



නව නිර්දේශය/புதிய பாடத்திட்டம் / New Syllabus

අධ්‍යයන පොදු සහතික පත්‍ර (සාමාන්‍ය පෙළ) විභාගය, 2016 දෙසැම්බර්
 கல்விப் பொதுத் தராதரப் பத்திர (சாதாரண தர)ப் பரீட்சை, 2016 டிசெம்பர்
 General Certificate of Education (Ord. Level) Examination, December 2016

ගණිතය II
 கணிதம் II
Mathematics II

පැය තුනයි
 மூன்று மணித்தியாலம்
Three hours

Important:

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

Part A

Answer five questions only.

1. An incomplete table prepared to draw the graph of the function $y = 4 - x(x - 2)$ is given below.

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

- (i) Find the value of y when $x = 1$.
- (ii) Using the scale of 10 small divisions as one unit along the x -axis and along the y -axis, draw the graph of the above function on a graph paper.
- (iii) Find the range of values of x for which y is decreasing and $-4 < y \leq 1$.
- (iv) Suppose that the given function is written in the form $y = -(x - p)^2 + q$. Indicate the point (p, q) on the graph as M .
- (v) Using the graph, find the positive value of x such that $x^2 - 2x = 4$, to the first decimal place.

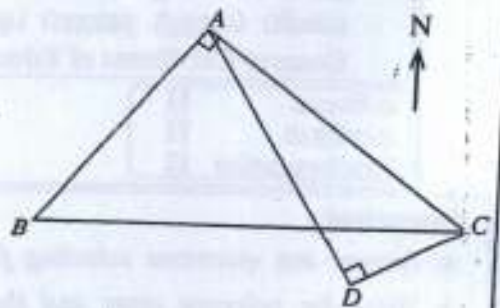
2. The information obtained from a survey conducted to find out how much time it takes for a doctor to examine a patient who arrives at the outpatient department of a certain hospital, is given in the following table. 100 patients were used in the survey. In the table, 2 - 4 denotes the time interval "greater than 2 and less than or equal to 4", and the others denote similarly.

Time taken to examine a patient (minutes)	2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14
Number of patients	19	32	37	6	4	2

- (i) Using a suitable assumed mean or otherwise, find the mean time taken by a doctor to examine a patient.
 - (ii) Find the percentage of patients who were examined for more than the mean time.
- Each doctor in this department examines patients for 6 hours per day.
- (iii) Find the number of patients that can be expected to be examined by a doctor during a day.
 - (iv) Estimate the minimum number of doctors required to examine 400 patients who arrive at the outpatient department on a certain day.

3. A computer which is sold for a cash payment of Rs 80 000 can also be bought by making a down payment of Rs 20 000 and paying the rest in 12 equal monthly instalments. In this case, the interest is calculated on the reducing balance at an annual interest rate of 24%. Calculate the value of a monthly instalment.

4. The figure shows the locations of four statues A , B , C and D on a city plan drawn to scale. Here, $\hat{BAC} = \hat{ADC} = 90^\circ$, $AC = 10$ cm and $AD = 9.4$ cm.



- (i) By considering the triangle ACD and using the trigonometric tables, find the magnitude of \hat{ACD} and show that it is 70° to the nearest degree.

The bearing of D from C is 242° , and C is located due east of B .

In the following calculations, use 70° for the magnitude of \hat{ACD} .

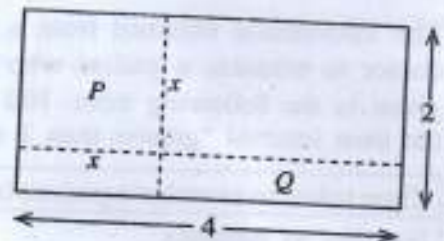
- (ii) Find the magnitudes of \hat{BCD} and \hat{ACB} .
- (iii) By considering the triangle ABC and using the trigonometric tables, find the length of AB .

5. The following describes how the students and teachers of a school are involved in a tree planting event organized by the school environmental society.

A total of Rs 16 500 is collected, with each student contributing Rs 150 and each teacher contributing Rs 500. Then 330 saplings are bought with this money, and all of them are distributed to be planted, by giving each student 5 saplings and each teacher 2 saplings.

- (i) By constructing a pair of simultaneous equations and solving them, find the number of students and the number of teachers.
- (ii) If, instead of the above method of distributing the saplings, each student is given p saplings and each teacher q saplings, then some saplings will remain undistributed. Write an inequality in terms of p and q using this information.

6. The part P obtained by cutting a rectangular metal sheet of length 4 metres and breadth 2 metres, along two straight dashed lines as shown in the figure, is a square.



Let the side length of part P be x metres.

- (i) Find an expression in terms of x , for the area of the rectangular part labelled Q in the figure.

The area of P is twice the area of Q .

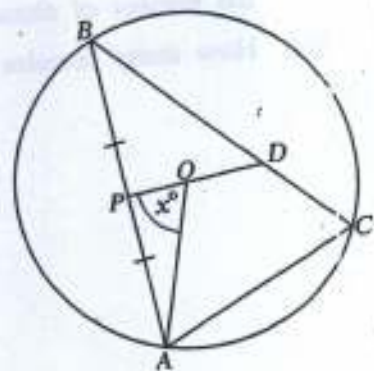
- (ii) Show that $x^2 - 12x + 16 = 0$.
- (iii) Using the formula or by some other method, show that $x = 6 \pm 2\sqrt{5}$.
- (iv) Show that the value $6 + 2\sqrt{5}$ is not suitable for x .
- (v) By taking the value of $\sqrt{5}$ as 2.24, find the suitable value for x .

Part B

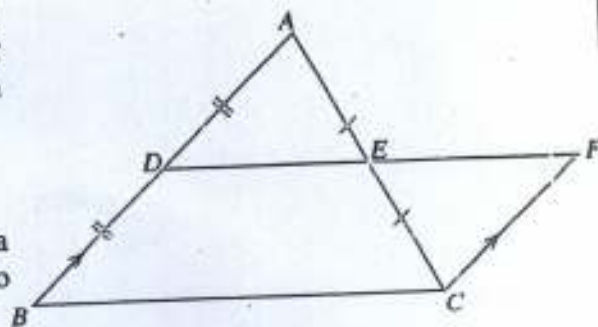
Answer five questions only.

7. (a) The first term of a given arithmetic progression is 3 and the 11th term is 43.
- Show that the common difference is 4.
 - Find the sum of the first 20 terms of the progression that is obtained by removing the terms in the even positions of the given progression, such as the second term, fourth term, sixth term.
- (b) The common ratio of a geometric progression is 2 and the sum of its first 6 terms is 7. Find
- the first term
 - the fifth term of this progression.
8. Use only a straight edge with a cm/mm scale and a pair of compasses for the following constructions. Show the construction lines clearly.
- Construct the triangle ABC such that $AB = 6.5$ cm, $AC = 5$ cm and $\hat{BAC} = 60^\circ$.
 - Construct the angle bisectors of \hat{BAC} and \hat{ABC} and name their point of intersection O .
 - Construct a perpendicular from O to the side AB , name its foot M , and construct the incircle of the triangle ABC .
 - A point D (other than M) should be found on the incircle such that the tangent drawn to the circle at D is parallel to AB . Find such a point, name it D , and construct the tangent to the circle at D .

9. The centre of the circle in the figure is O , and AB , BC and AC are chords of the circle. P is the midpoint of AB . The line drawn from P through O meets BC at D . It is given that $\hat{AOP} = x^\circ$. Find \hat{ACD} in terms of x and show that $AODC$ is a cyclic quadrilateral.

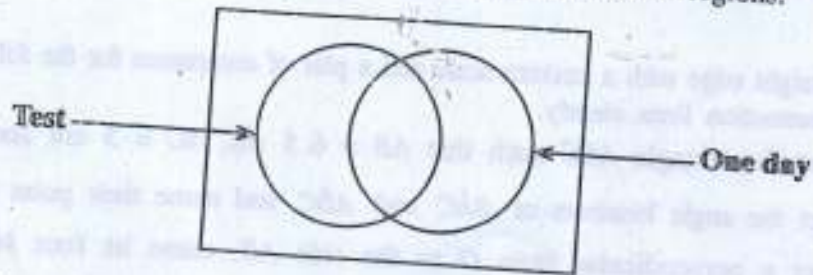


10. In the triangle ABC shown in the figure, the midpoints of the sides AB and AC are D and E respectively. The line DE produced meets the line through C , drawn parallel to BA , at F .



- Show that $\triangle ADE = \triangle CFE$.
- Join AF and DC and show that $ADCF$ is a parallelogram and that its area is equal to the area of the triangle ABC .
- Show that if $DE = AE$, then $\hat{ADC} = 90^\circ$.

11. A solid spherical glass ball of radius 21 cm is melted and 240 identical solid cylindrical glass discs are made. Assume that there is no change in the volume of glass in this process. If the radius of each disc is r centimetres and height is $\frac{r}{9}$ centimetres, show that $r = \sqrt[3]{\frac{21}{20}}$ and, using the logarithms table, find the value of r correct to two decimal places.
12. The information given by 50 persons in a survey conducted to assess the popularity of test and one day cricket matches revealed the following.
- 15 had watched test matches.
 - 13 had watched both test and one day matches.
 - 5 had not watched matches of either of these two formats.
- (i) Copy the Venn diagram given below, find the number of elements belonging to each region using the given information, and write them in the relevant regions.



- (ii) How many persons had watched one day matches?
- 33 of these 50 persons were males, and they all had watched one day matches. Moreover, 9 males had also watched test matches.
- (iii) Copy the above Venn diagram again, include the subset "Males" in a suitable way, find the number of elements belonging to each region, and write them in the relevant regions.
- (iv) How many females had watched one day matches?

