නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW

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

32 **E** **I**

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	I		පැය දෙකයි
கணிதம்	I		இரண்டு மணித்தியாலம்
Mathematics	**I**		***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** in answering the questions.

* Marks are awarded as follows:

  In Part A
  2 marks for each question

  In Part B
  10 marks for each question

* Blank papers can be obtained for scratch work.

For Marking Examiners' Use Only

Part	Question Numbers	Marks
A	1 - 25	
B	1	
	2	
	3	
	4	
	5	
Total		

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

Part A

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

1. Duty of 6% has to be paid when an item worth Rs 800 is imported. Find the duty.

2. In the given Venn diagram, shade the region that represents the subset $A \cap B$.
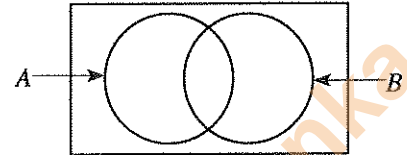
3. A bus which moves at a uniform speed, travels a distance of 48 metres in 3 seconds. Find the speed of the bus in metres per second.

4. Represent in index form: $\log_2 16 = 4$

5. Solve: $(x - 1)(x - 2) = 0$

6. Write all the positive integers that satisfy the inequality $2x + 1 \leq 5$.

7. Simplify: $\dfrac{1}{x} + \dfrac{1}{2x}$

8. Find the least common multiple of the two algebraic expressions xy and x^2.

9. It takes 6 hours to harvest a paddy field with a machine. How many hours will it take to harvest this paddy field with three such machines?

10. Write the probability of getting a card with an odd number written on it, when a card is drawn randomly from a box which contains 3 identical cards with the numbers from 1 to 3 written on them.

11. Using the information given in the table, find the first approximation of $\sqrt{90}$.

x	9.3	9.4	9.5	9.6
x^2	86.49	88.36	90.25	92.16

12. The two triangles ABC and PQR in the figure are congruent. Find the values of x, y and z using the given information.
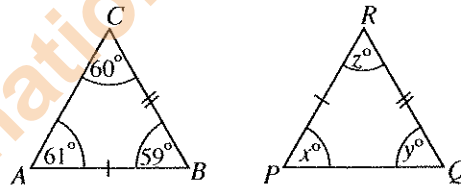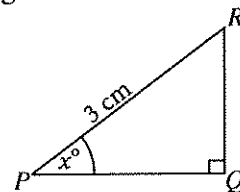

13. The radius of a solid cylinder is 7 cm and its height is 2 cm. Taking $\frac{22}{7}$ for the value of π, find the area of its curved surface (the area of the curved surface of a solid cylinder of radius r and height h is $2\pi rh$).
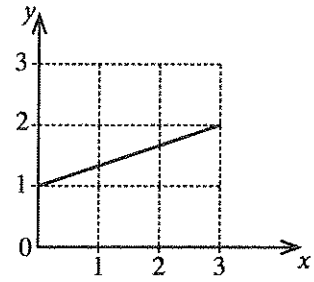
14. Find the value of x using the information given in the figure.
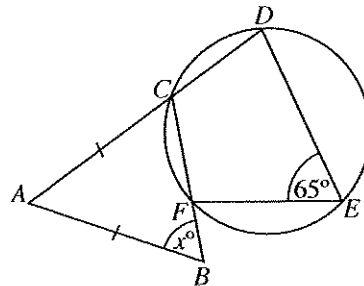
15. Given that $\cos x° = 0.8$, find the length of PQ using the information in the figure.

16. Write the values that are obtained for m and c when the equation of the straight line in the figure is expressed in the form $y = mx + c$.


17. In the table, place the mark "√" in the boxes in front of the true statements, if any, and the mark "X" in the boxes in front of the false statements, if any.

In a parallelogram, opposite sides are equal and parallel.	
In a parallelogram, opposite angles are equal.	
The area of a parallelogram is bisected by each diagonal.	

18. Using the information given in the figure, find the magnitude of $C\hat{D}A$.
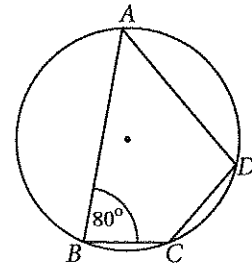
19. The radius of the circle with centre O in the figure is 10 cm. Find the length of the chord AB using the given information.
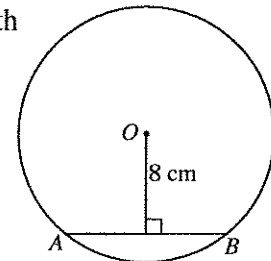
20. Given that $\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 2 & 0 \\ 0 & 4 \end{pmatrix}$, find the matrix $\mathbf{AB}$.

21. Find the magnitude of $E\hat{F}C$, using the information relevant to the triangle ABC in the figure.
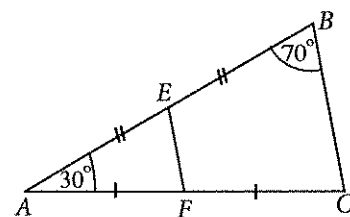
[see page five

22. The centre of the circle in the figure lies on AC. Find the magnitude of $C\hat{B}D$ using the given information.
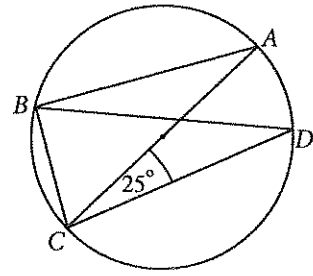
23. Find the volume of the triangular prism in the figure using the given information.
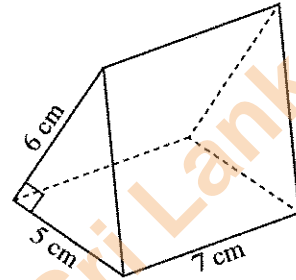
24. The first 12 data of 23 data that are written in ascending order is as follows.

$$4, 4, 6, 7, 7, 8, 9, 9, 10, 11, 13, 15$$

Write the median and the first quartile of the 23 data.

25. In the figure, draw a sketch of the construction lines required to find the point on AC that is equidistant from the points A and B, and indicate this point by naming it D.

* *

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

1. Mr. Kithsiri made a cash donation to a community centre. $\frac{2}{9}$ of the total amount he donated was used to buy musical instruments and $\frac{1}{2}$ to buy sports equipment.

    (i) Find what fraction of the total amount was used to buy the musical instruments and sports equipment.

    $\frac{1}{5}$ of the remaining amount was used to buy books for the library.

    (ii) Find what fraction of the total amount was used to buy books.

    The amount remaining after purchasing the books was used to renovate the community centre.
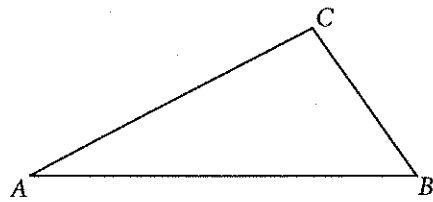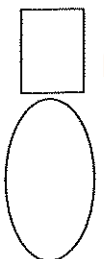
    (iii) Find what fraction of the total amount was used for the renovation.

    (iv) If the renovation cost was Rs 20 000, find the total amount Mr. Kithsiri donated.

2. The pie chart given in the figure shows how a certain group of farmers selected various types of vegetables for growing. Each farmer grew only one type of vegetable.

    The number of farmers who selected pumpkins is equal to the number of farmers who selected brinjals.

    (i) Find the magnitude of the angle at the centre of the sector that represents the farmers who selected brinjals.
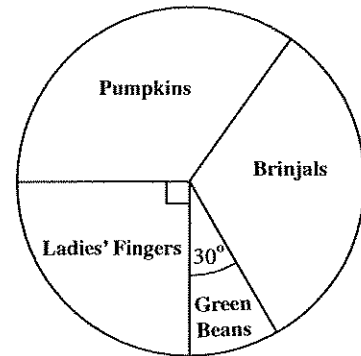
    The number of farmers who selected green beans is 15.

    (ii) Find the number of farmers who selected pumpkins.

    (iii) Find the total number of farmers represented in this pie chart.

    After one year, 20 farmers who had been growing brinjals stopped growing vegetables.

    (iv) Find the magnitude of the angle at the centre of the sector which represents the farmers growing brinjals, in a new pie chart drawn considering the changed data.

3. Mr. Perera, who is an investor in the stock market, invests Rs 40 000 to buy shares of a company at the market price of Rs 80 per share. The company pays annual dividends of Rs 6 per share.

   (i) Find the number of shares Mr. Perera buys.

   (ii) Find the annual dividend income Mr. Perera receives.

   After one year, Mr. Perera sells all the shares and makes a capital gain of Rs 3 500.
   (iii) Find the selling price of a share.

   Mr. Perera adds Rs 3 500 to the capital gain and dividend income he receives and deposits the whole amount for a period of two years, in a fixed deposit account which pays an annual compound interest rate of 10%.
   (iv) Find the total amount in the account at the end of the two years.

4. There are three red tennis balls and one green tennis ball in a box. A ball is drawn from the box, its colour is recorded and is put back. A ball is drawn from the box again and its colour is also recorded. The balls are drawn randomly.

   (i) Indicate the relevant sample space in the given grid using the mark "x" (R_1, R_2, R_3 represent red balls and G represents the green ball).

   (ii) Indicate the event of drawing the green ball at least once, by encircling it in the grid, and write down its probability.
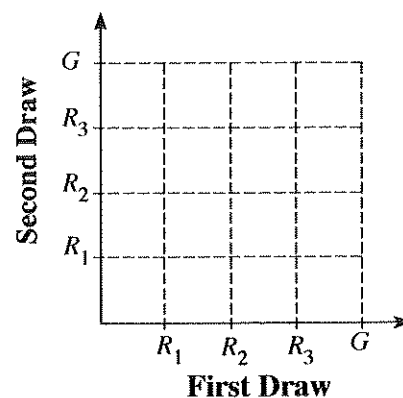
   Two of the three red balls are each marked with the letter X, and the remaining red ball and the green ball are each marked with the letter Y. Suppose that the letter marked on the ball was also recorded in each of the above drawings.

(iii) Complete the following tree diagram relevant to this random experiment.

First Draw   **Second Draw**
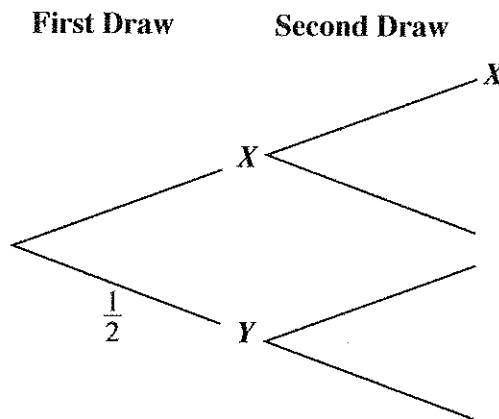
(iv) Find the probability of drawing balls marked with the same letter on both occasions.

(v) State with reasons whether there is a greater probability of drawing balls marked with the same letter on both occasions or drawing the green ball at least once.

5. A sketch of the floor of a theatre is shown in the figure. It consists of a semicircular part *CED* on which the stage is built and a rectangular part *ABCD* where the auditorium is built. The length of *DC* is 14 m.

In the following calculations, use $\frac{22}{7}$ for the value of π when required.

   (i) Find the arc length of the semicircle *CED*.

   (ii) Find the area of the floor on which the stage is built.
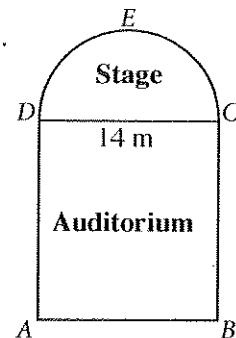
(iii) If the floor area of the auditorium is three times the area of the floor on which the stage is built, find the length of *AD*.

(iv) Light bulbs have been fixed around the floor on which the stage is built, with bulbs at *C* and *D* too. There is an equal gap of 1.4 metres between adjacent bulbs on the line *CD*. The bulbs on the arc *CED* are also fixed with an equal gap. The number of bulbs on the line *CD* and on the arc *CED* are equal. Calculate the distance along the arc between two adjacent bulbs on the arc *CED*.

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නව නිර්දේශය/புதிய பாடத்திட்டம்/New Syllabus

NEW

Sri Lanka Department of Examinations, Sri Lanka

32 **E** **II**

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**		පැය තුනයි
கணிதம்	**II**		மூன்று மணித்தியாலம்
Mathematics	**II**		***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, $B\hat{A}C = A\hat{D}C = 90°$, $AC = 10$ cm and $AD = 9.4$ cm.
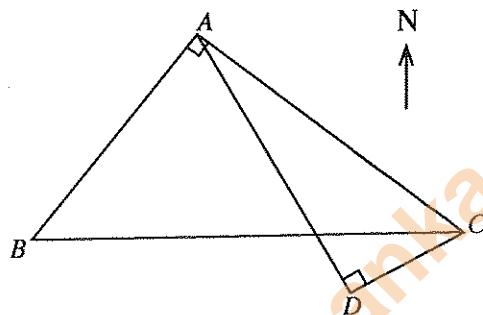
   (i) By considering the triangle ACD and using the trigonometric tables, find the magnitude of $A\hat{C}D$ and show that it is $70°$ to the nearest degree.

   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 $A\hat{C}D$.

   (ii) Find the magnitudes of $B\hat{C}D$ and $A\hat{C}B$.

   (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.
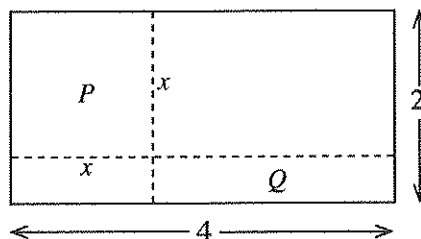
   The area of P is twice the area of Q.

   (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.

    (i) Show that the common difference is 4.

    (ii) 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

    (i) the first term

    (ii) 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.

    (i) Construct the triangle ABC such that $AB = 6.5$ cm, $AC = 5$ cm and $B\hat{A}C = 60°$.

    (ii) Construct the angle bisectors of $B\hat{A}C$ and $A\hat{B}C$ and name their point of intersection O.

    (iii) Construct a perpendicular from O to the side AB, name its foot M, and construct the incircle of the triangle ABC.

    (iv) 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 $A\hat{O}P = x°$. Find $A\hat{C}D$ in terms of x and show that $AODC$ is a cyclic quadrilateral.
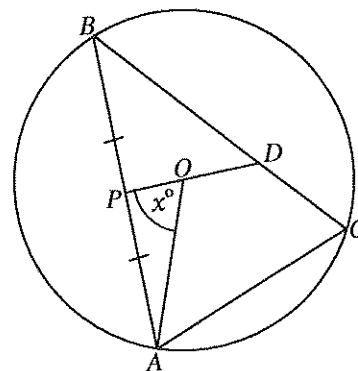

10. In the triangle ABC shown in the figure, the midpoints of the sides AB and AC are D and E respectively. The line DE produced meets the line through C, drawn parallel to BA, at F.
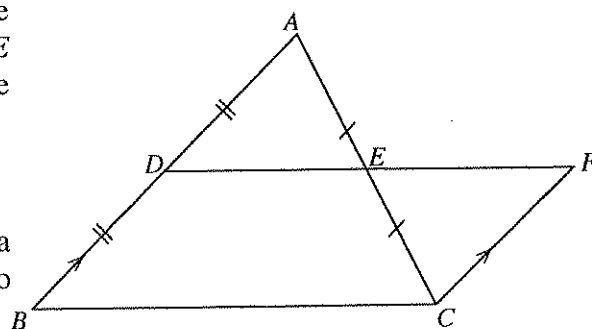
    (i) Show that $\triangle ADE \equiv \triangle CFE$.

    (ii) Join AF and DC and show that $ADCF$ is a parallelogram and that its area is equal to the area of the triangle ABC.

    (iii) Show that if $DE = AE$, then $A\hat{D}C = 90°$.

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 $r = \frac{21}{\sqrt[3]{20}}$ 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.
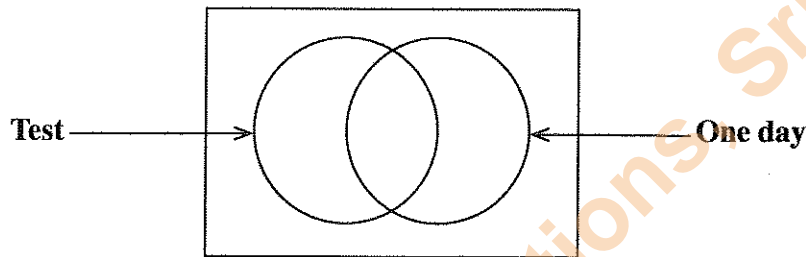
   (ii) How many persons had watched one day matches?

   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?

* * *