K.C.S.E YEAR 2010 PAPER 2
## SECTION I (50 marks)

Answer all the questions in this section in the spaces provided

1. The length and width of a rectangle measured to the nearest millimeter are 7.5cm and 5.2cm respectively.
   Find, to four significant figures, the percentage error in the area of the rectangle. (3 marks)

2. Simplify $\dfrac{4}{\sqrt{5} + \sqrt{2}} - \dfrac{3}{\sqrt{5} - \sqrt{2}}$ (3 marks)

3. In the figure below, O is the center of the circle which passes through the point T, C and D. line TC is parallel to OD and line ATB is a tangent to the circle at T. angle DOC = 36^0
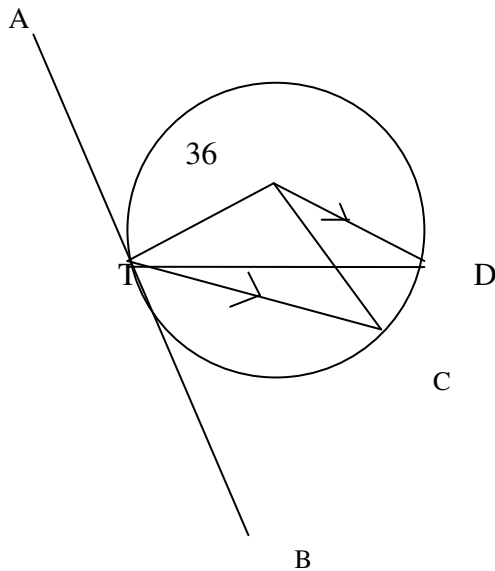
       Calculate the size of angle CTB
       (3 marks)

4. A tea dealer mixes two brands of tea, x and y, to obtain 35 kg of the mixture worth Ksh.65 per kg. If brand x is valued at Ksh.68 per kg and brand y at Ksh. 53 per kg, calculate the ratio, in its simplest form, in which the brands x and y are mixed.
   (3 marks)

5. The length of flower garden is 2 m less than twice its width. The area of the garden is 60m^2. Calculate its length. (3 marks)

6. Five people can build 3 huts in 21 days. Find the number of people, working at the same rate that will build 6 similar huts in 15 days.
   (2 marks)

7. When Ksh. 40 000 was invested in a certain bank for 5 years it earned a simple interest of Ksh.3 800. Find the amount that must have been invested in the same bank at the same bank at the same rate for 7 ½ year to earn a simple interest of Ksh. 3 420
   (3 marks)

8. The heights, in centimeters, of 100 tree seedlings are shown in the table below.

Height (cm)	10-19	20-29	30-39	40-49	50-59	60-69
Number of seedlings	9	16	19	26	20	10

Find the quartile deviation of the heights. (4 marks)

9. A bag contains 2 white balls and 3 black balls. A second bag contains 3 white balls and 2 black balls. The balls are identical except for the colours.
Two balls are drawn at random, one after the other from the first bag and placed in the second bag. Calculate the probability that the 2 balls are both white.
(2 marks)

10. The point O, A and B have the coordinates (0,0), (4,0) and (3,2) respectively. Under shear represented by the matrix $\begin{bmatrix} 1 & k \\ 0 & 1 \end{bmatrix}$, triangle OAB maps onto triangle OAB'
   a) Determine in terms of k, the x coordinates of point B' (2 marks)
   b) If OAB' is a right angled triangle in which angle OB' A is acute, find two possible values of k.(2 marks)

11. A particle starts from O and moves in a straight line so that its velocity V ms^{-1} after time t seconds is given by $V = 3t – t^2$. The distance of the particle from O at time t seconds is s metres.
   a) Express s in terms of t and c where c is a constant. (1 mark)
   b) Calculate the time taken before the particle returns to O. (3 marks)

12. .a) Expand and simplify $(2 – x)^5$
   (2 marks)
   b) Use the first 4 terms of the expression in part (a) above to find the approximate value of $(1.8)^5$ to 2 decimal places.

13. .a) Using line AB given below, construct the locus of a point P such that APB = 90^0. (1 mark)

A|————————————————————|B

   b) On the same diagram locate **two** possible position of point C such that point C is on the locus of P and is equidistance from A and B.
   (2 marks)

14. Make x the subject of the equation:
   $3y = y + \dfrac{p}{q + \frac{1}{2}}$ (3 marks)

15. Find the value of x give that
   Log $(15 – 5x) – 1 = $ log $(3x – 2)$ (3 marks)

16. The circle shown below cuts the x-axis at (-2,0) and (4,0). It also cuts y-axis at (0,2) and (0,-4).
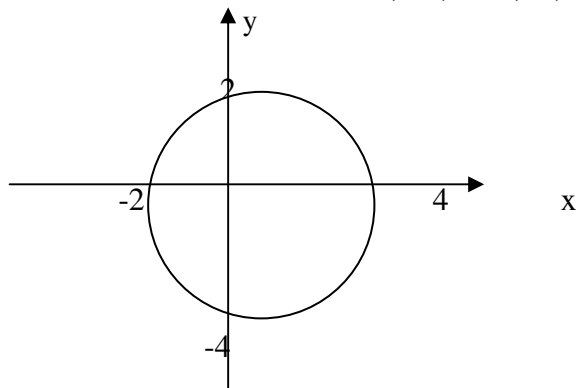
Determine the:
a) i) Coordinates of the centre; (1 mark)
   ii) radius of the circle. (1 mark)
b) Equation of the circle in the form $x^2 + y^2 + x + by = c$ where a, b and c are constants. (2 marks)

SECTION II (50 marks)

Answer all five questions in this section in the spaces provided.

17. (a) Complete the table below, giving the value correct to 2 decimal places. (2 marks)

| X^0	0^0	20^0	40^0	60^0	80^0	100^0	120^0	140^0	160^0	180^0
Cos X^0	1.00	0.94	0.77	0.50		-0.17		-0.77		-1.00
Sin x^0 – Cos x^0	-1.00	-0.60		0.37	0.81		1.37		1.28	1.00

b) On the grid provided and using the same axes draw the graphs of $y = \text{Cos } x^0$ and $y = \sin x^0 - \text{Cos } x^0$ for $0^0 \le x \le 180^0$. Using the scale; 1 cm for 20^0 on the x-axis and 4cm for 1 unit on the y-axis.
(5 marks)
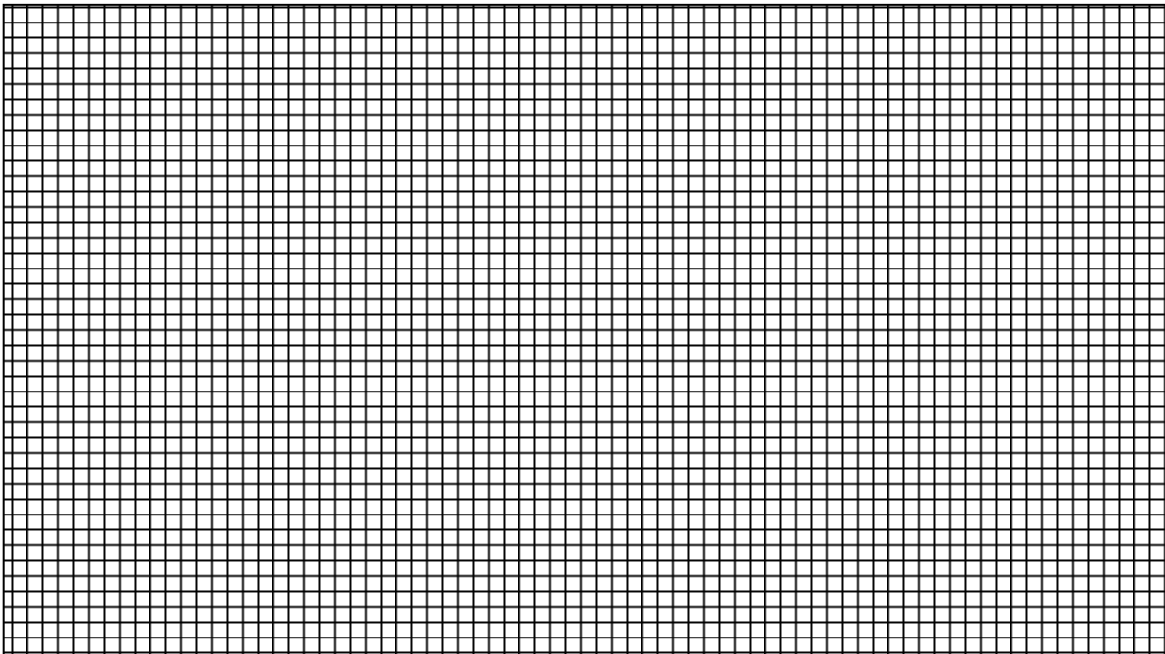
c) Using the graph in part (b);
   i) Solve the equation $\sin x^0 - \cos x^0 = 1.2$; (1 mark)
   ii) Solve the equation $\cos x^0 = \frac{1}{2} \sin x^0$; (1 mark)
   iii) Determine the value of $\cos x^0$ in part (c) (ii) above. (1 mark)

18. In the figure below OJKL is a parallelogram in which OJ = 3p and OL = 2r

O ——————— 3p ——→ J
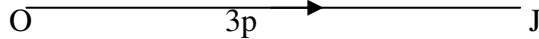
a) If A is a point on LK such that LA = ½ AK and point B divide the line JK externally in the ratio 3:1, express **OB** and **AJ** in terms of **p** and **r.** (2 marks)

b) Line OB interests AJ at X such that **OX = mOB** and **AX = nAJ.**
   i) Express OX in terms of p, r and m. (1 mark)
   ii) Express OX in terms of p, r and n (1 mark)
   iii) Determine the value of *m* and *n* and hence the ratio in which point x divides line AJ. (6 marks)

19. The position of three points A, B and C are $(34^0N, 16^0W)$, $(34^0N, 24^0E)$ and $(26^0S, 16^0W)$ respectively.
   a) Find the distance in nautical miles between:
      i) Port A and B to the nearest nautical miles; (3 marks)
      ii) Ports A and C. (2 marks)
   b) A ship left port A on Monday at 1330h and sailed to Port B at 40 knots.
      Calculate:
      i) The local time at port B when the ship left port A; (2 marks)
      ii) The day and the time the ship arrived at port B (3 marks)

20. A carpenter takes 4 hours to make a stool and 6 hours to make chair. It takes the carpenter and at least 144 hours to make x stools and y chairs. The labour cost should not exceed Ksh.4800. the carpenter must make a least 16 stools and more than 10 chairs.
   a) Write down inequalities to represent the above information. (3 marks)
   b) Draw the inequality in (a) above on a grid. (4 marks)
   c) The carpenter makes a profit of Ksh 40 on a stool and Ksh 100 on a chair. Use the graph to determine the maximum profit the carpenter can make. (3 marks)

21. A hall can accommodate 600 chairs arranged in rows. Each row has the same number of chairs. The chairs are rearranged such that the number of row is increased by 5 but the number of chairs per row is decreased by 6.
   a) Find the original number of rows of chairs in the hall. (6 marks)
   b) After the re-arrangement 450 people were seated in the hall leaving the same number of empty chairs in each row. Calculate the number of empty chairs per row. (4 marks)

22. The first term of an Arithmetic Progression (A.P.) with six terms is p and its common difference is c. Another A.P. with five terms has also its first term as p and a common difference of d. the last terms of the two Arithmetic Progressions are equal.
   a) Express d in terms of c. (3 marks)
   b) Given that the 4th term of the second A.P. exceeds the 4th term of the first one by 1 ½ , find the value of c and d. (3 marks)

c) Calculate the value of p if the sum of the terms of the first A.P. is 10 more than the terms of the second A.P. (4 marks)

23. In a uniform accelerated motion the distance
    a) Express in terms of (3 marks)
    b) Find:
       i) The distance travelled in 5 seconds; (2 marks)
       ii) The time taken to travel a distance of 560 metres. (3 marks)

24. In the figure below, P,Q, R and S are points on the circle. Line USTV is a tangent to the circle at S, <RST = 50^0 and <RTV = 150^0. PRT and USTV are straight lines.
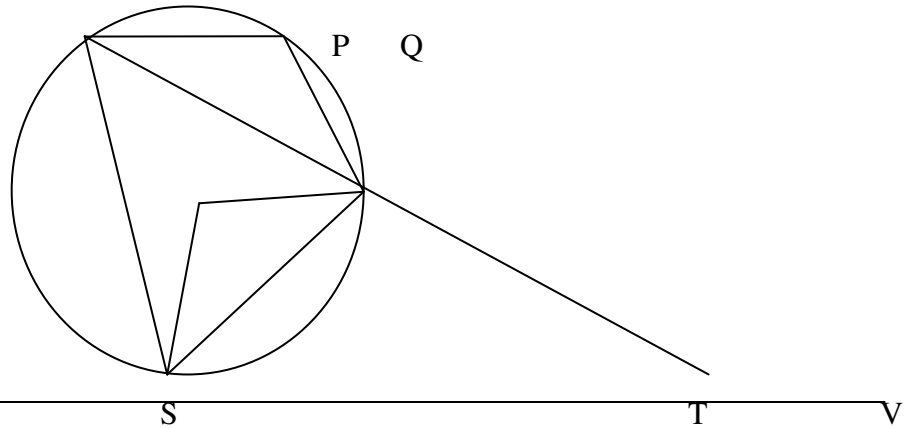
a)   Calculate the size of:
   i)   < ORS; (2 marks)
   ii) < USP; (1 mark)
   iii) < PQR (2 marks)
b)   Given that RT = 7 cm and ST = 9 calculate to 3 significant figures:
   i)   The length of line PR; (2 marks)
   ii) The radius of the circle. (3 marks)