GCE O/L December 2011
Mathematics Paper 2
Duration 2.30 Hour

Part A

1. (a) A man rents out a house owned by him for Rs. 4000 per month. From the annual income he receives, he spends 20% on house maintenance and Rs 1200 as annual rates.

   (i) What is the total amount received as rent in a year?
   (ii) What is the amout spent on maintenance in a year?
   (iii) What is the amount he saves by the end of the year?

   (b) If a person who invests Rs 37200 to buy Rs 10 shares of a company at Rs 16 per share receives an annual income of Rs 4650, find the annual dividend paid by the company.

2. An incomplete table consisting of y values of the function $y = 2 - x(x - 4)$ corresponding to several given values of x is given below.

x	-1	0	1	2	3	4	5
y	-3	2	5	6	5	.....	-3

   (a) (i) Find the value of y when $x = 4$
   (ii) By selecting a suitable scale for the x and y axes, draw the graph of the function using the values in the above table.

   (b) Using the graph
   (i) Find the maximum value of the function
   (ii) Write down the interval of x in which the function is positive and decreasing
   (iii) obtain the minimum value of the function $y = x(x - 4) - 2$

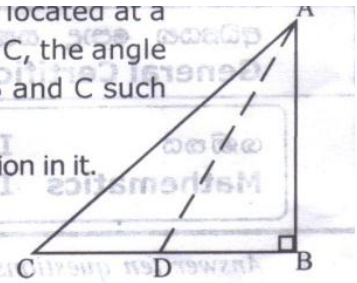
   (c) When $x = 2 + \sqrt{6}$ the value of the given function is zero. Deduce the value of $\sqrt{6}$

3. (a) Solve $\frac{1}{x - 2} + \frac{2}{3(x - 2)} = \frac{1}{3}$

   (b) Factorize $x^2 + bx - ax - ab$

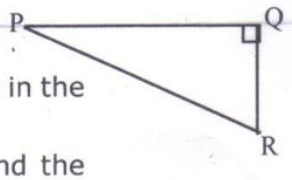
   (c) By completing the square or by another method, find the solutions of the quadratic equation $x^2 + 4x - 8 = 0$ to two decimal places.
   (Take $\sqrt{3} = 1.73$)

4. (a) A post AB erected on a level horizontal ground and a point C which is located at a distance of 100m from the post is given in the figure. Observed from C, the angle of elevation of the top of the post is $27^0\ 50'$. D is located between B and C such that AD = 80m.



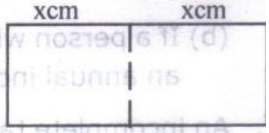
(i) Copy this figure onto your answer sheet and include the above information in it.
(ii) Find the height of the post.
(iii) Find the magnitude of the angle $A\hat{D}B$.

(b) The given sketch shows a lamp post P, a tower Q and a mango tree R which are located on a horizontal ground.



(i) If the actual distance 15m, between P and Q is represented by 7.5cm in the scale diagram, find the scale used to draw the diagram.
(ii) If the distance between Q and R in the scale diagram is 4.0cm find the actual distance between them.
(iii) Observed from P, R is located 28^0 due South from East. What is the bearing of P when observed from R?

5. (a) The length, breadth and perimeter of a piece of rectangular metal sheet are x cm, y cm and 160cm respectively. Another rectangular sheet with perimeter of 260cm is made by welding two such pieces together as shown in the figure,



(i) Construct a pair of equation in x and y using the information given above.
(ii) Obtain the values of x and y by solving these equations.

(b) If $A = \begin{bmatrix} 2 & 0 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ 5 & 2 \end{bmatrix}$ find the matrix given by 2A - B

6. (a) A prism with cross-sectional area a^2 and height b is made out of the metal obtained by melting a solid metal cylinder of base radius a and height 2a, without any wastage of metal.

(i) Obtain the volume of the cylinder in terms of a
(ii) Show that the height of the prism, $b = 2\pi a$

(b) Using logarithm tables, simplify : $\dfrac{(7.432)^2 \times 0.253}{2.343}$

Part B

7. In a college drill display, students are positioned so that the first row has 10 students, the second row has 13 students, the third row has 16 students and so on. According to this pattern.
(i) How many students are in the ninth row?
(ii) Which row has 52 students?
(iii) If the drill display had 18 rows, how many students participated in the display in total?
(iv) The principal states that if 131 more students participate, then 3 additional rows can be added to the display. Show that this statement is **not true.**

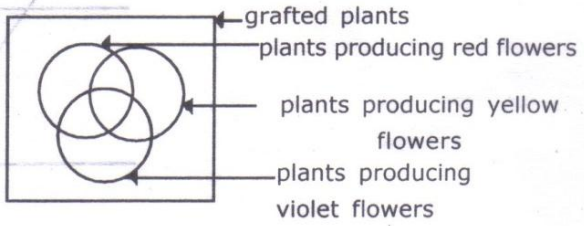
8. Using only a straight edge with a cm/mm scale and a pair of compasses,
(i) Construct the traingle ABC such that AB = 6.0cm, $A\hat{B}C = 90^0$ and BC = 3.5cm
(ii) Construct a line AP such that $B\hat{A}C = C\hat{A}P$ and the points P and B are located in either side of AC
(iii) If AP meets BC produced at E, mark point D anywhere on the line AP except at E. Construct a line through D parallel to AC.
(iv) by joining the required points with straight line segments, identify and name a triangle which is equal in area to the triangle ACD

9. The data collected by a student on the reuse of Mathematics text books in 50 classes of his school are given in the following table.

Number of books reused	Mid value (x)	Number of classes (f)
0 - 6	3	3
7 - 13	10	7
14 - 20	....	9
21 - 27	24	11
28 - 34	31	10
35 - 41	....	8
42 - 48	.....	2

(i) Copy this table onto your answer sheet and complete the mid value (x) column.
(ii) Add a column for fx and complete it.
(iii) Calculate the mean number of books reused by a class.
(iv) Find the number of books which could be expected to be reused in 5 such schools consisting of 60 classes each.
(v) "The number of books reused in the school where the data was collected could have been 1300" Show that the above statement could be true according to the information in the above table.

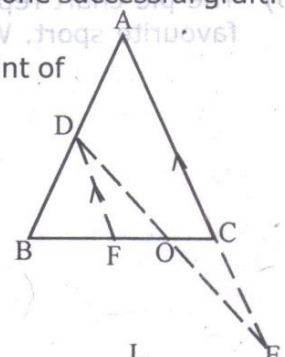
10. A student grafted 3 different grafts which produce red, yellow and violet flowers, to each of 100 plants in a nursery. A graft is considered to be successful, if the plant produces flowers of the relevant colour. A Venn diagram to represent the information on the blooming of flowers on the plants after the grafting is given here.



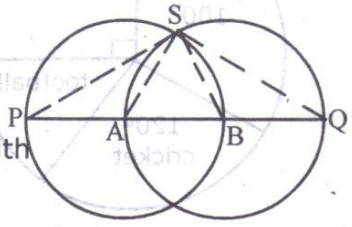
(i) Copy the given Venn diagram and shade the region which represents the plants producing only red flowers.
(ii) Include the following information in the Venn diagram.
- The number of plants producing only yellow flowers is 25
- The number of plants producing both yellow and violet flowers, but not red flowers is 5.

(iii) The number of plants producing both yellow and red flowers is 10. How many plants do not produce yellow flowers?
(iv) The number of plants producing red flowers is 45 and the number of plants producing only violet flowers is 20. Find the probability that a randomly selected plant has at least one successful graft.

11. In triangle ABC , AB = AC. The line drawn parallel to AC through D, the mid point of AB, meets BC at F. AC is produced up to E such that BD = CE. Show that
(i) $D\hat{B}F = D\hat{F}B$
(ii) triangle DFO and triangle ECO are congruent
(iii) $OC = \frac{1}{4}BC$
(iv) DFEC is a parallelogram.



12. (a) S is an intersection point of two equal circles with centres A and B
(i) What is the magnitude of $P\hat{S}B$?
(ii) Show that the triangle ASB is equilateral.
(iii) Show that $S\hat{P}A = 30^0$
(iv) Show that SP = SQ



(b) In triangle LMN, L X is drawn perpendicular to MN
Show that $LM^2 - LN^2 = MX^2 - XN^2$