

### 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)  $-2y = 3\cos(x + 30)$  **(3marks)**
- c) Calculate the angles in a triangle whose lengths are 5.5cm, 4.2cm and 3.8cm **(5marks)**
- d) If  $u=v$  and  $u = hi + 3i - j + 4k + lk$   $v = 5i - j + 6k$  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)  $10^{\circ}$  **(1marks)**
  - (ii)  $180^{\circ}$  **(1marks)**
  - (iii)  $270^{\circ}$  **(1marks)**

### Question Two

- a) Solve for  $\theta$  such that  $0 \leq \theta \leq 360^{\circ}$  and  $2\sin^2 2\theta + \sin 2\theta - 1 = 0$  **(5marks)**
- b) When the angle of elevation of the sun is  $58^{\circ}$ , 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  $1080^{\circ}$  **(2marks)**
  - (ii) A regular polygon if each exterior angle is  $24^{\circ}$  **(3marks)**
- d) A ship leaves port P through port Q. Q is 200km on a bearing of  $220^{\circ}$  from P. R is 420 km on a bearing of  $140^{\circ}$  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  $PQ=3\mathbf{q}$  and  $PS=\mathbf{s}$ .  $SR=\mathbf{q}$ .
- (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

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

(5marks)

#### Question Four

- a) Construct a triangle ABC in which  $AB=4.5\text{cm}$ ,  $BC=6.5\text{cm}$  and  $AC=7.5\text{cm}$ . 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( $13^{\circ}\text{N}$ ,  $31^{\circ}\text{E}$ ) and flew due north to an airport B( $30^{\circ}\text{N}$ ,  $31^{\circ}\text{E}$ )
- (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 ( $30^{\circ}\text{N}$ ,  $13^{\circ}\text{E}$ ) 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  $\theta$  given  $0 \leq \theta \leq 360^{\circ}$  and  $4 \sin 2\theta + 1 = 0$  (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  $\angle PQR=75^{\circ}$  line  $PQ=5.3\text{cm}$  and line  $QR=4.5\text{cm}$ . construct the locus of all points 2.5cm from Q and equidistant from P and R. mark this locus with  $P_1$  and  $P_2$ . Measure  $P_1 P_2$  (8marks)
- c) Solve for  $\theta$  given that:
- (i)  $\sin\theta = \cos 15$  (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  $65^{\circ}$ . If the boat is 4m from the foot of the cliff. Calculate the height of the cliff. (3marks)