Question one (compulsory)

a) Briefly explain the meaning of the following:
   (i)   Arc   **(1mark)**
   (ii)   Chord   **(1mark)**
   (iii)   Segment   **(1mark)**
   (iv)   Sector   **(1mark)**

b) Find the wavelength, amplitude and phase angle of the following:
   (i) $y = -\sin(3x + 60)$ **(3marks)**
   (ii) $-2y = 3cos(x + 30)$ **(3marks)**

c) Calculate the angles in a triangle whose lengths are 5.5cm, 4.2cm and 3.8cm   **(5marks)**

d) If u=v and $u = hi + 3i - j + 4k + lk \quad v = 5i - j + 6k$ where h and k are constant.
   Calculate the values of h and l **(4marks)**

e) A stool is made up by shaping a tree stump into a conical frustum of vertical height 60cm. If the top radius is 12cm and the bottom one is 24cm. calculate the surface area of the stool.
                                                                                         (8marks)

f) Convert the following angles into radians
   (i) 10^0 **(1marks)**
   (ii) 180^0 **(1marks)**
   (iii) 270^0 **(1marks)**

Question Two

a) Solve for θ such that $0 \le \theta \le 360^0$ and $2sin^2 2\theta + sin2\theta - 1 = 0$ **(5marks)**

b) When the angle of elevation of the sun is 58^0, a vertical pole casts a shadow of length 5m on a horizontal ground; calculate the height of the pole.   **(3marks)**

c) Find the number of sides of:
   (i)   A polygon having sum of interior angles 1080^0 **(2marks)**
   (ii)   A regular polygon if each exterior angle is 24^0 **(3marks)**

d) A ship leaves port P through port Q. Q is 200km on a bearing of 220^0 from P. R is 420 km on a bearing of 140^0 from Q.
   (i)   Using a suitable scale, draw a diagram showing the relative positions of the ports P, Q and R.   **(3marks)**
   (ii)   By further drawing on the same diagram determine how far R is east of P.
                                                                                         (3marks)

Question Three

a) Given the vectors AB=$\begin{bmatrix}2\\3\end{bmatrix}$ and BC=$\begin{bmatrix}-2\\4\end{bmatrix}$ work out.

   (i)   AB+ BC   **(1mark)**

   (ii) $\frac{1}{2}$BC   **(1mark)**

(iii) AB-2BC **(1mark)**

b) PQRS is a trapezium where PQ is parallel to SR, PR and SQ intersect at X so that SX=kSQ and PX=hPR where h and k are constants. Vectors PQ=3**q** and PS=**s**. SR=**q.**

    (i)   Show this information on a diagram **(2marks)**

    (ii)   Express vector SX in terms of k,s and q **(3marks)**

    (iii)   Express vector SX in terms of h,s and q **(3marks)**

    (iv)   Find h and k **(4marks)**

c) Prove the following identity

$$\frac{(cos\theta - sin\theta)^2}{cos\theta} = sec\theta - 2sin\theta$$

(5marks)

Question Four

a) Construct a triangle ABC in which AB=4.5cm, BC=6.5cm and AC=7.5cm. construct an escribed circle opposite to angle BAC. Measure the radius of the circle. **(7marks)**

b) A plane flying at 200knots left an airport A(13^0N, 31^0E) and flew due north to an airport B(30^0N, 31^0E)

    (i)   Calculate the distance covered by the plane in nautical miles **(3marks)**

    (ii)   After 20mins stop over at B, the plane flew due east to an airport C (30^0N,13^0E) at the same speed. Calculate the distance covered by the plane between B and C in nautical miles. **(4marks)**

    (iii)   Calculate the total time taken to complete the journey from airport B to C. **(3marks)**

c)   Solve for θ given $0 \leq \theta \leq 360^0$ and 4 sin 2 θ+1=0 **(3marks)**

Question Five

a) Show that a triangle of sides 7, 24 and 25 is a right angled triangle. **(3marks)**

b) Draw a triangle PQR such that <PQR=75^0 line PQ=5.3cm and line QR=4.5cm.construct the locus of all points 2.5cm from Q and equidistant from P and R. mark this locus with P_1 andP_2. Measure P_1 P_2 **(8marks)**

c) Solve for θ given that:

    (i) $sin \theta = cos15$ **(3marks)**

    (ii) $sin (\theta + 20) = cos(3\theta + 30)$ **(3marks)**

d) The angle of depression of a boat from the top of a cliff is 65^0. If the boat is 4m from the foot of the cliff. Calculate the height of the cliff. **(3marks)**