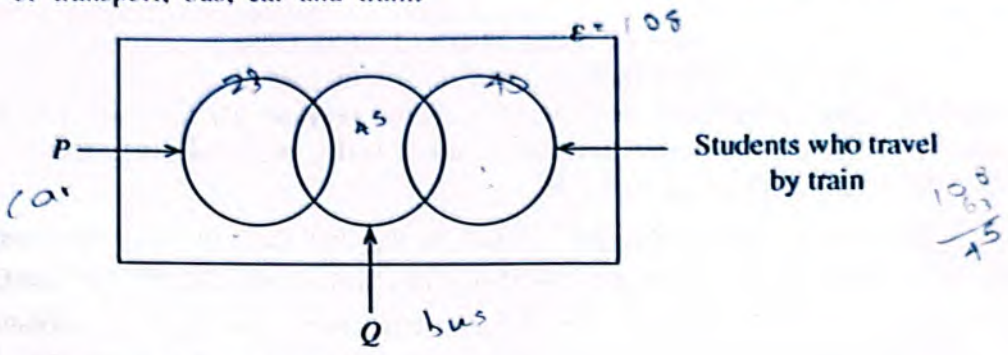
10. (*a*) A solid hemisphere of radius r cm made of metal is melted and 56 solid right circular cones of base radius $\frac{1}{4}$ the radius of the hemisphere, and height h cm are made. By assuming that there is no wastage of metal, show that the relationship between the radius of the hemisphere and 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*) $P = \dfrac{\sqrt{25.26} \times 0.78}{2.47}$.

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.

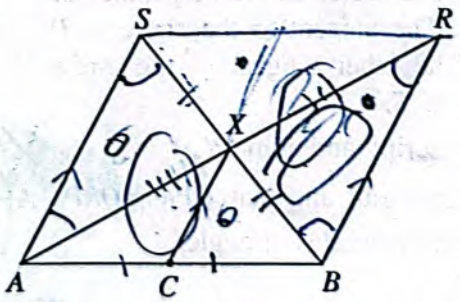
(ii) The number of students who travel by car or by train is 63. How many students travel by bus only?

(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.

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