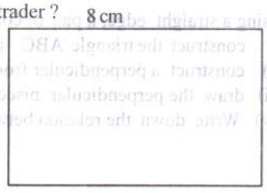
GCE O/L December 2003
Mathematics Paper 2
Duration 3 Hour

1. (a) (i) Simplify : $\left[\frac{1}{2}+\frac{1}{3}\right] \div 1\frac{2}{3}$

(ii) A man buys 2 kilogrammes of suger at Rs. 32 per kilogramme and 250 grammes of tea at Rs 240 per kilogramme How much will he receive as the balance, if he tenders Rs. 200 to the trader ?

(b) (i) Solve $3x+y=7$, $2x-y=-2$ (ii) Factorise : $2x^2+xy-2ax-ay$

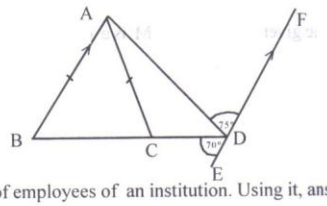
(c) A scale drawing of a rectangular ground drawn to the scale 1 centimetre to 20 metres is shown here .



(i) Find the area of the scale drawing .
(ii) Find the lenght and the breadth of the ground.
(iii) If a barbed wire fence has been made around this ground, find the lenght of a single strand of barbed wire .

(d) In the triangle ABC, AB = AC. Side BC is produced to D. Point s A and D are joined . Through D,EF is drawn parallel to side BA.ADF =75° and BDE = 70°

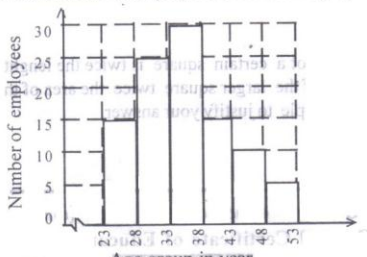
Copy the diagram on to your answer script and giving reasons,



(i) find the value of $A\hat{C}B$.
(ii) find the value of $C\hat{A}D$.
(iii) Show that AC = CD.

(e) Diagram shows a histogram which represnts the various age groups of employees of an institution. Using it, answer the following questions.

(i) In which age groups are the number of employees equal ?
(ii) What is the modal class of this distribution ?
(iii) What is the total number of employees in the institution ?
(iv) Express the number of employees whose age is less than 38 years, as a percentage of the total number of employees
(v) Write down a remark that you can make about the distribution of employees in different age groups.



(f) If the set of letters that makes the word 'COMMUNICATION' is X,

(i) Write down the set X with its elements.
(ii) Find n (X) If the set of letters that makes the word 'GENERATION " is Y,' .
(iii) illustrate the two sets X and Y in a Venn Diagram.
(iv) taking that Z = {A,N,I,T,O} write down the set Z in terms of X and Y.

2. (a) Sumedha collects money in a till as follows : Rs 5 in the fist week , Rs 10 in the second week , Rs 15 in the third wee and so on . (He saves money this way in order tobuy a certain book using the money collected in a few weeks) Using the knowledge of progressions,

(I) find the amount of money he puts into the till in the sixth week.
(II) find the number of weeks he has to save money to buy a book priced at Rs 225..

(b) Using the formula or by completing the square ,find the roots of $x^2 + 4x - 1 = 0$ to the nearest second decimal place

3. (a) Using a straight edge, a pair of compasses and a cm/mm scale and showing the constuction lines clearly,
(i) construct the triangle ABC in which AB = 7.5cm , BC = 5cm and $A\hat{B}C = 120^0$
(ii) construct a perpendicular from C to AB produced . Name the point that it meets AB produced as D..
(iii) draw the perpendicular bisector of side AD. Name the point that it intersects the side AC as P.
(iv) Write down the relation between the point P and the circum -circle of triangle ADC.

(b) (i) Using a protractor , measure and write down the magnitude of $C\hat{A}B$

(ii) Measure and write down the lenght of side CD in centimetres to the first decimal place.

(iii) Using the lenght of CD you obtain ed above and that sin $60^0 = \frac{\sqrt{3}}{2}$,find the value of $\sqrt{3}$ to the nearest first decimal place.

4. Now you can buy Rs . 10 shares at Rs 15 each of Rasmini & co . which pays an annual dividend of 12 %.

Above is a part of an advertisement from a newspaper.

(a) (i) What is the nominal value of a share of this company ?

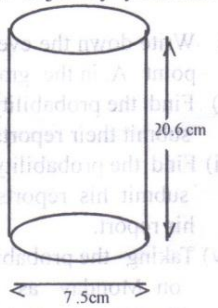
(ii) How many shares can Saman buy in this company with an investment of Rs. 60 000?

(iii) What will be his income at the end of an year ?

(iv) A man who invests Rs. p to buy Rs 10 shares of a company at Rs x, which pays an annual dividend of r%, gets an income Rs A, at the end of the year. Form a formula for A in terms of p,r,and x. .

(b) Is it more profitable for Saman to invest this Rs. 60 000 in a fixed deoposit of another company for an year, which pays an annual interest of 8% , instead of investing it in Rasmini & company? Give reasons to justify your answer .

5. (a) A right circular solid cylinder is shown in the diagram.



(i) What is the radius of the cross - section of this cylinder ?

(ii) Taking $\pi = 3.14$,write down an expression , in terms of radius and height of this cylinder, for its volume V.
(Simplification is not necessary)

(iii) Using logarithmic tables , calculate the volume of the cylinder to the nearest cubic centimetre .

(b) The volume of a right circular solid cylinder of cross- sectional radius r is equal to the volume of a right circular solid cone of base radius r . How many times the height of the cylinder is the perpendicular height of the cone ? Clarify your answer

6. The lenght of a rectangle is 6 cm and its breadth is 2 cm. A new rectngle is formed by decreasing the lenght of this rectangle by x cm and increasing its breadth by x cm.

(a) (i) What is the lenght of the new rectangle?

(ii) What is the breadth of the new rectangle ?

(iii) If the area of the new rectangle is y , show that $Y = -x^2 + 4x + 12$.

(b) An incomplete table of values of x and y obtained to draw the graph of the above function $Y = -x^2 + 4x + 12$ is given below

x	0	1	2	3	4	5	6
y	-	15	16	-	12	7	0

(i) Copy down this table on to your answer script and fill in the blanks .

(ii) Taking 10 small divisions along the x- axis to represent **one unit** and 10 small divisions along the y-axis to represent **two units** as scale , draw the graph of the above function on the graph paper provided.

(c) Using your graph ,

(i) find the maximum area that the above rectangle can have.

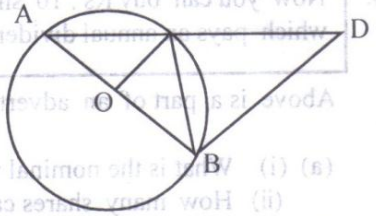
(ii) write down the range of values of x for which the area of the rectangle is greater than 13 cm^2

(iii) when value of x is 6, what happens to the rectangle?

7. Prove the following theorem.

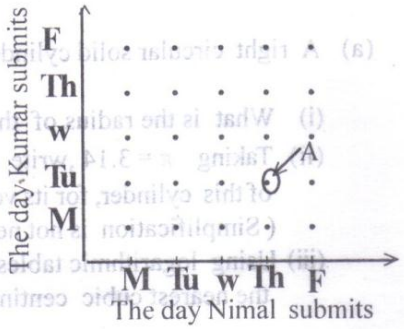
"The angle subtended by an are of a circle at its centre is twice the angle subtended by the same are at any point on the remaining part of the circle. "

AB is a diameter of a circle whose centre is O.
C is a point on the circle at B and the chord AC produced meet at D.
Using above information ,



(i) name a right angle.
(ii) show that $2\,C\hat{B}D = C\hat{O}B$.
(iii) show that the triangles BCD and ABD are equi -angular.
(iv) show that $BD^2 = AD.CD$, by equating the ratios of the corresponding sides of the triangles BCD and ABD.

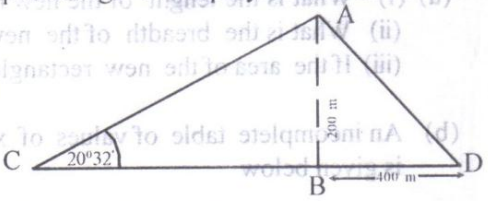
8. (a) Students of grade eleven have been asked to submit their mathematics project reports within the five days of the next week.The graph given here represents the sample space which shows the different ways Nimal and Kumar can submit their reports.



(i) Write down the event represented by the point A in the graph.
(ii) Find the probability that both will be able to submit their reports on the same day.
(iii) Find the probability that Kumar will be able to submit his reports on a day prior to the day on which Nimal submits his report.
(iv) Taking the probability of Nimal being able to submit his report on Monday as $\frac{1}{5}$ draw a tree diagram to illustrate the instances that his being able to and not being able to submit the report.
(v) $\frac{1}{5}$ the instances that Kumar too being able to and not being able to submit the report on Monday itself.
(vi) Using the tree diagram drawn , calculate the probability of both these students being able to submit their reports on Monday.

(b) In a certain institute , 68% of the employees know sinhala language while 40% know English Language. 20% **do not know** any of these languages. Out of them , find the percentage of employees who know both these languages.

9. (a) In the diagram, DA and CA represent two straight roads leading to the highest point A of the mountain which is 200 metres high.Points C and D lie on the same horizontal level.



(i) Taking $\sqrt{20} = 4.47$,calculate the lenght of the road AD
(ii) Using trigonometric tables and logarithmic tables, calculate the lenght of the road CA.
(iii) Write an advantage that a man gains by riding along road CA ,than riding along road DA to the highest point A.

(b) PQRS is a parallelogram. The straight line drawn through R parallel to diagonal QS meets PQ produced at T. Draw a diagram to illustrate this data and show that SR = QT .

10. (a) The following information was collected during a study carried out with 50 employees to find the time taken by each employee to assemble the parts of a certain electrical item.

Time spent (In minutes)	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
No of employees	2	5	7	10	14	8	3	1

(i) According to this information ,what is the time interval which includes the maxium number of employees?
(ii) Taking the mid value of the above mentioned interval as the assumed mean , calculate the mean time an employee spends to assemble one such electrical item.
(iii) According to the mean you obtained ,etimate how many employees should be used to asemble 450 such electricl items during a work shift of 6 hours.

(b) The cumulative frequency curve given here shows the distributon of marks scored by 40 students for a certain subject.According to the graph ,

(i) how many students have scored 70 marks or less?
(ii) what is the mark that seprates the 25% of the students who have scored the highest marks.from the rest?