CHAPTER 1 Loci

1. For each of the following cases, sketch and describe the locus of the goat if it walks about, keeping the rope taut. Find also the area of the region that the goat can reach.

(a) The goat is tethered to a tree by a rope 2 m long.

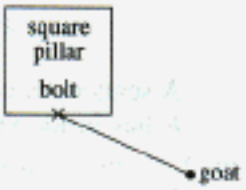
(b) The goat is tethered by a rope $1\frac{1}{2}$ m long to a ring which slides on a rail 4 m long.

(c) The goat is tethered to a bolt in the middle of a wall 8 m long by a rope 3 m long.

(d) The goat is tethered to a bolt in the middle of a wall of a square pillar of side 1 m by a rope

(i) 1 m long,

(ii) 2 m long.

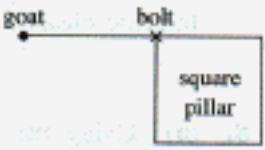


(e) The goat is tethered to a bolt on one corner of a square pillar of side 1 m by a rope

(i) 2 m long,

(ii) $3\frac{1}{2}$ m long.

and moves in an anticlockwise direction.



2. Given a square $ABCD$, sketch and describe the locus of a variable point P moving within the square such that

(a) P is equidistant from AB and AD,

(b) P is nearer to BC than to CD.

3. Given a triangle ABC, sketch and describe the locus of a point P moving within the triangle such that

(a) P is 3 cm from B,

(b) $BP \leqslant 3$ cm.

4. Given a semicircle with diameter AB, sketch and describe the locus of a point P moving within the semicircle such that

(a) $AP = BP$,

(b) $AP \leqslant BP$.

5. Draw a square $ABCD$ of side 6 cm.

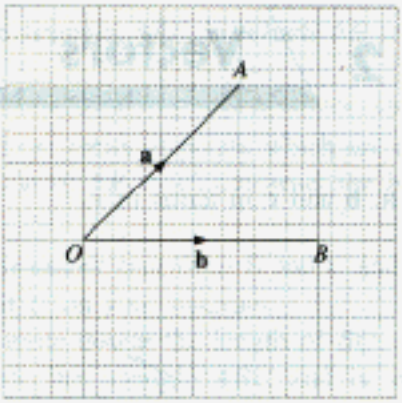
(a) Within the square,

(i) construct and describe the locus of a point P such that $A\hat{P}B = 90°$,

(ii) construct and describe the locus of a point Q such that area of $\triangle AQB = 6$ cm^2.

(b) X is a point which moves inside the square so that $A\hat{X}B > 90°$ and area of $\triangle AXB \geqslant 6$ cm^2. Indicate clearly by shading the region in which X must lie.

4.



(a) Copy the figure and on it construct

(i) $\overrightarrow{OP} = 3\mathbf{a} + 2\mathbf{b}$,

(ii) $\overrightarrow{OQ} = 2\mathbf{b} - 2\mathbf{a}$.

(b) If $\overrightarrow{OR} = \mathbf{a} + \frac{2}{3}\mathbf{b}$, what can you tell about the points O, P and R?

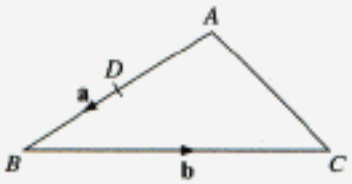
(c) If $\overrightarrow{AS} = \frac{3}{2}\mathbf{a} + \mathbf{b}$, what can you tell about the lines AS and OP?

(d) If $\overrightarrow{BC} = \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$, what can you tell about

(i) the points A, B and C,

(ii) the lines BC and OQ?

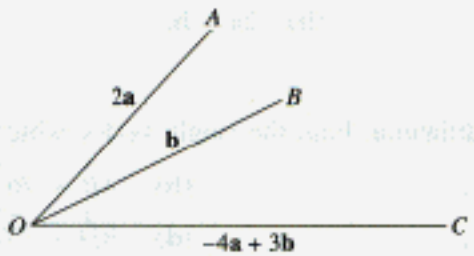
5. In $\triangle ABC$, $\overrightarrow{AB} = \mathbf{a}$ and $\overrightarrow{BC} = \mathbf{b}$. D is the midpoint of AB. Express the vectors $\overrightarrow{CA}$ and $\overrightarrow{DC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.



6. In the figure, $\overrightarrow{OA} = 2\mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = -4\mathbf{a} + 3\mathbf{b}$.

(a) Express the vectors $\overrightarrow{AB}$ and $\overrightarrow{BC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

(b) Hence show that the points A, B and C lie on a straight line.



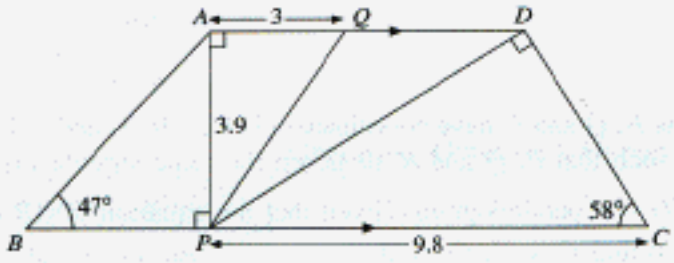
ASSESSMENT PAPER SET A (PAPER 2)

Time : $2\frac{1}{2}$ hours
Marks: 100

This paper consists of 2 sections.
Section A consists of **5 questions**.
Section B consists of **7 questions**.
Calculators may be used in this paper. If the degree of accuracy is not specified and if the answer is not exact, the answer should be given to three significant figures.

Section A (52 marks)
ALL *questions may be attempted.*

1.



In the diagram, $AQ = 3$ cm, $AP = 3.9$ cm, $CP = 9.8$ cm, $A\hat{B}P = 47°$, $D\hat{C}P = 58°$, $A\hat{P}B = P\hat{A}Q = C\hat{D}P = 90°$ and $AD \parallel BC$. Calculate

(a) AB, [3]
(b) CD, [2]
(c) $Q\hat{P}D$. [3]

2. **(a)** Solve the equation $\frac{4}{w+3} = 5w$. [4]

(b) Express $\frac{6}{2x-3} - \frac{5}{x}$ as a single fraction. [3]

(c) Simplify $\frac{8x + 6x^2y}{3x^2y^2 - 5xy - 12}$. [3]

(d) Given that $q = \frac{3(q-r)}{3q-r}$, make r the subject. [3]