

Subject – Math(Higher Level)  
Topic - Vector  
Year - Nov 2011 – Nov 2019

**Question 1**

[Maximum mark: 15]

(a) For non-zero vectors  $a$  and  $b$ , show that

(i) if  $|a - b| = |a + b|$ , then  $a$  and  $b$  are perpendicular;

(ii)  $|a \times b|^2 = |a|^2 |b|^2 - (a \cdot b)^2$ . [8 marks]

(b) The points A, B and C have position vectors  $a$ ,  $b$  and  $c$ .

(i) Show that the area of triangle ABC is  $\frac{1}{2} |a \times b + b \times c + c \times a|$ .

(ii) Hence, show that the shortest distance from B to AC is

$$\frac{|a \times b + b \times c + c \times a|}{|c - a|}. \quad [7 \text{ marks}]$$

**Question 2**

[Maximum mark: 5]

Find the values of  $x$  for which the vectors  $\begin{pmatrix} 1 \\ 2 \cos x \\ 0 \end{pmatrix}$  and  $\begin{pmatrix} -1 \\ 2 \sin x \\ 1 \end{pmatrix}$  are perpendicular.

$$0 \leq x \leq \frac{\pi}{2}.$$

**Question 3**

[Maximum mark: 6]

Two boats, A and B, move so that at time  $t$  hours, their position vectors, in kilometres, are  $r_a = (5t)\mathbf{i} + (3 - 6t)\mathbf{j}$  and  $r_b = (7 - 4t)\mathbf{i} + (7t - 6)\mathbf{j}$ .

(a) Find the coordinates of the common point of the paths of the two boats. [4 marks]

(b) Show that the boats do not collide. [2 marks]

# Ib Math HL Past Papers 2011

**O García**



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IB World Schools Yearbook 2011 Wendy Bosberry-Scott, 2011 This yearbook is the official guide to schools offering the International Baccalaureate Diploma Middle Years and Primary Years programmes It tells you where the schools are and what they offer and provides up to date information about the IB programmes and the International Baccalaureate Organization

**Quick Reference for Counselors**, 2011 *Science Citation Index*, 1961 An international interdisciplinary index to the literature of science

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